

# 2022 Indonesian-American Kavli Frontiers of Science

Indonesian Academy of Sciences – U.S. National Academy of Sciences

The David and Lucile Packard Foundation

The Kavli Foundation

Yogyakarta, Indonesia – August 1-5, 2022

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**2022 Indonesian-American Kavli Frontiers of Science**  
Indonesian Academy of Sciences – U.S. National Academy of Sciences

Yogyakarta, Indonesia – August 2-5, 2022

Program - sessions listed in Alphabetical Order

**Early Childhood Education and Learning**

Organizer: Gunadi

INTRODUCTORY SPEAKER:

*Pushing the Frontiers of Knowledge in ECE and Learning*  
Zulfa Sakhiyya, Universitas Negeri Semarang

SPEAKERS:

*Neuroscience and the Construction of a New Child in Early Childhood Education in Indonesia: A Neoliberal Legacy*

Vina Adriany, Universitas Pendidikan Indonesia

*Infant Learning from Face Time*

Lisa Scott, University of Florida

**Marine Microbial Diversity in a Changing Environment**

Organizers: Felycia Edi Soetaredjo and Richard Coleman

INTRODUCTORY SPEAKER:

*Leveraging Technology and Cultivation to Reach New Frontiers in Marine Microbiology*  
Kelle C. Freel, Hawai'i Institute of Marine Biology

SPEAKERS:

*The Neglected Threats and Future Prospects of Marine Microorganisms in Indonesia*  
Mada Triandala Sibero, Diponegoro University

*Giant Viruses – Emerging Ecological and Evolutionary Drivers in the Marine Microbiome*  
Mohammad (Monir) Moniruzzaman, University of Miami

**Nature-inspired Chemistry: From Medicine to Materials**

Organizers: Sri Fatmawati and Gregory Holland

INTRODUCTORY SPEAKER:

*Nature-inspired Innovations: From Medicine to Material*  
Agung Nugroho, Lambung Mangkurat University

SPEAKERS:

*Bioinspired Electronics:*

*Lessons from Nature on the Design of New Bio- Electronic Materials*  
Allon Hochbaum, University of California, Irvine

*Plant Natural Products: A Prolific Source of Bioactive Molecules in Drug Discovery*  
Edwin Risky Sukandar, Institut Teknologi Sepuluh Noverber

The Indonesian-American Kavli Frontiers of Science symposium is sponsored by the David and Lucile Packard Foundation. Major support is provided by the Kavli Foundation with additional support from the U.S. National Academy of Sciences and the Indonesian Academy of Sciences.

2022 Indonesian-American Kavli Frontiers of Science

**The Neuroscience of Truth and Deception**  
Organizers: Berry Juliandi and Nichole Lighthall

INTRODUCTORY SPEAKER:  
*Science at the Frontiers of Truth and Deception*  
Sarah Barber, Georgia State University

SPEAKERS:  
*Deception Detection based Brain Computer Interface*  
Arjon Turnip, Universitas Padjadjaran

*Judging Truth in a Fake News Era*  
Nadia Brashier, Purdue University

**Point of Care Diagnostics**  
Organizers: Vanny Narita and Megan McCain

INTRODUCTORY SPEAKER:  
*Point of Care Diagnostics for Infectious Diseases: Lessons from COVID-19*  
Wilbur A. Lam, Emory University and Georgia Institute of Technology

SPEAKERS:  
*Paper-based Molecular Diagnostics for Pathogen  
Detection at the Extreme Points-of-Care*  
Jacqueline C. Linnes, Purdue University

*Point-Of-Care Diagnostics for Viral Hepatitis Infection in Indonesia*  
Korri El Khobar, Eijkman Research Center for Molecular Biology

**Political Ecologies of Health and the Climate Crisis**  
Organizers: Inaya Rakmani and Brian King

INTRODUCTORY SPEAKER:  
*Political Ecologies of Covid-19 and the Climate Crisis: Insights from Indonesia*  
Rini Astuti, Universitas Gadjah Mada

SPEAKERS:  
*Blaming and Pinning Hopes in Women:  
Reproduction and Reproductive Work in Times of Crises*  
Ariane Utomo, Universitas Indonesia

*Housing is a Human Right*  
Shawnita Sealy-Jefferson, Ohio State University

**2022 Indonesian-American Kavli Frontiers of Science Symposium**  
**Indonesian Academy of Sciences - U.S. National Academy of Sciences**  
**The David and Lucile Packard Foundation**

Yogyakarta, Indonesia – August 1-5, 2022 Agenda

Sunday, July 31, 2022

Indonesian attendees arrive in Yogyakarta and check into Hyatt Regency Yogyakarta Hotel

Monday, August 1, 2022

Indonesian and US attendees arrive at Yogyakarta airport  
7:00 – 8:30 a.m. Breakfast at Hyatt Regency Yogyakarta Hotel restaurant  
8:30 a.m. COACH Workshop: Proposal Writing: Understanding the Process  
10:30 a.m. COACH Workshop: Career Launch: Making the most of your talents  
12:15 p.m. Lunch at Hyatt Regency Yogyakarta Hotel Restaurant  
1:00 p.m. COACH Workshop: Publishing in Peer Reviewed Journals  
3:00 p.m. COACH Workshop: Career Launch: The Art of Effective Negotiation  
4:30 pm. COACH Workshop adjourns  
6:00 p.m. Organizers, Chairs, Speakers meeting – symposium meeting room  
7:00 p.m. Dinner – Hyatt Regency Yogyakarta Hotel Restaurant  
8:00 p.m. Dinner Lecture – Dr. Sangkot Marzuki and Dr. Raymond Tjandrawinata

Tuesday, August 2, 2022

6:30 – 8:00 a.m. Breakfast at Hyatt Regency Yogyakarta Hotel restaurant  
8:00 a.m. Travel to Tawangmangu, meeting point at the hotel lobby  
8:00 – 11:00 a.m. Arrive at Tawangmangu, Center for Research Development and Medicinal Plants and Traditional Medicine  
(short stop in Gula Kelapa Resto Solo)  
11:00 – 12:00 p.m. Lunch at the Center for Research Development and Medicinal Plants and Traditional Medicine  
12:00 – 2:00 p.m. Explore the Center for Research Development and Medicinal Plants and Traditional Medicine and  
Presentation by Dr. Sri Fatmawati  
2:00 – 5:00 p.m. Return to Yogyakarta (short stop in Gula Kelapa Resto)  
5:00 p.m. Arrive at Hyatt Regency Yogyakarta Hotel  
7:00 - 9:30 p.m. Opening dinner at Hyatt Regency Yogyakarta Hotel and Welcome remarks from Vice Chair of AIPI (Dr. Sofian Effendi) and UGM Rector

### Wednesday, August 3, 2022

- 6:00 – 9:00 a.m. Breakfast at Hyatt Regency Yogyakarta Hotel restaurant / Put up posters
- 9:00 a.m. Welcome remarks – Dr. Sangkot Marzuki, past President, Indonesian Academy of Sciences
- 9:30 a.m. Introduction to Kavli Program – Mr. Edward Patte, NAS
- 9:45 a.m. Session I
- 12:15 p.m. Lunch at Hyatt Regency Yogyakarta Hotel Restaurant
- 1:30 p.m. Session II
- 4:00 p.m. Coffee Break
- 4:15 - 6:00 p.m. Flash Talks and Poster Session I
- 6:30 p.m. Dinner – Hyatt Regency Yogyakarta Hotel

### Thursday, August 4, 2022

- 6:00 – 9:00 a.m. Breakfast – Hyatt Regency Yogyakarta Hotel
- 9:00 a.m. Session III
- 11:45 a.m. Lunch – Hyatt Regency Yogyakarta Hotel
- 1:00 p.m. Session IV
- 3:00 p.m. Coffee Break
- 3:30 p.m. Presentation – Packard Foundation  
Presentation – ALMI  
Presentation – The Conversation Indonesia
- 4:30 p.m. Flash Talks and Poster Session II
- 6:30 p.m. Dinner – Hyatt Regency Yogyakarta Hotel Restaurant

### Friday, August 5, 2022

- 6:00 – 9 a.m. Breakfast – Hyatt Regency Yogyakarta Hotel
- 9:00 a.m. Session V
- 11:30 a.m. Lunch – Hyatt Regency Yogyakarta Hotel Restaurant
- 1:00 p.m. Session VI
- 3:00 p.m. Closing Remarks – Dr. Bruce Alberts, Past President, National Academy of Sciences
- 4:00 p.m. Buses depart Hotel for Prambanan
- 5:00 p.m. Dinner - Prambanan
- 7:30 p.m. Ramayana Dancing – Prambanan

### Saturday, August 6, 2022

- 7:00 – 9:00 a.m. Breakfast at Hyatt Regency Yogyakarta Hotel restaurant
- 9:00 a.m. Travel to Candirejo village, meeting point at the hotel lobby
- 9:40 – 11:00 a.m. Arrive at Candirejo village, explore village, with horse/carriage ride
- 11:00 – 1:00 p.m. Tour Borobudur Temple complex
- 2:00 p.m. Lunch at Local Restaurant
- 3:00 p.m. Depart for Hyatt Regency Yogyakarta Hotel
- 4:00 p.m. Arrive at Hyatt Regency Yogyakarta Hotel

## **COACH Career Development Workshop,**

*Dr. Supapan Seraphin, Senior Advisor, Research Quality Management, National Science and Technology Development Agency (NSTDA)  
and King Mongkut's University of Technology Thonburi (KMUTT), Thailand  
Distinguished Professor Emerita, Department of Materials Science and Engineering  
University of Arizona, Tucson, Arizona, U.S.A.*

### **Indonesian-American Kavli Frontiers of Science Yogyakarta, Indonesia – August 1, 2022**

#### **Workshop Description**

8:30 – 10:15

##### **Selling Your Science: The Art of Effective Proposal Writing**

This workshop provides training in effective techniques for writing proposals to gain research support for a scientific or engineering project. Participants may bring an example of a proposal that they have recently completed or have in-progress. Topics include identifying the priorities of the agency or program solicitation, determining criteria for assessment and writing to the criteria, developing a format for the proposal following known guidelines, identifying the objectives of the research project and why anyone should care, discussing examples of successful proposal formats, developing a budget and cost assessment, interacting with program officers and agencies, and developing research partnerships.

10:30 – 12:00

##### **Career Launch: Making the Most of Your Talents**

The first years as a researcher in science can be exhilarating, exhausting, stressful and rewarding. This workshop provides techniques necessary for an effective career launch in STEM fields. Participants may bring a current CV for review and critique. Topics include applying for jobs and fellowships, the importance of networking and mentoring, building a strong CV and internet presence, effective in-person and cyber interviews and persuasive scientific oral and poster scientific presentations.

13:00 – 14:45

##### **Publishing in Peer Reviewed Journals**

This workshop provides advice and training on publishing scientific and technical results in peer-reviewed English language journals. Participants may bring an example of a paper or outline for an article they are considering for submission to a journal. Topics include publication and review process for many journals, organizing a paper, determining when and where to publish results, identifying data to include in the publication and organizing the material, working with editors and on-line submissions, and responding to reviews.

15:00 – 16:30

##### **The Art of Effective Negotiation**

In this workshop, successful techniques for increasing communication and negotiation skills in the technical workplace will be discussed. The ground rules, and what comprises good and bad negotiation techniques will be presented in an interactive manner.

**COACh Grant Writing Workshop  
Indonesian-American Kavli Frontiers of Science  
Yogyakarta, Indonesia – August 1, 2022**

**Workshop Description**

- 8:30 - 9:00 a.m. Introductory Remarks; Introductions - Activities for the day
- 9:00 - 9:30 a.m. 1. Getting Started: (~15 minutes)
- a) Identify potential funding sources and specific areas that overlap with your interests (Open discussion of where to find potential sources)
  - b) Understand the goals and objectives of the funder
  - c) Determine how your project will help them fund their priorities
- Participant Exercise:
- Each individual should identify 1-2 very specific projects that they would like to get funded
  - Break into groups of ~5 with each person to have 5 minutes to describe their project
- 9:30 - 10:30 am. 2. Proposal Assessment
- 3. Structuring the Proposal
  - 4. Elements of a Good Proposal
  - 5. Common mistakes of proposal writers  
The Review Process
  - 6. Summary remarks
- 10:30 - 12:00 Career Launch: Making the Most of your Talents  
Good CV, Preparations for interviews
- 12:00 - 1:00 p.m. Lunch
- 1:00 - 2:45 p.m. Publishing in Peer Reviewed Journals (For scientists)  
Beginner traps, common mistakes, tips for writing well
- 3:00 - 4:30 p.m. The Art of Effective Negotiation



## HYATT REGENCY YOGYAKARTA

Jalan Palagan Tentara Pelajar  
Yogyakarta 55581,  
Indonesia  
TELEPHONE +62 274 869 123  
FACSIMILE +62 274 869 588  
EMAIL [yogyakarta.regency@hyatt.com](mailto:yogyakarta.regency@hyatt.com)  
[yogyakarta.regency.hyatt.com](http://yogyakarta.regency.hyatt.com)

### ACCOMMODATION

- Satellite television
- IDD telephone
- Bathrobe and slipper set
- Hair dryer
- Coffee and tea making facilities
- Mini-bar
- In-room safety-deposit box
- Regency Club™

### RECREATIONAL FACILITIES

- Modern Health Club featuring sauna, whirlpool, plunge pool and a wide selection of relaxation treatments (massage, therapies, etc.). A hairdresser and beauty salon, a doctor's clinic, and separate locker rooms for male and female guests complete the facilities. Other diversions include two floodlit tennis courts and a and a salty water multilevel free-form pool
- Nine hole par-30 golf course and driving range with 24 lanes
- Camp Hyatt™: Children can join the Camp Hyatt™ programme where there are plenty of games, a kids' pool, a playroom and a napping room

### RESTAURANT, BAR & LOUNGE

- Kemangi Bistro—Asian / Western
- Paseban Lobby Lounge—teas, cocktails and light snacks
- Paseban Lobby Court—teas, cocktails and light snacks
- Bogey's Teras—heavy and light meals
- Cemara Teras—light meals
- Panorama Teras—seasonal rooftop dining

### SERVICES & FACILITIES

- 24-hour in-room dining
- Complimentary welcome drink and chilled towel upon arrival
- Shuttle to Malioboro downtown
- Nursery and babysitting services
- Safety-deposit boxes
- Laundry and dry cleaning 24 hours
- Tour and travel agent desk
- Hyatt Boutique

### POINTS OF INTEREST

- Borobudur Temple, the biggest Buddhist temple in the world
- Prambanan Temple, Indonesia's biggest Hindu temple
- "Kraton" Sultan Palace and complex of Royal Water Castle
- Kotagede, center of silversmiths and leatherworks
- Kaliurang Mountain Retreat with Merapi Volcano
- Ullen Sentalu museum, a Javanese culture and art museum

### VISITOR INFORMATION

- Language: Bahasa Indonesia and English
- Currency: Indonesian Rupiah (IDR)
- Climate: Tropical with dry weather from April to October. Monsoon season from November to March

- Visas: Contact your travel planner or airline for up-to-date visa requirements

### TRANSPORTATION

- Strategically situated near the main highway with convenient access to Borobudur Temple and other places of interest. Adisucipto Airport Yogyakarta is just a 15 minute journey by car, while the city centre is only 7 kilometres, a ten-minute drive from the hotel

### LOCATION

- Situated in the scenic outskirts of north-western Yogyakarta, with stunning views of Mount Merapi (the sacred mountain of Java), Seribu Mountain and Java's beautiful landscape





## Pushing the Frontiers of Knowledge in ECE and Learning

Zulfa Sakhiyya, Universitas Negeri Semarang

This session aims to identify issues of frontier research on ECE and learning by examining the debates on neuroscience and educational sociology. By using critical literacies to look at the relationship between the two, my presentation outlines the landscape of education in post-colonial and post-authoritative Indonesia where ECE and learning takes place. Critical literacies may reveal how literacy teaching and educational process in general are not neutral, mechanistic processes of “civilizing” future generations. Instead, they are a battleground in which competing visions, ideologies, discourses, and political interests struggle for dominance in a given society. Dialogical approaches, such as this forum, are essential to gain a deeper understanding of ECE and the possibility of consensual social action, build on a long trajectory of research and efforts to use public space for collective advancement.

### Background Review Article:

Leigh, B. (1999). [Learning and Knowing Boundaries: Schooling in New Order Indonesia](#). *Journal of Social Issues in Southeast Asia*, 14(1), 34–56. <https://doi.org/10.1355/sj14-1b>

Sakhiyya, Z., & Hapsari, C. T. (2021). [Critical Literacies in Indonesia](#). In J. Zacher Pandya, R. A. Mora, J. H. Alford, N. A. Golden, & R. S. de Roock (Eds.), *The Handbook of Critical Literacies* (pp. 169–176). Routledge. <https://doi.org/10.4135/9781483385198.n67>

## **Neuroscience and the Construction of a New Child in Early Childhood Education in Indonesia: A Neoliberal Legacy**

*Vina Adriany*

*SEAMEO CECCEP & Universitas Pendidikan Indonesia*

Neuroscience has become a new 'truth' in early childhood education across the globe, including in Indonesia. This article aims to demonstrate how the alignment of neuroscience discourse and the legacy of neoliberalism constructs a new form of childhood in Indonesia. The conceptual framework of brain science, predicated on biological determinism, suggests that the brain will significantly influence not only children's development in the present but also will have an impact in the future. Neuroscience is also based on the idea of transparency. Beneath this conceptual framework lies the idea that a child's mind can be made visible through both technological means and standardized development measures. Global neoliberal discourse reinforces this techno-scientific approach through the concept that stimulating children's development facilitates economic growth in a country. This instrumental use of child development contrasts with the paradigm which emphasizes children's agency. This article is based on ongoing and previous fieldwork from both authors. Using Foucault's concept of discourse and disciplinary power, the authors argue that neuroscience has become the truth that hides societal issues such as poverty as well as becomes a form of surveillance that constructs a child as being open to the adult gaze and surveillance. The findings will also illuminate the tension and negotiation between local values and global values in assembling a new form of childhood in Indonesia.

Keywords:

Neuroscience, neoliberalism, discourse, children, childhood

## **Infant Learning from Face Time**

*Lisa S. Scott, University of Florida*

Faces are arguably the most important social stimulus for humans and likely the most effective tool for promoting and supporting infant learning. Newborns arrive in the world preferring to look at anything that resembles a face. This initial preference for face-like images, coupled with their ubiquitous, engaging, and information rich nature leads infants to spend a significant amount of time attending to and learning from faces. In fact, a large portion of learning in the first year of life occurs in the home and parents are the teachers. The foundations for attention, perception, language abilities and social development are built in the first year of life. Providing a supportive learning environment, with lots of interactive face-time is an easy way to teach infants important skills that may have a long-lasting impact on development. Just like books are educational tools used to promote language development and reading during early childhood, faces are also educational tools.

Across the first year of life, infants hone and focus their attention to faces. This increased attention allows infants to begin to learn all of the subtle information that faces have to offer. They learn to follow gaze cues, recognize identities and emotions, and learn the sounds and words that make up their native language(s). Infants also learn the characteristics of people they see and interact with the most, like age, race and sex. By 9 months of age infants are better at telling the difference between two faces within a highly familiar group than two faces within a relatively unfamiliar group. Interestingly, before 9 months, infants equally differentiate faces within both familiar and unfamiliar groups. During this early learning period, faces that are verbally labelled with names are learned better than faces that are not labelled or that are given a generic label. When it comes to learning from faces, the people infants attend to the most are those they learn from the most. In addition, given their developmental relevance, it's not surprising that humans develop an area of the brain specifically for processing faces. In this presentation, I will introduce you to the infant's visual world and walk you through what we know about the developing brain, how we measure and study it in the laboratory, and how learning from faces impacts both neural and behavioral development.

### Background Review Article:

Scott, Lisa S., and Natalie H. Brito. "[Supporting Healthy Brain and Behavioral Development during Infancy](#)." Policy Insights from the Behavioral and Brain Sciences 9.1 (2022): 129-136.

## **Leveraging Technology and Cultivation to Reach New Frontiers in Marine Microbiology**

*Kelle Freel, University of Hawai'i at Mānoa*

The broad field of marine microbial ecology aims to explore how bacteria, archaea, viruses, and single-celled eukaryotes interact with their environment and each other. Recent advances in methods and technologies have set the stage for the exploration of microbial communities at scales unfathomable just a few decades ago. Every drop of seawater harbors approximately one million bacterial cells, as well as an order of magnitude more viruses, constituting the majority of the biomass in the ocean. Perhaps it is unsurprising that these microscopic powerhouses are essential players in key global nutrient cycles and marine food webs. Marine microbes also impact each of us more directly, from providing much of the oxygen we breathe to producing medicines, antibiotics, and biofuels. It was only relatively recently that it became apparent we lacked a thorough understanding of the true extent of microbial diversity in the ocean and their complex ecologies. One reason for this deficit in knowledge is that many marine microbes remain recalcitrant to cultivation in a laboratory. Without isolates in hand, it is impossible to design experiments to investigate links between genes, physiology, and ecology. However, leveraging recent advances in technology has led to a new view of microbial diversity by allowing researchers to directly obtain and sequence DNA from environmental seawater samples. These modern techniques, along with continual efforts to grow previously uncultured bacteria, are paving the way for understanding why groups of microbes are genetically cohesive, their role in the environment, and how microbial assemblages might shift in our future climate.

### Background Review Article:

Advances in new methods and technologies have set the stage for the exploration of marine microbial communities at scales unfathomable just a few of decades ago. The broad field of marine microbial ecology aims to explore how bacteria, archaea, viruses, and single-celled eukaryotes interact with their environment and each other. Every drop of seawater harbors approximately one million bacterial cells, as well as an order of magnitude more viruses, constituting the majority of the biomass in the ocean. These microscopic powerhouses are essential players in key global nutrient cycles. Often overlooked in our daily lives, marine microbes impact each of us, from providing much of the oxygen we breathe to producing medicines, antibiotics, and biofuels. It was only recently that it became apparent we lacked a thorough understanding of microbial diversity and ecological interactions. While crucial to clarifying ecosystem functions, many marine microbes remain recalcitrant to cultivation in a laboratory. Without isolates in hand, it is impossible to design experiments to investigate the links between genes, physiology, and ecology. However, leveraging recent advances in technology has led to a new view of microbial diversity by allowing researchers to directly obtain and sequence DNA from environmental seawater samples. These modern techniques, along with continual efforts to grow previously uncultured bacteria, are paving the way for understanding why groups of microbes are genetically cohesive and their role in the environment.

## **The Neglected Threats and Future Prospects of Marine Microorganisms in Indonesia**

*Mada Triandala Sibero, Universitas Diponegoro*

As an archipelagic and tropical country, Indonesia harbors numerous numbers of microorganisms in the ocean. Plenty of studies have reported the diversity of bacteria, fungi, protist and virus in Indonesia's ocean. The microorganisms have important role in biogeochemical cycle in the ocean and maintain the ecosystem health. However, climate change and anthropogenic activity have been reported causing disturbance of microbial composition and diversity in the ocean. These disturbances causing plenty of problems that affect the ecosystem health that indicated by the outbreak of several diseases. Moreover, the irresponsible human activity also impacting the microbial physiology in the ocean. Some studies found the presence of multidrug-resistant organisms (MDRO) in the coastal area that can be a future threat for human. On the other hand, the richness of microbes in the ocean also a blessing for Indonesia. These microbes have outstanding ability to produces functional bioproducts such as novel bioactive compounds and enzymes that can be applied in industries. Our previous studies successfully isolated novel compounds such as Karimanone, Karimunone A-B, and Penicitrinone G from marine fungi; as well as Nocarimidazole C-D and TMKS8A from marine bacteria.

### Background Review Article:

Hutchins, David A.; Jansson, Janet K.; Remais, Justin V.; Rich, Virginia I.; Singh, Brajesh K.; Trivedi, Pankaj (2019). [Climate change microbiology — problems and perspectives](#). *Nature Reviews Microbiology*, 17(6), 391–396.  
doi:10.1038/s41579-019-0178-5

## Giant Viruses – Emerging Ecological and Evolutionary Drivers in the Marine Microbiome

Mohammad Moniruzzaman, University of Miami

Viruses are key components of the marine microbiome. As the most abundant biological entities on the planet, viruses modulate the global biogeochemistry and population dynamics of numerous microorganisms in the ocean. One of the most compelling viral groups that have recently garnered great interest are the ‘giant viruses’, also known as Nucleocytoplasmic large DNA viruses (NCLDV). NCLDVs are a diverse group of eukaryotic viruses with large virion size that can reach up to 1.5 µm, genomes as large as 2.5 million base-pairs and hundreds of genes with complex evolutionary histories. NCLDVs challenge the traditional view of viruses as ‘filterable infectious agents’ and demonstrate that viruses could be larger than some cellular lineages both in terms of physical size and genomic contents. Microbial eukaryotes (protists) play broad roles in the marine ecosystem as primary producers, grazers, and symbiotic partners of many organisms<sup>3</sup>. Current research has established that NCLDVs infect diverse marine protists and has implicated them as important modulators of marine biogeochemical cycles. Global climate change and increased anthropogenic activities are dramatically reshaping the ecology of protists, leading to ecosystem-disruptive events like massive algal blooms and coral bleaching, and NCLDVs are often recognized as integral components of these events. Despite the importance of NCLDVs in the ocean, more specific roles of these viruses in shaping ecological dynamics in marine ecosystems remain poorly understood.

In my current and previous research, I have revealed key insights on the ecological and evolutionary roles of NCLDVs in the marine environment. Leveraging community genome sequence data (metagenomics), I have recovered genomes of hundreds of novel NCLDVs that encode genes involved in energy metabolism, photosynthesis, and nutrient transport, which can potentially rewire the host metabolism during infection. These results establish giant viruses as key components of marine biogeochemistry, as they infect and manipulate host metabolic networks using the diverse functions encoded in their genomes. In addition to the genomic potential of the giant viruses, I have also studied their impact on the evolutionary trajectory of diverse protists. Remarkably, I have found that many giant viruses frequently integrate in the genome of diverse algae. Such ‘endogenization’ results in large-scale gene flow from NCLDVs to their hosts and indicate that NCLDVs can act as a massive conduit of horizontal gene transfer - profoundly affecting the genome evolution of their hosts. Together, these results provide important foundation for future research on the role of NCLDVs on the eco-evolutionary trajectory of protist community in the marine microbiome, along with their role in modulating the global biogeochemical cycles.

### Further reading:

Moniruzzaman M, Martinez-Gutierrez CA, Weinheimer AR, Aylward FO. 2020. Dynamic genome evolution and complex virocell metabolism of globally-distributed giant viruses. *Nature Communications*, 11, 1710. doi: [10.1038/s41467-020-15507-2](https://doi.org/10.1038/s41467-020-15507-2).

Moniruzzaman M, Martinez-Gutierrez CA, Weinheimer AR, Aylward FO. 2020. Widespread endogenization of giant viruses shapes genomes of green algae. *Nature*, 588, 141-145. doi: [10.1038/s41586-020-2924-2](https://doi.org/10.1038/s41586-020-2924-2).

### Review article:

Brandes N and Linial M. 2019. Giant Viruses – Big Surprises. *Viruses*, 11(5): 404. doi: [10.3390/v11050404](https://doi.org/10.3390/v11050404)

**Nature-inspired Innovations: From Medicine to Material**  
*Agung Nugroho, Lambung Mangkurat University*

Nature provides a great source of inspiration for humankind. Interest in nature inspiration and related topics is growing fast today. A wide range of nature-inspired technologies has been developed to accommodate needs in medicine, food, fashion, material, engineering, electronics, information technology, automotive, transportation, communication, building architecture, and others. A natural product is a chemical entity formed by a naturally occurring living organism with pharmacological properties, which may contribute to vital drug discovery. The natural environment remains a significant origin of novel therapeutic agent compounds. Natural therapeutic agents are prepared from natural substances containing active components, including plants, microbes, minerals, and animals. A story of nature-inspired medicine is the discovery of artemisinin from the *Artemisia annua* plant by Tu Youyou, a Nobel prize winner in medicine. Artemisinin is a drug that has significantly reduced the mortality rates of malaria patients. The ancient Chinese medical texts inspired the discovery. Nature-inspired material is a developed material that enables the imitation of a particular natural material. In general, nature-inspired material is developed to achieve sustainability in the current lifestyle. The anaerobic respiration by some sediment microbes requires shuttling electrons from the cell to remote electron acceptors has inspired the development of self-assembled biomimetic conductive fibers. In efforts to support and realize the sustainable development goals (SDGs), the development of science and technology should be oriented to produce environmentally-friendly and sustainable products. Nature-inspired technologies may have excellent prospects in the future when sustainability becomes the key to all kinds of technology development.

*Keywords: biomimetics, biomimicry, inspiration, material, medicine, nature.*

Background Review Article:

Nature-inspired Innovations: From Medicine to Material (PDF attached at end)

**Bioinspired Electronics:  
Lessons from Nature on the Design of New Bio- Electronic Materials**  
*Allon Hochbaum, University of California, Irvine*

Proteins and peptides are ideal building blocks for materials interfacing between the synthetic and biological world: they have limited toxicity, are resorbable under physiological conditions, have properties responsive to biochemical signals, and their assembly and function is programmable with appropriate sequence design. Electronic materials made of natural amino acids could even be assembled to create bio-device interfaces autonomously by engineered organisms. One significant drawback to using proteins for such bioelectronic applications, however, is that arbitrary amino acid sequences are not particularly good electronic conductors. Nonetheless, Nature has evolved structures that conduct electronic charge as integral parts of physiological processes that critically dictate the competitiveness of microorganisms. Many of these protein assemblies have been discovered as part of extracellular electron transfer processes over length scales spanning membranes (~few nm) to redox gradients in aquatic sediment (mm to cm), highlighting Nature's control over long-range electron transport. This talk will discuss structure-property relationships gleaned from work on cytochrome filaments produced by the model anaerobe, *Geobacter sulfurreducens*, including conserved heme arrangements found in multiheme cytochromes across domains of life. Complimentary efforts will be discussed to understand the extent to which heme-free peptides can contribute to electronic states and delocalization supporting long-range electron transport in supramolecular assemblies. These studies provide insights with which we can start to answer the question of how proteins can be made to conduct electronic charge over distances far beyond those of conventional charge transfer processes.

Background Review Article:

"New Life Found that Lives Off Electricity", Emily Singer, June 21, 2016. Quanta Magazine.

<https://www.quantamagazine.org/electron-eating-microbes-found-in-odd-places-20160621/>



## **Plant Natural Products: A Prolific Source of Bioactive Molecules in Drug Discovery**

*Edwin R. Sukandar, Institut Teknologi Sepuluh Nopember Surabaya, Indonesia*

Plants produce natural products which often belong to secondary metabolites with chemically diverse structures. The substances have important roles as part of ecological responses, such as volatile attractants secreted as a signal for insect-mediated pollination and toxic components generated by certain plants for self-protection against predators.

Their functions in nature are then mimicked for a wide variety of applications, including fragrances in cosmetic industry, pesticides in agricultural sector, and particularly in searching natural products-based therapeutic agents.

Based on this background, we focus on the chemistry of natural products and the potential of medicinal plant constituents in drug discovery program. An overview of my projects on exploring bioactive molecules from Indonesian *Garcinia* plants, so-called mangosteen family, will be discussed as a case study. This will cover the analysis of phytochemicals diversity and the importance of chemical functionality incorporated to the core structures toward their biological activities, which can be used as a valuable information in new drug leads development.

### Background Review Article:

Ji, Hong-Fang, Xue-Juan Li, and Hong-Yu Zhang. "[Natural products and drug discovery: can thousands of years of ancient medical knowledge lead us to new and powerful drug combinations in the fight against cancer and dementia?.](#)" *EMBO reports* 10.3 (2009): 194-200.

**Science at the Frontiers of Truth and Deception**  
*Sarah Barber, Georgia State University*

Even though most people value honesty and the truth, research studies show that deception commonly occurs in human interactions. As an introduction to the two main speakers, in this overview presentation I will describe the prevalence of deception during interpersonal communication and on social media. I will also briefly discuss the impact of deception and misinformation on people's behavior and health. This will be followed by an overview of the neuroscience methodology that is used to study deception detection and belief formation. Subsequently, Dr. Arjon Turnip will discuss recent advances in the emerging field of deception detection based upon biological brain signals. Finally, Dr. Nadia Brashier will explain why people believe fake news and misinformation and will outline brain mechanisms that contribute to these effects.

## Deception Detection based Brain Computer Interface

Arjon Turnip, Universitas Padjadjaran

In this research, the differences in brain signal activity (EEG-P300 component) which detects whether a person is telling the truth or lying is explored. Brain signal activity is monitored when they are first respond to a given experiment stimulus. In the experiment, twelve subjects whose age are around  $19 \pm 1$  years old were involved. In the signal processing, the recorded brain signals were filtered and extracted using bandpass filter and independent component analysis, respectively. Furthermore, the extracted signals were classified with adaptive neuro-fuzzy inference system method. The results show that a huge spike of the EEG-P300 amplitude on a lying subject correspond to the appeared stimuli is achieved. The findings of these experiments have been promising in testing the validity of using an EEG-P300 as a lie detector.

### Background Review Article:

Simbolon, Artha Ivonita, et al. "[An experiment of lie detection based EEG-P300 classified by SVM algorithm.](#)" *2015 International Conference on Automation, Cognitive Science, Optics, Micro Electro-Mechanical System, and Information Technology (ICACOMIT)*. IEEE, 2015.

## **Judging Truth in a Fake News Era** *Nadia Brashier, Purdue University*

We live in a fake news era, where 44% of people visited untrustworthy sites ahead of the 2016 U.S. presidential election. Misinformation harms public health, incites violence, and undermines democracy around the world. Why do people believe that coronavirus is a bioweapon or that Biden rigged the 2020 U.S. election? My research demonstrates that basic features of our brains leave us vulnerable to falsehoods. First, most content encountered in daily life is mundane and true. Reflecting this base rate, people develop a modest bias to accept claims. Second, our own feelings convey useful information in many situations, so we often “go with our guts.” Assertions that feel easy to process, for example, seem true. Unfortunately, relying on these heuristics leads people astray in a news context. Third, we can draw on our own memories to verify claims, but often must be prompted to do so. Remembering factual knowledge and cues about a source’s credibility makes us more discerning, but also takes up time and cognitive resources. To succeed in a post-truth world, interventions must account for these predictable judgment errors and memory failures. Together, my work suggests ways to cope in the current climate of misinformation, where falsehoods travel further and faster than the truth.

### Background Review Article:

Brashier, Nadia M., and Elizabeth J. Marsh. "[Judging truth](#)." *Annual review of psychology* 71.1 (2020).

## Point of Care Diagnostics for Infectious Diseases: Lessons from COVID-19

*Wilbur Lam, Emory University/ Georgia Institute of Technology*

Point-of-care (POC) testing is, by definition, medical diagnostic testing conducted at the time and place of patient care. This contrasts to the typical and historical paradigm in which diagnostic testing is confined to a centralized clinical laboratory, which requires not only the logistical challenges of specimen delivery from the POC and lengthier wait times for the results to be reported. While POC testing has taken place in healthcare settings (e.g. outpatient clinics, emergency rooms, intensive care units) and even the home (e.g. urine pregnancy tests, diabetic glucose meters) for decades, the COVID-19 pandemic has clearly demonstrated the value of POC technologies to the medical community, healthcare systems, and even the public as diagnostic testing for SARS-CoV-2 infections has steadily decentralized to atypical non-clinical settings. Indeed, use of POC diagnostics, especially for the screening and diagnosis of infectious diseases, in these non-traditional locations (e.g., pharmacies, drive thru sites, schools, homes) will only become more prevalent in the future. While the clinical value of POC tests and their degree of patient empowerment and convenience are clear, these new diagnostic technologies also bring about new challenges. Because of the environment in which they are used and the minimal level of user training involved, POC tests must not only maintain accuracy and precision, but must also be physically robust, accessible, and easy to use. Moreover, more macroscopic questions arise with POC technologies including: who “owns” POC data and how can quality be assured? What are the effects of POC technologies on healthcare costs and the practice, and even the business, of medicine? What are the regulatory, legal, and ethical hurdles that must be overcome? Finally, as COVID-19 POC tests have unfortunately exacerbated health disparities that have adversely affected underserved and marginalized populations, how do we ensure equity with new POC diagnostics? As POC tests are here to stay, these are the issues that we as a society must address to maximize the utility of these powerful new diagnostic technologies.

### Background Review Article:

Farmer S, ..., Lam WA. “[Don't forget about human factors: Lessons learned from COVID-19 point-of-care testing.](#)” *Cell Rep Methods*. 2022 May 23;2(5):100222. PMID: 35527805

Roback JD, ..., Lam WA. “[The need for new test verification and regulatory support for innovative diagnostics.](#)” *Nature Biotechnology*. 2021 Sep;39(9):1060-1062

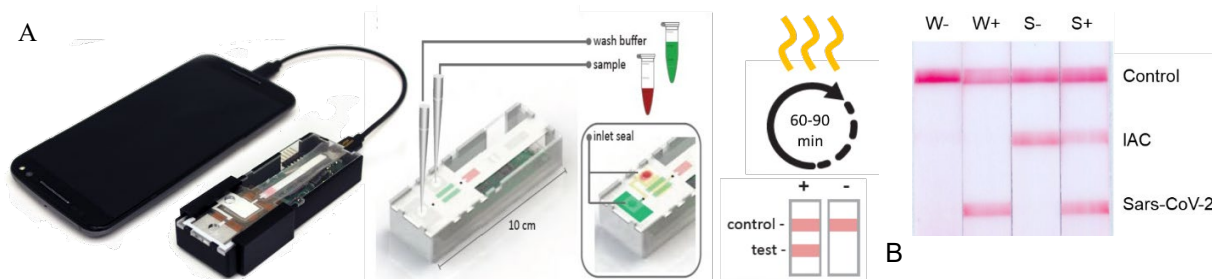
## Paper-based Molecular Diagnostics for Pathogen Detection at the Extreme Points-of-Care

Jacqueline C. Linnes, Purdue University

From HIV and influenza to emerging pathogens like COVID-19, each new infectious disease outbreak has highlighted the need for massively-scalable testing that can be performed outside of centralized laboratory settings, at the point-of-care (POC), in order to prevent, track, and monitor pandemic threats. Nucleic acid amplification tests (NAAT) are a molecular technique to detect the genetic material of pathogens and are considered among the most sensitive detection methods available. While NAATs can be developed and scaled within weeks, they are almost exclusively relegated to high resource settings with benchtop equipment and trained users. Combining NAATs with paper-based detection platforms is promising method to bring these tests to the POC due to the manufacturability, scalability, and simplicity of each of the components.

We have developed microRAAD, a fully automated device that integrates viral separation from a biofluid such as blood or saliva, lysis (breaking open the virus to access the nucleic acids inside), single-temperature (isothermal) nucleic acid amplification, and a simple lateral flow assay (LFA) readout for detection (Fig.1). This platform requires only a handheld battery to run and can be brought out of the lab and clinic to the community to test a potentially infected individual. While microRAAD was originally designed to detect HIV RNA in whole blood samples,<sup>1</sup> we redesigned the platform to test for SARS-CoV-2 detection in human saliva. To date, we are able to detect as few as 75 viral particles of SARS-CoV-2 in 10% saliva on the LFA readout. We have also incorporated an internal amplification control (IAC) detecting human 18s RNA to ensure that the sample was collected correctly and that the test functions properly. This reduces false negative results so that users can be confident in their interpretation of the tests.

Development and implementation of POC tests exists within the larger ecosystem of sample collection and interpretation workflow, usability, and manufacturability which can be vastly perturbed during a pandemic emergence. As we developed the new assay, we encountered significant manufacturing and scalability challenges that are being overcome by redesigning the microRAAD platform with a streamlined format that can be produced using small, medium, and large-scale manufacturing processes. We are presently integrating the entire sample-to-answer assay into the new microRAAD platform for truly handheld detection of SARS-CoV-2. In this talk, I will present our progress in point-of-care test development as well as efforts to reduce the barriers to their implementation in order to enable rapid diagnosis anywhere in the world.



**Fig. 1:** (A) Existing microRAAD platform with integrated paperfluidic sample handling for HIV RNA detection directly from whole blood within 75 minutes.<sup>1</sup> (B) detection of SARS-CoV-2 and human sample demonstrating use of the IAC to differentiate between saliva (S) and water samples (W), with (+) and without (-) SARS-CoV-2 spiked into each matrix. In samples such as water where the IAC does not amplify, the test would be considered invalid.

EA Phillips\*, TJ Moehling\*, KFK Ejendal, OS Hoilett, KM Byers, LA Basing, LA Jankowski, JB Bennett, LK Lin, LA Stanciu, JC Linnes. "Microfluidic Rapid and Autonomous Analytical Device (microRAAD) to Detect HIV from Whole Blood Samples," Lab on a Chip, 2019. Doi: 10.1039/C9LC00506D

COVID Set off A Boom in Diagnostics, Scientific American 326, 40-45 (March 2022)  
<https://www.scientificamerican.com/article/the-pandemic-set-off-a-boom-in-diagnostics/>

**Point-Of-Care Diagnostics for Viral Hepatitis Infection in Indonesia**  
*Korri El Khobar, National Research and Innovation Agency (BRIN)*

Hepatitis is an inflammation of the liver that is caused by infectious viruses. There are five main hepatitis viruses, referred as type A, B, C, D, and E. Of these, infection of hepatitis B virus (HBV) and hepatitis C virus (HCV) may cause chronic hepatitis that can develop into more severe liver diseases, including liver cirrhosis and liver cancer. Chronic hepatitis B and hepatitis C infections are responsible for over 90% of hepatitis deaths. Despite the available guideline to diagnose, treat, and prevent chronic viral hepatitis, some of these health services remain beyond reach. Therefore, point-of-care diagnostics for viral hepatitis infection is needed to prevent loss of linkage to care and provide better access and care for hepatitis patients. Indonesia has a substantial burden of HBV and HCV infections, with estimated HBV prevalence of 7% and HCV prevalence of 1% of the population. Initial testing for hepatitis B and hepatitis C can now be performed in primary health facilities, but the subsequent nucleic acid test for viral load quantification is usually more costly and only available in centralized laboratory facilities. Development and use of point-of-care testing for hepatitis B and hepatitis C will be important to broaden testing access in low-resource settings and hard-to-reach populations in Indonesia.

Background Review Article:

*"The Silent Epidemic Killing More People than HIV, Malaria or TB" in SA Health & Medicine 1, 1, (February 2019)*

*doi:10.1038/scientificamericanhealth0219-19*

<https://www.nature.com/articles/d41586-018-07592-7>

## **Political Ecologies of Covid-19 and the Climate Crisis: Insights from Indonesia** *Rini Astuti, Gadjah Mada University & Australian National University*

As emerging economies in the ASEAN region grow (ASEAN, 2019), the environmental quality declines due to over exploitation of the natural resources (Nathaniel, 2021). Intensive economic activities produce environmental externalities in the forms of pollutions, transboundary haze, and carbon emissions (Khan, 2019). Despite all the ASEAN countries experience similar threat, such as from climate change, its environmental repercussions will be distributed unevenly depending on country's socio-economic and geographic situations (Mendelsohn et al., 2006). At the community level, the climate impact will be unequally distributed between those who have measures to shield their households from climate induced crisis and those who don't. This unequal situation highlights the widening of wealth gap between the richest and the poorest in ASEAN countries (World Bank, 2014). The accumulated profit from the extractive industries in the ASEAN member countries grew disproportionately with the socio-economic impact negatively affecting the life quality of the poorest people in the region (Oxfam, 2017). For example, the collective wealth of 4 richest Indonesian men was \$25billion, and this is more than the total wealth of 100 million poorest (Oxfam, 2017). Indonesian land access is concentrated, with 1% of Indonesian control 68% of land (Central Bureau of Statistics, 2013). This pre-existing socio-economic gap will be heightened in times of Covid-19 health crisis. Socio-economic dimensions such as ethnicity, age, gender, job, health, education, and geography will affect how people are exposed to pandemic and climate induced socio-economic crises (Blundell et al., 2020).

In Indonesia the Covid-19 pandemic is its biggest challenge since the 1998 Asian financial crisis (Bahuet, 2020). The health and social crises from Covid-19 pandemic has hit the informal sector hard. Social distancing policies and lockdown have reduced demand in the tourism, hospitality, transportation, commercial transactions, and infrastructure sectors. These sectors are the main employment providers in the country, apart from the traditional agricultural sector. According to the Indonesian Ministry of Manpower, as of April 2020 around 2.8 million people had lost their jobs due to the pandemic-induced crisis. The rise of urban unemployment may force workers to return to their rural origin and add pressure to the forest and conservation areas. Environmental NGOs have reported increased numbers of illegal logging during the pandemic (Mapong, 2021). On the other hand, the reduction on environmental commons due to large-scale land acquisitions have narrowed rural people's livelihood options (Miller et al, 2022). As elsewhere in the region, Indonesian rural areas have experienced drastic socio-ecological transformations. In the outer islands (outside of Java and Bali islands) a widespread large-scale land acquisitions driven by increased global demand on food, fibre, and fuel have changed rural areas' environmental landscapes (Astuti et al, 2022; Hall, 2011; McCarthy et al., 2012). State backed enclosures and private large-land deals have consequently reduced the availability of forest-lands commons in the rural areas (Barney and Van Der Meer Simo, 2019). On the other hand, the commercialisation of agriculture have opened the opportunity for rural people to engage in boom crops and intensive mono-culture farming such as oil palm (Hall, 2011; Semedi and Bakker, 2014). This agrarian transition has changed the pattern of land access and ownership in the rural areas. While some farmers able to improve their livelihoods and accumulate lands, other fall deeper into poverty and landlessness (Li, 2014). This in turn have reduced the rural poorest's capacity in dealing with the socio-economic effect of Covid-19 pandemic and climate crises.

### Background Review Article:

Mehta, Lyla, et al. "[The Political Ecology of COVID-19 and Compounded Uncertainties in Marginal Environments.](#)" *Frontiers in Human Dynamics* (2022): 8.



**Blaming and Pinning Hopes in Women:  
Reproduction and Reproductive Work in Times of Crises**  
*Ariane Utomo, The University of Melbourne/Universitas Indonesia*

For decades, the “depressing streak within demography” (Dorling and Gietel Basten, 2017) sees women often depicted as being responsible for having *too many* - or *too few* - babies. In 2022, narratives linking overpopulation and the climate crises continue to appear in recent academic publications. This is despite evidence showing significant declines in the average number of children per woman across many parts of the world, including in Indonesia.

In Indonesia, the total fertility rate (TFR) had declined from about 5.7 children per woman in the 1960s to about 2.3 in 2019. There are indications that in some provinces TFR had fell to below replacement level (below 2.1 children per woman), and we no longer see significant differentials in fertility preferences and outcomes among younger cohorts of women across different levels of education.

In this talk, I begin with a discussion of the contemporary politics of family planning in Indonesia. On the one hand, we have witnessed a long-run shift in both the global and national family planning paradigms; taking the focus away from a rationale of fertility reduction/population control to women’s empowerment and health/well-being. But the use of indicators such as the percentage of postpartum women with implants and IUD as a programmatic benchmark for success seems somewhat contradictory to the spirit of rights-based family planning.

I then highlight discourses - in Indonesia and elsewhere - that continue to place the blame on women’s reproductive choices and/or outcomes in driving a whole array of problems: from household poverty to the loss of planetary biodiversity. I juxtapose these discourses against a number of current research highlighting the central role that women play in guiding their families and communities navigate the overlapping socio-ecological crises and economic precarity in their everyday.

- Preliminary reading: [World population to reach 8 billion this year, as growth rate slows | UN News](#)

## **Housing is a Human Right** *Shawnita Sealy-Jefferson, Ohio State University*

Residential evictions are considered the most harmful source of housing instability and are considered a fundamental cause of health inequity. Increasing housing costs, decreasing or stagnant income among the socioeconomically disadvantaged, and drastic cuts to federal housing assistance all contribute to the increasing number of families impacted by evictions. Formal evictions, which are processed through the courts, are experienced by approximately 6,300 people every day, or 2.3 million every year. Informal evictions, including illegal strong-arm lockouts, and unofficial orders for the tenant to vacate a rental property, occur outside of the context of the courts. Informal evictions make up 48% of all evictions, and are significantly less expensive and more efficient (than formal evictions) for landlords. Evictions may be the most understudied issue affecting urban minoritized populations, and this gap in the literature is unfortunate since evictions cause financial hardship, insecurity, powerlessness, depression, and even death by suicide. Further, families that experience housing instability have higher rates of acute and chronic illnesses. Black mothers as well as victims of domestic and interpersonal violence bear the greatest burden of formal evictions, which suggests racial, family, and gender discrimination by landlords. The impact of evictions on Black women is similar to the impact of mass incarceration on Black men. In other words, Black men are locked up and Black women are locked out of stable housing. Rooted in structural racism and discrimination, eviction and mass incarceration are prevalent causes and consequences of poverty for Black communities. Unfortunately, the current COVID-19 pandemic has exacerbated existing racial inequities in housing stability and health in racially segregated cities. This talk will describe the work of the Social Epidemiology to Combat Unjust Residential Evictions (SECURE) study, which is a mixed-methodology, community-based participatory research project that will document for the first time, the magnitude and severity of court-ordered and illegal evictions and their impact on Black women, families, and communities. SECURE study is an example of research for *action* and this work will inform future research, policy change, and social activism to ensure that every human has safe and sustainable housing.

### Background Review Article:

Moran-McCabe K, Burris S. [Eviction and the Necessary Conditions for Health](#). N Engl J Med. 2021 Oct 14;385(16):1443-1445. doi: 10.1056/NEJMp2031947. Epub 2021 Oct 9. PMID: 34623786.

**2022 Indonesian-American Kavli Frontiers of Science**  
Indonesian Academy of Sciences – U.S. National Academy of Sciences  
The David and Lucille Packard Foundation

Yogyakarta, Indonesia – August 1-5, 2022

List of Poster Presenters<sup>1</sup>

**Biology and Medicine**

*1 - Current Status of Gayo Arabica Coffee Diversity on Gayo Highlands: Has the Global Warming Become More Obvious?*

Rita Andini, Badan Riset Inovasi Nasional (BRIN) - National Agency of Research and Innovation

*2 - Investigating Sociodemographic, Clinicopathology, and Molecular Differentiation Profile of Lymphoid Neoplasms to Provide Robust Foundation for The Benefit of Patient Care*

Nungki Anggorowati, Faculty Of Medicine, Public Health, And Nursing, Universitas Gadjah Mada

*3 - Kids characterizing coastal communities: a collaborative approach to monitoring nearshore fish diversity on Hawai'i Island using environmental DNA (eDNA)*

Matthew Iacchei, Hawai'i Pacific University

*4 - Sensor monitoring to determine daily functioning among post-stroke older people at the home setting*

Andi Masyitha Irwan, Universitas Hasanuddin

*5 - Deep ancestry of collapsing networks of nomadic hunter-gatherers in Borneo*

Pradiptajati Kusuma, Mochtar Riady Institute for Nanotechnology

*6 - Patient-operated, point-of-care diagnostic tests for anemia*

Wilbur Lam, Emory University/Georgia Institute of Technology

*7 - Retinoic acid stimulates expression of midkine in the anterior pituitary gland of rat*

Rita Maliza, Andalas University

*8 - A myocardial infarct border-zone-on-a-chip demonstrates distinct regulation of cardiac tissue function by an oxygen gradient*

Megan McCain, University of Southern California

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<sup>1</sup> Odd numbered posters will present on Wednesday, August 3, 2022 from 4:15-6:00 p.m.; even numbered posters will present on Thursday, August 4 from 4:30-6:15 p.m.

## **Biology and Medicine**

*9 - Induced Pluripotent Stem Cells: Research and Clinical Applications in Regenerative Medicine, Disease Modelling, and Drug Discovery*

Harry Murti, Stem Cell and Cancer Institute, PT. Kalbe Farma, Tbk.

*10 - Drug Discovery and Development from Indonesian Marine Organisms*

Masteria Yunovilsa Putra, National Research and Innovation Agency (BRIN)

*11 - Opposing growth and photosynthesis strategies by two co-occurring bloom algae: it's all about sweet spots.*

Angela Richards Dona, University of Hawaii at Manoa

*12 - eNose-TB: Innovation of the electronic nose for tuberculosis screening in Indonesia*

Antonia Saktiawati, Universitas Gadjah Mada, Faculty of Medicine, Public Health, and Nursing

*13 - Predicting the Effects of Submarine Groundwater Discharge On Coral Reef Biogeochemistry and Ecosystem Functioning*

Nyssa Silbiger, California State University, Northridge

*14 - Translational hepatology: from chronic hepatitis B to hepatocellular carcinoma*

Caecilia Sukowati, Badan Riset dan Inovasi Nasional (National Research and Innovation Agency / BRIN)

*15 - Pandemic inequity in a megacity: a multilevel analysis of individual, community and healthcare vulnerability risks for COVID-19 mortality in Jakarta, Indonesia*

Henry Surendra, Oxford University Clinical Research Indonesia

## **Chemistry / Biochemistry / Materials Science**

*16 - Design and Application of Homogeneous-structured TiO<sub>2</sub>/Activated Carbon Nanocomposite for Adsorption–Photocatalytic Degradation of MO*

Osi Arutanti, National Research and Innovation Agency

*17 - Nickel and Cobalt Extraction from Indonesian Nickel Laterite Ores for Preparation of NMC (Nickel Manganese Cobalt) Cathode Precursor*

Widi Astuti, National Research and Innovation Agency (BRIN)

*18 - MXene-based nanocomposite: An up-and-coming catalyst for bicarbonate photoreduction and hydrogen evolution reaction*

Grandprix Thomryes Marth Kadja, Institut Teknologi Bandung

*19 - Designing Green Solvent With Enhanced Capacity to Absorb Hazardous Gases*

Kiki Kurnia, Institut Teknologi Bandung

*20 - Surface Modification of Green Synthesized MIL-100(Fe) with mesoporous silica nanoparticles and carboxymethyl cellulose as slow release agents of curcumin*

Witri Wahyu Lestari, Universitas Sebelas Maret

### **Chemistry / Biochemistry / Materials Science**

21 - *GCMS Profiles Of Gonystylus Bancanus Wood*

Ika Oktavianawati, Institut Teknologi Sepuluh Nopember

22 - *Biological Activity Evaluation and In Silico Studies of Polyprenylated Benzophenones from Garcinia celebica*

Yenni Pintauli Pasaribu, Institut Teknologi Sepuluh Nopember

23 - *Development of quality control method for medicinal plant raw materials using a metabolomics approach*

Mohamad Rafi, Institut Pertanian Bogor

24 - *An innovative approach on synthesis of solid-acid catalyst from bagasse for esterification*

Shella Permatasari Santoso, Widya Mandala Surabaya Catholic University

25 - *Conceptualization of Integrating Chirality to Mesoporous Silica from Coconut Husk for Drug Delivery Applications*

Jeane Angelica Yulianadi Susanto, Widya Mandala Catholic University Surabaya

26 - *Doxorubicin loading on cellulose nanocrystals/ZIF-L composite (CNCs@ZIF-L) for future perspective of oral chemotherapy*

Christian Julius Wijaya, Institut Teknologi Sepuluh Nopember

27 - *Potential Utilization of Waste-based Magnetic Cellulose for Rhodamine-B Removal*

Maria Yuliana, Widya Mandala Surabaya Catholic University

28 - *Effect of Addition of Bacterium Pseudomonas aeruginosa on Biodecolorization of Methylene Blue by Brown-Rot Fungus Gloeophyllum trabeum*

Eka Pratiwi Yuniarti, Institut Teknologi Sepuluh Nopember Surabaya

### **Earth Science / Environmental Science**

29 - *Assessing habitat suitability of a vertically migrating deep-sea shark under a changing climate*

Danny Coffey, Texas A&M University-Corpus Christi

30 - *From spawning to settlement: Identifying fine-scale connectivity in the Convict Tang, Acanthurus triostegus, across O'ahu*

Richard Coleman, University of Texas, Austin

31 - *Genetic conservation of groupers (family Epinephelidae) in Aceh, Indonesia*

Nur Fadli, Universitas Syiah Kuala

**Earth Science / Environmental Science**

32 - *Diagnostic of Ulcerative White Spots (UWS) Disease in Coral Massive Porites*  
Widiastuti Widiastuti, Udayana University

**Math / Applied Math / Computer Science**

33 - *Identification and Mapping of Solar Energy Potential In Eastern Indonesia Districts*  
Dharma Aryani, Politeknik Negeri Ujung Pandang

**Neuroscience / Psychology**

34 - *Age Differences in Affective Forecasting Accuracy*  
Sarah Barber, Georgia State University

35 - *Visual Cues of Trustworthiness: Unique Effects of Social vs. Nonsocial Cues on Trust-related Behavior and Memory*

Nichole Lighthall, University of Central Florida

36 - *How the form and structure of memory underlie adaptive and maladaptive communication.*

Vishnu Murty, Temple University

**Social Science**

37 - *To wed or not to wed: Cinematic Representations of Interreligious Marriage and Religious Openness in Indonesia*

Evi Eliyanah, Universitas Negeri Malang (UM)

38 - *Geographies of colliding epidemics: COVID-19 and opioid misuse*

Brian King, Pennsylvania State University

39 - *Exploring the symbiotic relationship between nature and culture through the everyday making activities of craft makers in various regional areas*

Prananda Luffiansyah, Institut Teknologi Bandung

40 - *“Smong” means more than tsunami: The understanding of tsunami in the Indonesian context*

Alfi Rahman, Tsunami and Disaster Mitigation Research Center (TDMRC) Universitas Syiah Kuala

41 - *Human Agency in using Technology and the Effect on Customer Wellbeing*

Nila Windasari, Bandung Institute of Technology (ITB)

**Current Status of Gayo Arabica Coffee Diversity on Gayo Highlands: Has the Global Warming Become More Obvious? A Study Case in Aceh**

*Rita Andini, Badan Riset Inovasi Nasional (BRIN) - National Agency of Research and Innovation*

**R Andini<sup>1\*</sup>, M Muzaifa<sup>2</sup>, M I Sulaiman<sup>2</sup>, R Jaya<sup>3</sup>, Heru P Widayat<sup>2</sup>**

Forestry Department, Universitas Syiah Kuala (USK), Jalan Tgk. Hasan Krueng Kalee 3, Darussalam-Banda Aceh 23111, Indonesia

Agriculture Product Technology Department, USK Jalan Tgk. Hasan Krueng Kalee 3, Darussalam-Banda Aceh 23111, Indonesia

Balai Pengkajian Teknologi Pertanian Provinsi Aceh, Jl. Panglima Nyak Makam No. 27, Lampineung, Banda Aceh 23125, Indonesia

\*Email: rita.andini@unsyiah.ac.id

Biodiversity is defined as the variety of life encompassing the 'existing' variations at all level, starting from the tiny genes within a species up to a broader sense consisted of habitats within ecosystem. Meanwhile, 'Agrobiodiversity' has a crucial role in food and nutritional security issues, securing livelihoods for smallholders, and in lessening the impact of global warming. In the world, almost 4.3 million coffee producing smallholders are being involved and this activity provides 1,700,000 seasonal jobs. Indonesia is known as the fourth biggest coffee exporting country at the global level, with a total export of 639,000 tonnes per year. The Gayo Highlands [up to 1,450 m a.s.l.] located in Aceh is known as the most extensive arabica plantation in Indonesia; with an estimated area up to 101, 316 hectares, and 700- 800 kg ha<sup>-1</sup> productivity. A big concern issue is that the plantation has outreached the higher altitude regions as a result of increasing demand and attractive price of coffee at the global level. Such huge activities have deliberately large scale environmental impacts, and *synchronously* can make a significant contribution to biodiversity conservation and carbon sequestration. Based on recent findings, however, the opposite findings were being explored; in which reduced number of coffee varieties planted on the field has become more obvious. There are many reasons that lead to such situation. This report would like to explore the current situation of Gayo Arabica Coffee diversity in relationship with the more becoming obvious of the adverse effect of the global warming.

**Investigating Sociodemographic, Clinicopathology, and Molecular Differentiation Profile of Lymphoid Neoplasms to Provide Robust Foundation for The Benefit of Patient Care**

*Nungki Anggorowati, Universitas Gadjah Mada*

As heterogeneous disease, lymphoid neoplasms have various clinical appearances and molecular features. The classification of this neoplasm has rapidly increased since molecular research growth, and efforts to prevent overdiagnosis and overtreatment of condition mimicking lymphoma have become a consideration. In Indonesia, many unanswered questions of this neoplasm entity still need confirmation. A multidisciplinary research team should be formed. We have published several research articles as results of our previous researches toward this field including sociodemographic, clinicopathology, molecular subtypes, and viral occurrence of this disease. We found out that lymphoma was more frequent in male patients. Diffuse large B cell lymphoma (DLBCL) was found to be the most common histopathological type of lymphoma. There was difference in mean of age, occupation and education level between NHL and HL patients. There was high prevalence of anemia across all of lymphoma, and high total prognostic score were correlated significantly with the incidence of anemia. DLBCL is divided into two categories based on cell of origin (COO) into germinal center B like (GCB) and non-GCB. Previous study reported that GCB subtype had better progression free survival (PFS) and overall survival (OS) than non-GCB. The non-GCB profile in Indonesian DLBCL as shown in our study is higher than GCB, and the GCB profile is associated with higher expression of apoptotic and proliferation Index. Nevertheless, the role of COO with Hans' algorithm as prognostic factor in DLBCL is not confirmed in our recent study. In another data in our research, Epstein Barr Virus (EBV) genomes were detected in low to moderate rate in paraffin embedded tissue DLBCL. In opposite, Simian Virus 40 (SV 40) might not play a role in the oncogenesis of DLBCL here, since it was not detected in our specimens. By establishing linkages between sociodemographic, clinicopathologic, molecular and viral status may provide strong basis for the benefit of patient care.



**Kids characterizing coastal communities: a collaborative approach to monitoring nearshore fish diversity on Hawai'i Island using environmental DNA (eDNA)**

*Matthew Iacchei, Hawai'i Pacific University*

Marine biodiversity is increasingly threatened by human activities such as habitat destruction, pollution, fishing, and climate change. In some locations, species abundance and community composition are changing faster than can be documented using standard survey methods. One of the most successful approaches to marine resource monitoring and management is empowering communities who are deeply tied to their local resources to lead these efforts. Genetic sequencing of environmental DNA (eDNA) is a monitoring approach that is easy to implement at a community level, can be tailored to specific community interests, is effective in documenting species presence, and can compare species diversity in a standardized way across scales. Here, we present a collaborative effort between a public charter school (K-12), members of the local community, and a university research team to monitor marine fish diversity in a coastal community on Hawai'i Island. Using approximately monthly nearshore water collections by students, and Illumina MiSeq sequencing of the 12s and 16s ribosomal DNA regions of the mitochondrial genome, we detected a total of 110 fish species from 37 fish families during three years of sampling. This compared favorably with a total of 131 species detected by the National Oceanic and Atmospheric Administration (NOAA) using standard underwater visual reef fish surveys conducted across 37 sites along the whole west coast of Hawai'i. Using the eDNA assays, students and community members were able to detect and monitor 10 species deemed important nearshore fisheries resources, seven species that were targets of the aquarium fish trade, and three introduced and potentially invasive species, in addition to relatively rare species from deep sea and pelagic habitats. Students were able to document fish community differences through time and compare communities during the Kau (dry) and Ho'oilō (wet) seasons. Future efforts should incorporate additional eDNA assays to monitor invertebrate and algal species of interest to the community, and engage students in the bioinformatic and data analyses to develop additional high-demand STEM skillsets.

## Sensor monitoring to determine daily functioning among post-stroke older people at the home setting

Andi Masyitha Irwan, PhD.RN  
Faculty of Nursing, Universitas Hasanuddin, Indonesia

**Stage 1** Aim : To measure daily functioning of post-stroke patients by matching result from sensor monitoring, FIM, walking speed and nutritional status.

### Methods:

- Cross sectional study with a week measurement for wearable sensor monitoring and every morning walking speed. Other measurements measured once.
- 16 participants (no drop-out)
- Makassar city, South Sulawesi Province, Indonesia
- **Inclusion**
  - Age 60 years old and above, hemiplegia, can walk either with/without walking aid and family assistance
  - As first cognitive screening, participants will were asked to follow simple directions, such as 'could you raise your arm?' If they could follow, they will be screened further with Isaacs Walkey Impairment Measurement instrument.
- **Exclusion**
  - Having acute diseases or unstable chronic diseases
- **Drop Out**
  - If the participants **stop to wear** sensor device before a week
- **Personal Activity Monitor (PAM) AM300**
  - How active, when and what activity, calorie spent
  - Mode zone (minutes spent for activity). Living zone, Health Zone, and Sport Zone
  - Activity index (point from minutes and calorie). <20 and 20



### Results:

Table 1. Participants Functional Status (n=16)

Functional Status	Min-max	Mean±SD
Index Activity	3-35	18.28±10
Living Zone (mins)	14-24	103.56±58.6
Health Zone (mins)	4-67	27.81±19.6
Sports Zone (mins)	0-3	0.69±0.9
FIM total	28-125	106±27.5
FIM motor	23-90	75.19±20.7
FIM cognitive	5-35	30.81±8.4

FIM, Functional Independence Measure

- Walking ability, fear of falling, walking speed, self-efficacy, and some aspect of FIM were **significantly differed** with sensor activity index
- Some variables which **significantly differed** with sensor are activity index, also significantly differed with FIM, walking ability, self-efficacy and lefthemiplegia



**Stage 2** Aim: To trace pattern and detect changes in functional status by observing daily activity performance through sensor monitoring

### Methods:

- Longitudinal study for 5 months with 10 participants with the inclusion, exclusion criteria same with the 1st stage. All variables are the same with stage 1 study.

### Results:

There were **significant decline** of index activity and health zone over 5 months. In addition, fall risk measured by timed-up and go test and right handgrip were also had significant changes. However, no detected changes in participants FIM.

FIM could not detect any changes during 5 months but sensor monitoring could detect it. In terms of time spent based on 3 zones, there were decline on time spent for doing healthy zone or going outside houses. Living arrangement variable is **corelated significantly** with index activity changes.

### Further Conderations:

- PAM300 is **very costly** and only produced in European countries.
- We still need to perform further analysis to answer the hypothesis and describe whether there is any decline of index activity based on walking ability, regularity of rehabilitation attendance, and fall history, and to point out, when exactly changes happened
- The majority of participants complained of itchinness while using the device at the hip.

**Stage 3** Aim : To develop a similar device at a cheaper price so it could be affordable for the larger community

### Future Plan:

- A device that could be attached to the wrist.
- Need to collaborate with other disciplines such as engineering, psychology, etc.

**Deep ancestry of collapsing networks of nomadic hunter-gatherers in Borneo**

*Pradiptajati Kusuma, Mochtar Riady Institute for Nanotechnology*

*Authors:*

*Pradiptajati Kusuma, Guy S. Jacobs, Murray P. Cox, Herawati Sudoyo, J. Stephen Lansing*

The behavioral repertoire of our species evolved during the Pleistocene, at a time when our ancestors lived as hunter-gatherers. Consequently the study of the few remaining populations of hunter-gatherers has high priority for understanding the evolutionary basis of human behavior. This is especially true in island Southeast Asia, an understudied hub of human cultural and biological evolution, where rapid development poses particular threats to hunter-gatherer subsistence. On the island of Borneo, the Punan are the largest and most diverse extant hunter-gatherer group living in rock shelters. However, anthropological interest has been muted – both because most communities have long been resettled into sedentary villages, and because, phenotypically Asian and speaking Austronesian languages, the Punan have repeatedly been presented as descendants of migrating Neolithic farmers who recently reverted to a hunter-gatherer way of life. Here we present a multifaceted study of a particularly remarkable group, the Punan Batu Sajau (Cave Punan Sajau), that is inconsistent with the recent reversion hypothesis. This community have maintained a substantially mobile lifestyle, living in temporary camps and under rock shelters. Our results argue for an urgent reassessment of the importance of the Indonesian hunter-gatherers in our understanding of human genetic diversity and evolution.

**Patient-Operated, Point-Of-Care Diagnostic Tests for Anemia***Wilbur Lam, Emory University/Georgia Institute of Technology*

Anemia, or low blood hemoglobin levels, afflicts 2 billion people worldwide. Currently, hemoglobin levels are typically measured from blood samples using hematology analyzers (blood counts), which are housed in hospitals, clinics, or commercial laboratories and require skilled technicians to operate. A reliable, inexpensive point-of-care (POC) hemoglobin test would enable cost-effective anemia screening and chronically anemic patients to self-monitor their disease. To that end, our hematology bioengineering laboratory developed a rapid, stand-alone, and disposable POC anemia test that, via a single drop of blood, outputs color-based visual results that correlate with blood hemoglobin levels (Tyburski E, et al, *Journal of Clinical Investigation*, 2014). Our group and others then demonstrated that this inexpensive (<\$0.25 USD) POC assay accurately estimates low hemoglobin concentrations and has the potential to become a transformational diagnostic tool for severe anemia in limited-resource settings (McGann P, et al, *American Journal of Hematology*, 2015). This device received 510k clearance by the FDA for clinical use in 2017 and is now being reviewed for over-the-counter indications. Recently, we also introduced a paradigm of completely non-invasive (no need for blood sampling), on-demand diagnostics that may replace common blood-based laboratory tests using only a smartphone app and photos. Specifically, we developed a smartphone app that estimates hemoglobin levels by analyzing color and metadata of “fingernail selfie” smartphone photos and effectively detects anemia (Mannino R, et al, *Nature Communications*, 2018). The app is currently available for public download for free: <https://sanguina.com/>. Moreover, with “personalized” calibration using a standard blood count or even our single drop of blood POC anemia test described above, the app’s algorithm is then individualized to each patient, significantly increasing the accuracy of the app, thereby empowering chronic anemia patients to serially monitor their hemoglobin levels instantaneously and remotely. Our on-demand system enables anyone with a smartphone to download an app and immediately detect anemia anywhere and anytime. In addition, these data indicate that these two POC anemia tests could effectively synergize, as the POC blood test could be used to personalize the anemia app to each patient.

**Retinoic acid stimulates expression of midkine in the anterior pituitary gland of rat**  
*Rita Maliza, Andalas University*

Midkine (MK) is known as a retinoic acid (RA)-inducible growth factor and modulates proliferation and migration of cells in various tissues. We recently reported that MK was produced by the folliculostellate (FS) cell in rat anterior pituitary gland and was suggested to act locally on hormone-producing cells (Fujiwara et al., Cell Tissue Res, 2014). In addition, our previous study showed RA-synthesizing enzyme expression in FS cells (Fujiwara et al., Cell Tissue Res, 2007). These results suggested the autocrine action of RA on MK regulation in FS cells. The present study, therefore, examined the effect of RA on MK gene expression in anterior pituitary gland. The cells were isolated from anterior pituitary glands of adult male Wistar rats. The isolated cells were cultured in medium with or without all-trans RA (ATRA) for 24 to 72 h. The gene expression level was measured by real-time PCR. The results showed that the expression of MK was increased in ATRA-treated pituitary cells. The stimulatory effect of ATRA on MK expression was dose- and time-dependent manners. Moreover, the retinoic receptor (RAR) agonist Am80 mimicked the effect of ATRA on MK expression, while retinoid X receptor (RXR) agonist PA024 had no effect on MK expression. These results suggest that RA promotes gene expression of MK via RAR. RA may regulate MK gene expression in FS cells.

Key words : Midkine, growth factor, retinoic acid, folliculostellate cell, rat

## **A Myocardial Infarct Border-Zone-On-A-Chip Demonstrates Distinct Regulation of Cardiac Tissue Function by an Oxygen Gradient**

*Megan McCain, University of Southern California*

*Megan L. Rexus-Hall<sup>1</sup>, Natalie N. Khalil<sup>1</sup>, Sean S. Escopete<sup>2</sup>, Xin Li<sup>3</sup>, Jiayi Hu<sup>3</sup>, Hongyan Yuan<sup>3</sup>, Sarah J. Parker<sup>2</sup>, and Megan L. McCain<sup>1,4</sup>*

<sup>1</sup>Laboratory for Living Systems Engineering, Department of Biomedical Engineering, USC Viterbi School of Engineering, University of Southern California (USC), Los Angeles, CA, USA; <sup>2</sup>Smidt Heart Institute, Cedars-Sinai Medical Center, Los Angeles, CA, USA; <sup>3</sup>Department of Mechanics and Aerospace Engineering, Southern University of Science and Technology, Shenzhen, Guangdong 518055, China; <sup>4</sup>Department of Stem Cell Biology and Regenerative Medicine, Keck School of Medicine of USC, USC, Los Angeles, CA, USA.

After a myocardial infarction, the boundary between the injured, hypoxic tissue and the adjacent viable, normoxic tissue, known as the border zone, is characterized by an oxygen gradient. Yet, the impact of an oxygen gradient on cardiac tissue function is poorly understood, largely due to limitations of existing experimental models. Here, we engineered a microphysiological system to controllably expose engineered cardiac tissue to an oxygen gradient that mimics the border zone and measured the effects of the gradient on electromechanical function and the transcriptome. The gradient delayed calcium release, reuptake, and propagation; decreased diastolic and peak systolic stress; and increased expression of inflammatory cascades that are hallmarks of myocardial infarction. Importantly, these changes were distinct from those observed in tissues exposed to uniform normoxia or hypoxia, demonstrating distinct regulation of cardiac tissue phenotypes by an oxygen gradient. Our border-zone-on-a-chip model advances functional and mechanistic insight into oxygen-dependent cardiac tissue pathophysiology.

**Induced Pluripotent Stem Cells: Research and Clinical Applications in Regenerative Medicine, Disease Modelling, and Drug Discovery**

*Harry Murti, Stem Cell and Cancer Institute, PT. Kalbe Farma, Tbk.*

Steady improvements in the world's economy and the prosperity that they bring have resulted in longer life expectancy and hence an expansion in the elderly population around the world. The ever-increasing prevalence of degenerative diseases which disproportionately affect the aging population and are often untreatable by conventional medicine, has given rise to novel approaches in therapy, one of which is regenerative medicine. The most commonly used agent in regenerative medicine is stem cells, i.e., undifferentiated cells which are capable of long-term proliferation and differentiation into a diverse range of specialized cells. Several clinical trials have attested the potential benefits of stem cells in treating degenerative diseases such as cardiovascular diseases, diabetes, and Parkinson's disease. Previously, we developed umbilical cord-Mesenchymal Stem Cells (UC-MSC) and their derivative products. Recently, we have started to explore research using induced pluripotent stem cells (iPSCs) as a new source for cell therapy and can also be developed as a degenerative disease modelling, and potentially for the development and screening of new drug candidates..

**Drug Discovery and Development from Indonesian Marine Organisms**

*Masteria Yunovilsa Putra, National Research and Innovation Agency (BRIN)*

Natural products have contributed significantly to the development of pharmaceuticals. In this regard, the marine environment is largely underexplored and untapped in comparison with the terrestrial environment. Hence, research efforts in the discovery of bioactive secondary metabolites have now expanded from the land to the ocean. Numerous novel secondary metabolites have been isolated in recent years, and many, especially those from invertebrates, reveal interesting pharmacological properties. In our ongoing project on the search for bioactive compounds from Indonesian marine invertebrates, we have focused mainly on marine sponges, soft corals, ascidians and sea cucumbers. Several new secondary metabolites, including cembranoid, steroids, alkaloids, glycolipids, saponins and peptides have been isolated from these organisms. The structures of the compounds were elucidated by extensive analysis of spectroscopy such as NMR and LC-MS/MS. Some of the isolated compounds displayed interesting *in vitro* biological activities such as anti-inflammatory, antiparasitic, neuroactive, and cytotoxicity against a panel of human cancer cell lines.



**Opposing Growth and Photosynthesis Strategies by Two Co-Occurring Bloom Algae: It's All About Sweet Spots**

*Angela Richards Donà, University of Hawai'i at Mānoa*

The native Hawaiian algal species *Ulva lactuca* (limu pālahalaha) and *Hypnea musciformis*, an aggressive invasive species in Hawaii, co-occur as persistent bloom species in impaired coastal regions. Both species display similar physiological features but may exhibit distinct performance patterns at extremes of abiotic parameters in the native range for *Ulva*. Experiments employing several combinations of salinity and nutrients, simulating submarine groundwater discharge (SGD) conditions, were done to determine how these species may compete given predicted climate change scenarios. We found that *U. lactuca* growth is at a maximum in low salinity/high nutrient environments closest to groundwater springs, whereas *H. musciformis* cannot tolerate hypo-saline conditions. However, if SGD conditions are modified as predicted, the invasive *H. musciformis* may be able to outcompete native *U. lactuca* in coastal environments where present conditions have prevented it from taking root.

## The potential of an electronic nose (e-Nose) as a screening tool for tuberculosis (TB) in Indonesia

Antonia Saktiawati, Universitas Gadjah Mada

Antonia Morita I. Saktiawati<sup>1,2\*</sup>, Kuwat Triyana<sup>3</sup>, Bintari Dwihardiani<sup>1</sup>, Shidiq Nur Hidayat<sup>3</sup>, Riris Andono Ahmad<sup>1,4</sup>, Ari Probandari<sup>1,5</sup>, Dian K. Nurputra<sup>6</sup>, Yodi Mahendradhata<sup>1,7</sup>

<sup>1</sup> Center for Tropical Medicine, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia <sup>2</sup> Department of Internal Medicine, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

<sup>3</sup> Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Gadjah Mada, Yogyakarta, Indonesia <sup>4</sup> Department of Biostatistics, Epidemiology, and Population Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

<sup>5</sup> Department of Public Health, Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia

<sup>6</sup> Department of Pediatrics, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia <sup>7</sup> Department of Health Policy and Management, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

**Background and Aims:** TB screening is challenging in low-resourced, highly burdened settings. An accurate, easy-to-use, fast, and cheap screening tool is needed. We develop an e-Nose to screen TB by examining the patient's exhaled breath. In this first (training) phase, we aim to investigate the diagnostic accuracy of e-Nose in differentiating TB patients from healthy controls and other respiratory diseases.

**Methods:** This study used a cross-sectional design. Patients with TB and other respiratory diseases were recruited consecutively from Respira Lung Hospital, Yogyakarta and Balai Kesehatan Masyarakat, Klaten. The healthy controls were recruited from TB patients' neighborhood to represent the same socioeconomic conditions. All participants were characterized by clinical symptoms, Chest X-ray, smear microscopic, Xpert MTB/Rif, HIV test, and eNose-TB breath test. The participants breathed normally through a disposable air collecting bag. Afterward, the bag was connected to the e-Nose, while the e-Nose was connected to a laptop, and the breath data was analyzed. Multivariate (chemometric) data analysis used the open-source programming language R version 3.5.1 and Phyton version 3.7. The feature extraction method was conducted by taking the average value of each sensor's sampling data. We calculated sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of the breath test using the Xpert MTB/Rif and composite reference standard as the reference standards. Statistical analysis is performed using STATA/SE 17.

**Results:** We included 52 TB patients, 24 healthy controls, and 101 patients with other respiratory diseases. We excluded 15 patients due to incomplete supporting examinations data or invalid breath test results. Median age was 45; range: 18-72 years; and median BMI was 19; range: 14.7-32.9 kg/m<sup>2</sup>. The e-Nose device had sensitivity of 91.5% (95%CI=79.6-97.6), specificity of 64.4% (95%CI=54.9-73.1), PPV of 46.1% (95%CI: 39.7-52.6), and NPV of 95.8% (CI: 89.8-98.3).

**Conclusion:** In this training phase, the e-Nose had high sensitivity and NPV, which shows its potential as a screening tool for tuberculosis. The e-Nose is also an easy-to-use device. It needs to be further developed in a validation study in presumptive TB patients that is currently in progress.

**Predicting the Effects Of Submarine Groundwater Discharge On Coral Reef Biogeochemistry And Ecosystem Functioning**

*Nyssa Silbiger, California State University, Northridge*

Silbiger, Nyssa J.<sup>1</sup>; Hagedorn, Benjamin<sup>2</sup>; Zeff, Maya E<sup>1</sup>; Jorissen, Hendrikje<sup>3,4</sup>; Barnas, Danielle<sup>1</sup>; Kerlin, Jamie<sup>1</sup>; Maine, Brittney<sup>2</sup>; Justis, Ellen<sup>2</sup>; Sparagon, Wesley<sup>3</sup>; McClintock, Rayna<sup>3</sup>; Nelson, Craig E.<sup>3</sup>; Donahue, Megan<sup>4</sup>

<sup>1</sup> Department of Biology, California State University, Northridge

<sup>2</sup> Geological Sciences, California State University, Long Beach

<sup>3</sup> Department of Oceanography, University of Hawai'i at Mānoa

<sup>4</sup> Hawai'i Institute of Marine Biology, University of Hawai'i at Mānoa

Submarine groundwater discharge (SGD) is a worldwide phenomenon in coastal ecosystems. The unique physicochemical environment created by SGD, including high nutrients, low pH, and cool water, can alter key ecosystem functions. SGD fluxes are affected by physical parameters that are expected to change with climate change (e.g., sea level rise and precipitation), but changing SGD fluxes and its impact on coastal biogeochemical and ecological processes is often excluded from climate change predictions. With a focus on coral reefs, we use high resolution time-series data from two different SGD sites in Mo'orea, French Polynesia to 1) better understand the interacting effect of tides, waves, and precipitation on SGD flux and 2) determine how changing SGD alters reef ecosystem metabolism. We then developed a model to predict how changing physical parameters affect the local biogeochemical conditions near the two SGD seeps. We broadly show that waves have a significantly higher effect on SGD flux than tides in Mo'orea, a microtidal habitat. Further, we show a substantial pulse of low pH, low salinity, cool, and high nutrient water onto the reef after a major wave event that lead to changes in net ecosystem production and calcification on the reef. As the unique biogeochemistry from SGD can affect ecological processes on coral reefs, our model can uncover how changing physical conditions may lead to altered coral reef ecosystem functioning via changes in SGD.

## Translational Hepatology: From Chronic Hepatitis B to Hepatocellular Carcinoma

Caecilia Sukowati, Eijkman Research Center for Molecular Biology

Hepatocellular carcinoma (HCC) is one of the most common cancers in the world with high mortality rate and poor prognosis. The incidence of HCC is closely associated with its known underlying etiologies, mostly due to liver cirrhosis caused by chronic hepatitis B virus (HBV) and hepatitis C virus (HCV) chronic infection, excess alcohol consumption, metabolic liver disease, and aflatoxin exposure. Accordingly, HCC is geographically distributed, with the highest number of cases in Asia that is predominant by HBV, including Indonesia.

Rapid advances in the molecular and cellular biology, bioengineering, and bioinformatics have given a substantial input, not only in basic studies, but also in clinical studies for the diagnosis, prognosis, and more importantly in the development of potential treatments. In order to study HBV pathogenicity, to discover new HBV-related HCC biomarkers and to develop new HCC treatment, we use various models and experimental approaches in the so-called translational hepatology. The use a simple *in vitro* model, *in vivo* animal model, *in silico* analysis, and validation in human clinical samples will improve the management of the disease.

Taking one example of our HBV work in *in vivo* animal model, we had identified that a HBV protein, HBsAg, activated the stem cells (SC) populations in the liver. By using HBV-transgenic mouse (C57BL/6J-TG(ALB1HBV)44BRI/J; TG) and its wild type (WT) counterpart, we observed an increased expression of the markers of hematopoietic SC markers along the stages of the liver damage: inflammation (hepatitis), early hepatocytes damage, dysplasia, and HCC, as noticed in human clinical samples. In the following work, we employed this model for the development of HCC therapy. Both TG and WT models were treated with 4-methylumbelliferone (4MU), a derivate of 7-hydroxycoumarine, substances present in many species of plants. We observed that 4MU treatments in animal model down-regulated the mRNA expressions of genes related to hyaluronic acid only in HBV-TG but not in normal WT. The results *in vivo* was supported *in vitro* by using two HCC cell lines, Interestingly, in both models, the expressions of various cancer SC were also decreased. Further, histological analysis showed that 4MU treatment reduced fibrosis, inflammation, and steatosis *in vivo*, in addition to be pro-apoptotic.

In summary, the use of various experimental models is beneficial in the study of cancer. The use of translational model using cellular and transgenic animal model is useful since cancer initial development, its progression, and effect of treatment can be monitored in real time. However, studies have to be always validated in human and clinics.

### References

- Chisari et al. Molecular pathogenesis of hepatocellular carcinoma in hepatitis B virus transgenic mice. *Cell* 59, 1145–1156 (1989).
- Anfuso et al. Activation of hepatic stem cells compartment during hepatocarcinogenesis in a HBsAg HBV-transgenic mouse model. *Sci. Rep.* 8, 13168 (2018).
- Sukowati et al. Hyaluronic acid inhibition by 4-methylumbelliferone reduces the expression of cancer stem cells markers during hepatocarcinogenesis. *Sci Rep.* 11, 4026 (2019)
- Weiz G et al. Glycosylated 4-methylumbelliferone as a targeted therapy for hepatocellular carcinoma. *Liver Int* 42, 444-457 (2022)

**Pandemic inequity in a megacity: a multilevel analysis of individual, community and healthcare vulnerability risks for COVID-19 mortality in Jakarta, Indonesia**

*Henry Surendra, Oxford University Clinical Research Indonesia*

**Introduction:** Worldwide, the 33 recognised megacities comprise approximately 7% of the global population, yet account for 20% COVID-19 deaths. The specific inequities and other factors within megacities that affect vulnerability to COVID-19 mortality remain poorly defined. We assessed individual, community-level and healthcare factors associated with COVID-19-related mortality in a megacity of Jakarta, Indonesia, during two epidemic waves spanning 2 March 2020 to 31 August 2021.

**Methods:** This retrospective cohort included residents of Jakarta, Indonesia, with PCR-confirmed COVID-19. We extracted demographic, clinical, outcome (recovered or died), vaccine coverage data and disease prevalence from Jakarta Health Office surveillance records, and collected subdistrict level sociodemographics data from various official sources. We used multilevel logistic regression to examine individual, community, and subdistrict-level healthcare factors and their associations with COVID-19 mortality.

**Results:** Of 705 503 cases with a definitive outcome by 31 August 2021, 694 706 (98.5%) recovered and 10 797 (1.5%) died. The median age was 36 years (IQR 24–50), 13.2% (93 459) were <18 years and 51.6% were female. The subdistrict level accounted for 1.5% of variance in mortality ( $p < 0.0001$ ). Mortality ranged from 0.9 to 1.8% by subdistrict. Individual-level factors associated with death were older age, male sex, comorbidities and age <5 years during the first wave (adjusted OR (aOR)) 1.56, 95% CI 1.04 to 2.35; reference: age 20–29 years). Community-level factors associated with death were poverty (aOR for the poorer quarter 1.35, 95% CI 1.17 to 1.55; reference: wealthiest quarter) and high population density (aOR for the highest density 1.34, 95% CI 1.14 to 2.58; reference: the lowest). Healthcare factor associated with death was low vaccine coverage (aOR for the lowest coverage 1.25, 95% CI 1.13 to 1.38; reference: the highest).

**Conclusion:** In addition to individual risk factors, living in areas with high poverty and density, and low healthcare performance further increases the vulnerability of communities to COVID-19-associated death in urban low-resource settings.

**Design and Application of Homogeneous-structured TiO<sub>2</sub>/Activated Carbon Nanocomposite for Adsorption–Photocatalytic Degradation of MO**

*Osi Arutanti, National Research and Innovation Agency*

The sol–gel method successfully prepared homogeneous-structured TiO<sub>2</sub>/activated carbon (TiO<sub>2</sub>/AC). This study highlights the effect of post-annealing temperature on the properties and photocatalytic activity of composite TiO<sub>2</sub>/AC to remove methyl orange (MO). The prepared photocatalysts were characterized by X-ray diffraction (XRD), scanning electron microscope (SEM), transmission electron microscope (TEM), Brunauer–Emmett–Teller measurement (BET), and thermogravimetric (TGA). The results confirmed that all prepared photocatalysts were TiO<sub>2</sub> anatase. The removal of MO was obtained through a synergistic effect of adsorption and photocatalysis. TiO<sub>2</sub>/AC-400 was the optimum photocatalyst to decompose MO up to 80% after 90 min under simulated UV irradiation. The remaining 1% AC after the annealing process at 500 °C had proved to be capable of decomposing MO mainly due to its serving as an electron trap. The potential photocatalyst formation and photocatalysis mechanism for TiO<sub>2</sub>/AC nanocomposite to support phenomena were proposed. The finding in this study provided important implications for further research on the preparation of composite TiO<sub>2</sub> and carbon-based co-catalyst to enhance the adsorption–photocatalytic activity.

## **Nickel and Cobalt Extraction from Indonesian Nickel Laterite Ores for Preparation of NMC (Nickel Manganese Cobalt) Cathode Precursor**

*Widi Astuti*

*Research Center for Mining Technology – National Research and Innovation Agency (BRIN)*

*Jl. Ir. Sutami Km. 15, Tanjung Bintang, Lampung Selatan, Lampung, Indonesia*

### **ABSTRACT**

In this study, an alternative method for recovering nickel and other valuable metals from nickel laterite ores is proposed and evaluated. The proposed method comprises a leaching step using citric acid to dissolve the nickel and cobalt from Indonesian nickel laterite ores, and subsequently, an oxalate precipitation step to precipitate the nickel (and cobalt) from citric acid leach filtrate. The results of the leaching experiments showed that nickel (and cobalt) can be dissolved in the leaching step using 1 M citric acid or sulfuric acid solution at 80°C, a pulp density of 100 g/L, and leaching duration of 5 h. The results of the oxalate precipitation experiments showed that complete precipitation of nickel can be achieved at 80°C, 500 rpm stirring speed, and precipitation duration of 3 h. This proposed method can recover nickel from nickel laterite ores in the form Mixed Oxalate Precipitate (MOP) with the nickel content of around 50-85%.

**MXene-based nanocomposite: An up-and-coming catalyst for bicarbonate photoreduction and hydrogen evolution reaction**

*Grandprix Thomryes Marth Kadja, Institut Teknologi Bandung*

Grandprix T. M. Kadja<sup>1,2,3</sup>

<sup>1</sup> Division of Inorganic and Physical Chemistry, Faculty of Mathematics and Natural Sciences, Institut Teknologi Bandung, Jalan Ganesha no. 10, Bandung 40132, Indonesia

<sup>2</sup> Center for Catalytic and Reaction Engineering, Institut Teknologi Bandung, Jalan Ganesha no. 10, Bandung 40132, Indonesia

<sup>3</sup> Research Center for Nanosciences and Nanotechnology, Institut Teknologi Bandung, Jalan Ganesha no. 10, Bandung 40132, Indonesia

MXene is a two-dimensional, transition metal carbide or nitride material with nanoscale thickness. It comprises several peculiar properties, such as highly conductive, chemically and thermally stable, adjustable energy gap by altering the chemical properties of its surface, and outstanding anisotropic mobility of electrons and holes, that are beneficial as electro- and photocatalyst. Herein, we demonstrate that combining  $Ti_3C_2$  MXene with a typical semiconductor, i.e.,  $TiO_2$  results in a highly active photocatalyst that can convert bicarbonate into formic acid under visible light illumination. Moreover,  $Ti_3C_2$  MXene could also be hybridized with metal nanoparticles. The  $Au/Ti_3C_2$  MXene nanocomposite displays an exceptional performance as an electrocatalyst for the reduction of water to hydrogen (hydrogen evolution reaction). The overpotential and Tafel slope could be suppressed lower than in several previous reports. Hence, this study shows that MXene-based nanocomposites could perform exceptionally in different catalytic systems. They are potential as the near-future materials for reducing bicarbonate into valuable chemicals and electrocatalytic hydrogen production.

Keywords:  $Ti_3C_2$ , MXene, nanocomposite, photoreduction, hydrogen evolution



## **Designing Green Solvent with Enhanced Capacity to Absorb Hazardous Gases**

*Kiki Adi Kurnia, Institut Teknologi Bandung*

With increasing concern for safer and more environmentally friendly solvents, ionic liquid (IL) and deep eutectic solvent have received massive attention from academicians and industry. However, the number of chemical compounds that can form IL and DES is limitless. Consequently, it makes the trial and error not practical. A computational tool that can screen and select the best green solvent for various applications is beneficial. Therefore, a Conductor-like Model for Real Solvent (COSMO-RS) has been used as a tool to design a green solvent with desired properties. For example, in this project, we present design ILs with enhanced capacity to absorb hazardous freon gas. Using this computational approach, screening 4225 potential ILs leads to the best working pair together with Freon R-152a. The screening can be done only within three hours. Thus, it could give economic and time benefits in selecting the best green solvent for a particular application.

**Surface Modification of Green Synthesized MIL-100(Fe) with mesoporous silica nanoparticles and carboxymethyl cellulose as slow release agents of curcumin** *Witri Wahyu Lestari, Universitas Sebelas Maret*

*Witri Wahyu Lestari\*, Nuhaa Faaizatunnisa, Amalia, Fajar Rakhman Wibowo, and Teguh Endah Saraswati*

*Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Jl. Ir. Sutami No. 36 A Kentingan, Jebres, Surakarta 57126, Indonesia*

As a hydrophobic drug, curcumin has poor bioavailability, low plasma and tissue absorption, low solubility, and rapid systemic metabolism. Therefore, encapsulation through drug delivery system based on nanoparticle modified Bio-Metal-Organic Frameworks (BiO-MOFs) could be an option in enhancing its bioavailability by vectoring into the targeted cell. MIL-100(Fe) is a biocompatible MOF which suitable for biomedical application with outstanding properties such as high crystallinity, large surface area, and pore volume. However this kind of MO is sensitive in acidic and base condition, thus surface modification is required. Our poster will present the green synthetic method of MOF-100(Fe) and its surface modification with mesoporous silica nanoparticles (MSNs) and carboxymethyl cellulose (CMC). The obtained material and its composites were fully characterized with powder XRD, FTIR, SEM, TEM, TG/DTA and nitrogen sorption isotherm. The presence of MSNs and CMC can protect the MIL-100(Fe) from degradation under acidic condition, and showed slower and controlled release profile of curcumin triggered by pH, where in acidic condition the curcumin was faster released than the neutral pH.

Keywords: CMC, MIL-100(Fe), MSNs, curcumin, drug delivery system

## GCMS Profiles of *Gonystylus Bancanus* Wood

Ika Oktavianawati<sup>1,2</sup>, Mardi Santoso<sup>1</sup>, Sri Fatmawati<sup>1</sup>

<sup>1</sup>Dept. Chemistry, Fac. Science and Data Analytics, Institut Teknologi Sepuluh Nopember, Kampus ITS, Sukolilo, Surabaya, 60111

<sup>2</sup>Dept. Chemistry, Fac. Math and Sciences, Universitas Jember, Kampus Tegalboto, Jember, 68121  
Email: [ika.fmipa@unej.ac.id](mailto:ika.fmipa@unej.ac.id) (IO); [mardisantoso13@gmail.com](mailto:mardisantoso13@gmail.com) (MS); [fatma@chem.its.ac.id](mailto:fatma@chem.its.ac.id) (SF)

### Abstract

*Gonystylus bancanus* wood or ramin wood has been generally known as a source of agarwood (gaharu) bouya, a kind of agarwood inferior type, or under exported trading name of aetoxylon oil. This research is focused on volatile components profiling of *G. bancanus* using GCMS analysis. In addition, the influence of solvent polarities on partitioning of metabolites in ramin wood is also explored. A range of solvent in different polarity was applied to provide comprehensive extraction of metabolites in ramin wood. Hydrodistillation was also carried out to extract the volatile compounds in spite of the non-volatile one. GCMS analysis were performed to identify volatile components in the extracts and essential oil. Multivariate data analysis was processed based on Principal Component Analysis (PCA), followed by Agglomerative Hierarchical Clustering (AHC) and Origin analysis. 89 metabolites were successfully identified by GCMS analysis. The oxygenated sesquiterpenes, especially 10-epi-g-eudesmol and  $\alpha$ -eudesmol, are the major volatile components identified from GCMS analysis reached relative amount approximately 30-60% of each. These two compounds are nominated as marker compounds in ramin wood. PCA of GCMS analysis discriminated three clusters: (1) n-hexane; (2) dichloromethane, and (3) essential oil, methanol and ethyl acetate extracts. This result demonstrated that extraction of ramin wood using n-hexane was beneficial, either using dichloromethane, since both solvents extracted difference minor metabolites compared to a cluster of essential oil, methanol and ethyl acetate extracts. *G. bancanus* wood is comprised of valuable volatile metabolites i.e., terpenoids, benefit for essential oil industry. Comprehensive extraction by performing solvents in different polarity on *G. bancanus* wood could allow exploration of fully extracted metabolites which was supported also by exhibiting identified metabolites from GCMS analysis.

**Keywords** Gonystylus; Ramin; Gaharu bouya; Wood; Metabolomics

**Biological Activity Evaluation and In Silico Studies of Polyprenylated Benzophenones from *Garcinia celebica***

*Yenni Pintauli Pasaribu, Institut Teknologi Sepuluh Nopember*

Three known polyprenylated benzophenones were isolated from the EtOAc extract of root bark of *G. celebica*, namely (-)-cycloxanthochymol, isoxanthochymol, and xanthochymol. The antioxidant and cytotoxicity evaluation showed that all benzophenones exhibited antioxidant activity compared to gallic acid and quercetin as positive controls and also exhibited strong activity against HeLa, MCF-7, A549, and B16 cell lines compared to cisplatin as the positive control. The antiplasmodial evaluation showed that isoxanthochymol exhibited activity against the chloroquine-sensitive *P. falciparum* strain 3D7. In addition, the in silico molecular docking study supported in vitro activities.

**Development of quality control method for medicinal plant raw materials using a metabolomics approach**

*Mohamad Rafi, Institut Pertanian Bogor*

Mohamad Rafi, Rudi Heryanto, Dewi Anggraini Septaningsih

Quality control of the medicinal plant's raw material is directly linked to the efficacy, safety, and quality of their products because the variability of the bioactive compounds in the medicinal plant is significant. As we know, quality control of the medicinal plant is more complicated than synthetic drugs due to their chemical complexity. The identification, discrimination, and authentication (IDA) method of the medicinal plant becomes a crucial task to ensure quality and prevent adulteration. Therefore, we need a precise and accurate analytical method for this purpose. The metabolomics approach became popular in developing the medicinal plant IDA method by chemicals with the targeted metabolite, and metabolite fingerprinting analysis was frequently used. Using a metabolomics approach, we will describe our developed method for the IDA of some Indonesian medicinal plant.

**An innovative approach in the synthesis of solid acid catalyst from sugarcane bagasse for esterification**

*Shella Permatasari Santoso, Chemical Engineering Dept., Widya Mandala Surabaya Catholic University*

The enormous sugar consumption triggers the production of 1.8 billion tonnes of sugarcane annually, and in consequence, approximately half a billion sugarcane bagasse (SCB) are generated and remain as waste upon the sugar extraction process. Therefore, developing innovative ways to convert the abundant and low-cost SB into high-value products is a worthwhile venture. One possible high-value product is a solid acid catalyst (SAC) derived from SCB for possible applications in biodiesel production. Conventional catalyst production is conducted by the step-by-step carbonization and sulfonation method. Nonetheless, this process requires extensive processing time, high carbonization temperatures (375-400°C), and would require the usage of water in large quantities for the washing step. Thus, optimization of these processes needs to be done. In this study, a new approach and concept to simultaneously carbonize and sulfonate SCB under less severe conditions, while also recovering available sugars in SCB in the form of sugar-rich hydrolysates were explored. The approach involved a 2-h dilute acid hydrolysis (DAH) step with dilute H<sub>2</sub>SO<sub>4</sub> (4 wt%) at 100°C, as pre-treatment to recover about 73% of the available sugars in the hydrolysate. The post-hydrolysis SCB (PHSCB) left after the DAH along with the residual acids were then subjected to drying at 100–150°C for 12–36 h. The drying the PHSCB residue would result in partial carbonization and potential sulfonation. Additionally, the liquid stream that came out of the process does not generate acid waste but rather a sugar-rich hydrolysate that is valuable for fermentation processes. The process was successfully carried out and enables the synthesis of carbonized and functionalized PHSCB. The catalyst was successfully used in the esterification of oleic acid and methanol while achieving a conversion of up to 95%.

**Conceptualization of Integrating Chirality to Mesoporous Silica from Coconut Husk for Drug Delivery Application**

*Jeane Angelica Yulianadi Susanto, Maria Yuliana, Widya Mandala Catholic University Surabaya, Indonesia*

Coconut husk waste production in Indonesia is estimated at 2.81 million tons by 2020, with minimum reduction and recycle efforts. Coconut husk contains many compounds; one of them is silica. Silica finds uses in the drug delivery system due to its adjustable textural properties (including surface area, pore size, and particle dimension), controllable morphology, high thermal stability, and is facile to prepare with a decorated selective function. In addition, silica has high biocompatibility, biodegradability, and high inert function. In the drug delivery system, chirality is one of the most important parameters in the development of drug carrier, since pharmacology activity depends mainly on the drug interaction to both the carrier materials and the targeted site. Due to the chiral nature of the targeted site and the drug itself; having a chiral-templated material as the nanocarrier of the drug is of special interest. The chiral structure can be synthesized by using surfactant and organo-gel as the chiral template, in which the type of the surfactant will affect the chiral structure within the nanoparticle. In this study, chiral mesoporous nanoparticle silica will be synthesized with coconut fiber as a raw material for producing silica and n-palmitoyl-DL-glutamic acid as an anionic chiral template. Its potential application in drug uptake and release will be also studied.

**Doxorubicin loading on cellulose nanocrystals/ZIF-L composite (CNCs@ZIF-L) for future perspective of oral chemotherapy***Christian Wijaya, Institut Teknologi Sepuluh Nopember*Christian J. Wijaya<sup>1</sup>, Suryadi Ismadji<sup>2,3</sup> and Setiyo Gunawan<sup>1</sup><sup>1</sup> Department of Chemical Engineering, Faculty of Industrial Technology and Systems Engineering, Institut Teknologi Sepuluh Nopember, Keputih Sukolilo, Surabaya 60111, Indonesia<sup>2</sup> Department of Chemical Engineering, Widya Mandala Surabaya Catholic University, Kalijudan 37, Surabaya 60114, Indonesia<sup>3</sup> Department of Chemical Engineering, National Taiwan University of Science and Technology, 43 Keelung Road, Sec. 4, Taipei 10607, Taiwan

Chemotherapy is one type of cancer treatments that is widely used. This treatment uses powerful chemicals to inhibit and destroy the growth of cancer cells. The chemicals are injected intravenously into the human body so that they can spread to all parts of the body through the bloodstream. Due to this mechanism, chemotherapy affects not only the growth of cancer cells, but also the growth of normal cells. This causes various side effects experienced by sufferers, such as nausea, vomiting, and hair loss. This study developed cellulose nanocrystals/ZIF-L composite (CNCs@ZIF-L) which have the potential as drug carriers of anticancer drugs that can be taken orally. The oral injection method will facilitate the consumption of anticancer drugs. Moreover, the anticancer drugs can be gradually released from the composites so as to prevent damage to normal cells. This study used zeolitic imidazolate framework-L (ZIF-L) as a type of metal-organic frameworks (MOFs) which has good characteristics as a composite material. ZIF-L was synthesized under optimum conditions based on the results of the optimization study where ZIF-L obtained had the optimum absorption capacity of crystal violet (CV) reaching  $810.32 \pm 9.25$  mg/g. Furthermore, CNCs@ZIF-L composite was successfully fabricated using ZIF-L and CNCs to promote a novel material for further applications. In the loading of doxorubicin (DOX), CNCs@ZIF-L composite possessed an adsorption capacity of up to  $1508.91 \pm 7.72$  mg/g. Here the antioxidant activity analysis has also been carried out to determine the ability of the materials to interact with free radicals where the  $IC_{50}$  value of the composite containing DOX (CNCs@ZIF-L/DOX) was 788.62 mg total/L or 480.21 mg DOX/L. In this study, the application of CNCs@ZIF-L composite as a DOX carrier indicated a great potential for the development of oral chemotherapy.



Potential Utilization of Waste-based Magnetic Cellulose for Rhodamine-B Removal  
*Maria Yuliana, Widya Mandala Surabaya Catholic University*

Andrean Natajaya, Felix Natanael Ongkowijoyo, Maria Yuliana, Shella Permatasari Santoso

Department of Chemical Engineering, Widya Mandala Surabaya Catholic University, Jl.  
Kalijudan 37, Surabaya 60114, Indonesia

Increasing concern about sustainability and environmental issues caused by the massive amount of solid biomass waste in Indonesia has driven efforts for the development of new products for various endues applications, in the sectors of energy, environment and health. This study focuses on the utilization of coconut husk as the cellulose source, in order to fabricate magnetic cellulose (MC) via coprecipitation with iron chloride salts. The combination of cellulose with magnetite nanoparticles aims to improve the removal rate of Rhodamine-B (RhB) as the latter provides high catalytic activity in the Fenton degradation process to eliminate persistent pollutants. The paramagnetic characteristics that MC possesses, also make them easily recovered after use. The maximum adsorption capacity of magnetic cellulose (250 mg/g) is obtained at 30°C, the RhB initial concentration of 100 ppm, and precursor mass ratio of 1:4.8:25. The mineralization of RhB in this condition also reaches 50%, indicating that this adsorbent can be used as an efficient material to adsorb and degrade RhB from aqueous solution. This magnetic adsorbent will be of immense potential application for removing organic contaminants, particularly synthetic dyes, due to its good performance, simple separation, and ability to perform both adsorption and degradation processes simultaneously.

**Effect of Addition of Bacterium *Pseudomonas aeruginosa* on Biodecolorization of Methylene Blue by Brown-Rot Fungus *Gloeophyllum trabeum***

*Eka Pratiwi Yuniarti, Institut Teknologi Sepuluh Nopember Surabaya*

**Abstract** Methylene Blue (MB) is one kind of textile dye from thiazine dyes that has negative impacts on humans and environment, therefore, it is very important to determine an effective method to decolorize it. Brown-rot fungus *Gloeophyllum trabeum* has ability to decolorize MB, but its ability was still relatively low and required a long incubation time. In this study, the effect of addition of the bacterium *Pseudomonas aeruginosa* at 2, 4, 6, 8, and 10 mL (1 mL  $\square$   $9.23 \times 10^8$  CFU) on the decolorization of MB by *G. trabeum* was investigated. The decolorization of MB by particular *G. trabeum* was 11.57%. The addition of 8 mL of *P. aeruginosa* into *G. trabeum* culture showed a maximum decolorization result of 93.20% in liquid medium of PDB for 7 days incubation. These results indicated that *P. aeruginosa* could enhance biodecolorization of MB by *G. trabeum* although not significant.

**Keywords:** Biodecolorization, Methylene Blue, *Gloeophyllum trabeum*, *Pseudomonas aeruginosa*

**Assessing habitat suitability of a vertically migrating deep-sea shark under a changing climate**

*Danny Coffey, Texas A&M University-Corpus Christi*

Recent advances in animal-borne tags evaluate the relative importance of temperature and dissolved oxygen on the distribution and behavior of marine fishes, revealing barriers in an otherwise featureless open ocean. Here, I combined a novel suite of biologging technologies to examine the distribution, behavior, and thermal physiology of a deep-sea “living fossil,” the bluntnose sixgill shark (*Hexanchus griseus*), in response to environmental changes experienced during diel vertical migrations in the subtropical waters off Hawai‘i. Using these empirically measured relationships, I predicted climate change impacts on bluntnose sixgill shark vertical habitat utilizing a suite of eleven Earth System Models to project end-of-the-century changes in environmental conditions. Contrary to other vertical migrators, activity levels were not suppressed during deeper daytime distributions (500-700 m) while experiencing prolonged exposure to low temperature and dissolved oxygen levels, thereby demonstrating tolerance of the hypoxic conditions within the local oxygen minimum zone. Though, thermal performance analyses revealed swimming activity rapidly declined when encountering temperatures above their thermal optimum during their shallower nighttime distribution (200-350 m), thus constraining their vertical habitat. Climate change is predicted to increase temperatures by up to 2°C above the upper-temperature threshold of bluntnose sixgill sharks at their shallower nighttime distribution, and lower oxygen concentrations will emerge at their deeper daytime distribution, indicating likely vertical habitat compression. By establishing linkages between behavior and environmental conditions, these results provide a mechanistic basis to project the effects of climate change on an ecologically important species in the relatively unexplored deep sea and lay the foundation for future study of additional deepwater species.

**From spawning to settlement: Identifying fine-scale connectivity in the Convict Tang, *Acanthurus triostegus*, across O‘ahu**

*Richard Coleman, University of Texas, Austin*

The gap between spawning and settlement location of marine fishes, wherein the larvae occupy an oceanic phase, is a great mystery in both natural history and conservation. Recent genomic approaches offer some promise, especially in linking parent to offspring with assays of nucleotide polymorphisms. Here, we apply this methodology to the endemic Hawaiian manini (*Acanthurus triostegus sandvicensis*), a surgeonfish with a long pelagic larval stage of ~54–77 days. We collected 606 adults and 607 juveniles from 23 locations around the island of O‘ahu, Hawai‘i. Based on 399 SNPs, we assigned 68 of these juveniles back to a parent (11.2% assignment rate). Each side of the island showed significant population structure with higher levels in the west and north. The west and north sides of the island also had little evidence of recruitment, which may be due to westerly currents in the region or an artifact of uneven sampling. In contrast, the majority of juveniles (94%) sampled along the eastern shore originated on that side of the island, primarily within semi-enclosed Kāne‘ohe Bay. Nearly half of the juveniles assigned to parents were found in the southern part of Kāne‘ohe Bay, with local settlement likely facilitated by extended water residence time. Several instances of self-recruitment were observed along the eastern and southern shores. Cumulatively, these findings indicate that most dispersal is between adjacent regions on the eastern and southern shores. Regional management efforts for manini and possibly other reef fishes will be effective only with collaboration among adjacent coastal communities, consistent with the traditional *moku* system of native Hawaiian resource management.

**Genetic conservation of groupers (family epinephelidae) in Aceh, Indonesia**

Nur Fadi, Universitas Syiah Kuala

Nur Fadli<sup>1\*</sup>, Adrian Damora<sup>1</sup>, Zainal Abidin Muchlisin<sup>1</sup>, Irma Dewiyanti<sup>1</sup>, Mutia Ramadhaniaty<sup>1</sup>, Muhammad Nanda Razi<sup>1</sup>, and Mohd N. Siti-Azizah<sup>2</sup>

<sup>1</sup>Faculty of Marine and Fisheries, Universitas Syiah Kuala, Banda Aceh, Indonesia

<sup>2</sup>Institute of Marine Biotechnology, Universiti Malaysia Terengganu, Terengganu, Malaysia

\* Email: nurfadli@unsyiah.ac.id

The groupers (family Epinephelidae) are among the most important commercial fish groups globally, including in the Aceh region, with many members under threat of extinction. Even though the groupers have high economic value and market demand in Aceh, there is still limited information on their bio-ecology and their molecular information. Therefore, to address these issues, molecular-based studies were conducted in the Aceh region. The study was utilized molecular markers (mainly mitochondrial DNA) to (1) DNA barcoding of commercially important groupers in Aceh, (2) Observe phylogeography pattern of several grouper species in the Aceh and Indo Malay Archipelago region (IMA), and (3) Population genetics of the aerolate grouper (*Epinephelus aerolatus*) in the IMA. Sampling was conducted in Aceh and across the Indo-Malaya Archipelago for specific objectives. The study found that Aceh has high grouper diversity, as revealed by the DNA barcode. In addition, the phylogeography study revealed genetic structuring for *Epinephelus areolatus* in the IMA region. At least two discrete *E. areolatus* lineages were detected encompassing the IMA region (western part of IMA and a combined central and eastern lineage of IMA) as revealed by population genetic analyses. Therefore, the fish populations should be treated as a separate management unit in management and conservation. Overall, the molecular data collected from this study would be beneficial for the future management plan of grouper in Aceh and Indonesia.

Keywords: Kerapu, reef fish, molecular genetics, phylogeography, population genetic

## **Diagnostic of Ulcerative White Spots (UWS) Disease in Coral Massive Porites**

*Widiastuti, Udayana University*

I Made B B Kresna, Inarya Sombuk, Rahel R Manurung, and Widiastuti\*

Department of Marine Science, Faculty of Marine Science and Fisheries, Udayana University

\*Corresponding author: [widiastutikarim@unud.ac.id](mailto:widiastutikarim@unud.ac.id)

Coral diseases have caused reefs degradation worldwide. Ulcerative White Spot (UWS) is one of the most infectious diseases in Bali reefs' which is only reported in the genus of massive Porites. However, the diagnosis of this disease remains limited according to the gross description and disease signs observed in the field. Thus, this study aimed to examine the microscopic morphology and potential agent of UWS disease in coral massive Porites. Samplings of coral tissues were conducted in the Pemuteran, Patas, and Amed reefs, Bali island, Indonesia, in February 2022. they were using SCUBA. Our histopathological analysis of this disease revealed that the UWS tissue undergoes changes throughout the gastrodermis, where the cellular and tissue rearrangements occur. It exhibited necrosis, swelling symbiosome, and a significant reduction in zooxanthellae density. Furthermore, the isolation of microorganism aggregates in the UWS degenerate d tissues revealed that based on the 99% similarity of its 16S rRNA gene sequence and selected phenotypical features, this isolate revealed a close relationship to *Vibrio parahaemolyticus*. The role of this bacterial species in UWS needs to be tested experimentally. In sum, the rearrangement of the UWS tissue structure and the zooxanthellae's symbiosome demonstrate the disease progression.

Keywords: Bacteria, Ulcerative White Spot Disease, Porites, Histopathology, Zooxanthellae

**Identification and Mapping of Solar Energy Potential in Eastern Indonesia Districts**

*Dharma Aryani, Politeknik Negeri Ujung Pandang*

The geographic location of Indonesia which climates almost entirely tropical provides exclusive potential for solar energy all through the year. This paper performs identification and prediction of solar irradiance in Eastern area of Indonesia. Modeling and estimation approach is carried out by using Artificial Neural Network (ANN) algorithm. Datasets for training and testing are highly correlated parameters from NASA climatological database for 20 years of historical data. The results of training and testing procedures in ANN show high accuracy of solar modelling and prediction. The research produces spatial mapping of solar irradiance intensity for the monthly average solar irradiance of 174 districts in Eastern Indonesia. The knowledge and information about solar resources availability and its forecasting are essentially useful to learn about the potential of solar energy for power generation. It is beneficial at the early stage of renewable energy planning to implement solar energy power generation, especially for the technology and site selection of solar power generation system.

**Age Differences in Affective Forecasting Accuracy**

*Sarah J. Barber, Georgia State University*

*Sarah J. Barber, Hiba Kausar, & Jessica Udry*

Affective forecasts are people's predictions of their future feelings in response to future events. In this study we examined whether younger and older adults differ in their affective forecasting accuracy. To do so, we recruited younger and older American voters and asked them to predict how they would feel following the 2020 United States presidential election. In the general feelings condition, participants predicted how they would feel, in general, following an election victory or loss. In the event-related feelings condition, participants predicted their future feelings specifically about an election victory and about an election loss. Later, these same participants reported their experienced feelings (either in general or about the election outcome). In the general feelings condition, age differences in affective forecasting accuracy varied as a function of whether participants' preferred candidate won or lost the election. Among election victors, there were age-related improvements in affective forecasting accuracy of negative feelings. In contrast, among election losers there were age-related declines in affective forecasting accuracy of both negative and positive feelings. A different pattern emerged for participants in the event-related feelings condition. These participants were highly accurate in their affective forecasts, and there were no significant age differences in forecasting accuracy. Together, these results show that age differences in affective forecasting accuracy depend upon both the type of future event, and the type of future feeling being predicted.



## Visual Cues of Trustworthiness: Unique Effects of Social vs. Nonsocial Cues on Trust-related Behavior and Memory

Jordan Schotz<sup>1</sup>, Nichole R. Lighthall<sup>1</sup>, Natalie C. Ebner<sup>2</sup>

<sup>1</sup>Department of Psychology, University of Central Florida

<sup>2</sup>Department of Psychology, University of Florida

### **Summary:**

**BACKGROUND AND AIM:** Research indicates that trust-related impressions and behavior are influenced by both the behavior of a trustee and visual cues of their trustworthiness (e.g., facial features). In a similar way, valenced nonsocial cues have been found to influence approach and avoidance behavior in nonsocial learning and choice tasks. It is unclear, however, whether social and nonsocial visual cues that impact impressions of trustworthiness have equivalent effects on trust-related behavior that involves learning and memory. Addressing this gap is required to determine the distinguishable mechanisms of social and nonsocial decision making.

**METHODS:** To address this gap, the present study implemented a novel adaptation of the Trust Game. Utilizing an online multi-round version of the Trust Game, participants made iterative ‘investments’ in a ‘trustee’ who may potentially reciprocate money. Participants (N = 204) were assigned to social/nonsocial conditions with associated visual cues to implicitly manipulate impressions of trustworthiness. Social cues representing trustees were non-emotional faces previously rated as high or low in subjective trustworthiness. Nonsocial cues representing trustees were computers set against colored backgrounds associated with behavioral motivations of approach (green) and avoidance (red). Cue valence (trustworthy/green vs. untrustworthy/red) and trustee behavior (high vs. low reciprocation rate) were manipulated within subject. Post-task measures indexed memory for social and nonsocial trustees.

**RESULTS:** Although visual cues had similar effects on initial subjective impressions of trustworthiness for social and nonsocial trustees, effects on initial investments and average investments were only observed for the social condition. Further, while reciprocation rate affected participants’ investments across conditions, participants in the nonsocial condition had poorer memory for trustees and their associated reciprocation rates.

**CONCLUSION:** Through a novel adaptation of the Trust Game, the present study demonstrates the unique influence of social cues on impression formation and memory. Specifically, we find that even when social and nonsocial visual cues similarly influence subjective impressions of trustworthiness, social cues exert a stronger impact on behavioral interactions and associative memory for visual cues. Such findings highlight differences in attention and memory for identity- and intention-related information in social versus nonsocial decision making.

## **How the Form and Structure of Memory Underlie Adaptive and Maladaptive Communication**

*Vishnu Murty, Temple University*

Individuals draw upon past experiences to inform how to achieve our concurrent goals. To subserve this type of adaptive behavior, neural systems are tailored to prioritize memories for meaningful events—such as events when we earned rewards, avoided punishments, or gained greater understanding of the world’s complexity. However, humans evolved in rich, social environments, allowing us to garner knowledge not only through direct experience but also by incorporating memories communicated to us by others. Yet, little is known about the features of memory that make memory retrieval efficacious in subserving communication goals. Across two studies, we characterized how the form and structure of memories influence how listeners understand events vicariously. In study 1, naïve listeners listened to event narratives in which participants were given goals to share stories or recall memories. In study 2, naïve listeners listened to event narratives of a complex, threatening event. By combining text-based analyses with qualitative assessments by listeners, we show that memory communication is bolstered by the inclusion of semantic details providing general knowledge relevant to an event in addition to event-specific details (Study 1) and is impaired by the over-inclusion of perceptual details about sensory features of the event (Study 2). Together, this body of research begins to provide the foundation for understanding why we can understand some people’s memories but not others.

**To wed or not to wed: Cinematic Representations of Interreligious Marriage and Religious Openness in Indonesia**

*Evi Eliyanah, Universitas Negeri Malang, Indonesia*

Ariane Utomo (The University of Melbourne, Australia)

We discuss the representation of interreligious marriage in contemporary Indonesian cinema. Ideas of ideal marital partners are not merely personal, but shaped by various social factors and thus may change overtime. Despite Indonesia's religious diversity, interreligious marriage hasn't been legally supported and remains a subject of public debate, more heightened in the post-*reformasi* Indonesia. We look at how contemporary Indonesian commercial films represent this controversial issue by examining seven films (2008-2020) whose narratives center on interreligious romantic relationships. We argue that while interreligious marriage has been more visible in Indonesian cinema, barely any film demonstrates clear support towards interreligious marriage. The unpopular representations of acceptable interreligious marriage and the normalized representations of religious conversion prior to marriage, show that religious openness remains difficult in the intimate sphere despite being more acceptable in the public sphere.

**Short bio**

Evi is an Associate Professor in Gender Studies Universitas Negeri Malang (UM), Indonesia. She is also a member of Indonesian Young Academy of Sciences (ALMI). Her current research includes GESI in film education in Indonesia, GEDSI in Indonesian research ecosystem, marriage patterns and social change in Indonesia, and representations of gender in Indonesian popular culture.

**Geographies of colliding epidemics: COVID-19 and opioid misuse**

*Brian King, Pennsylvania State University*

The convergence of the opioid epidemic and the COVID-19 pandemic has created new health challenges throughout the United States. Policy responses to mitigate the spread of COVID-19 have the potential to compound patterns of opioid use and misuse and affect the provisioning of treatment services. Social and economic patterns associated with the pandemic are expected to intensify mental health pressures and geographic patterns of opioid use and misuse. Since the onset of the pandemic, media attention and numerous policy commentaries have drawn attention to the intersections of addiction and COVID-19. However, there remain few empirical studies that examine the direct impacts of the COVID-19 pandemic for opioid overdose patterns. Even fewer have integrated quantitative and qualitative methods to detail the place-specific dynamics shaping opioid overdose and addiction treatment during the COVID-19 pandemic. In order to fill this gap, this research measures and maps change in the age-adjusted rate of opioid-related overdose incidents at the county level from 2018 - 2020. These analyses are combined with interviews conducted since December 2020 with public health providers in the state of Pennsylvania to identify key patterns influencing opioid misuse and adjustments to treatment patterns. This study demonstrates that policy efforts to mitigate COVID-19 transmission may have unintended consequences for opioid users, overdose patterns, and treatment responses that vary across spatial and temporal scales. This suggests an ongoing need for more informed policy interventions to assist the public health sector in managing co-occurring epidemics and improve local overdose response in the context of COVID-19.

**Exploring the symbiotic relationship between nature and culture through the everyday making activities of craft makers in various regional areas.**

*Prananda L. Malasan, Institut Teknologi Bandung*

The idea of “sustainability” has been focusing on the betterment of animal, plant, human and various living and non-living being as the key pillar to achieve the regeneration of natural ecosystem. However, the previous attempts and efforts tend to focus on mitigating the negative impacts of people behavior, such as how to prevent the waste, reducing the emissions and pollution, etc. In fact, there are various ways of human practices in everyday life have also a symbiotic relationship with nature, such as the making activities of craft makers in various rural areas. In this research, I will present my recent collaborative research with a UK researcher to explore various activities of several craft makers in various regions in West Java and in the UK to document their craft making activities in the context of everyday life. I will specifically highlight the crafters in West Java, Indonesia that directly or indirectly support their surrounding natural system through their craft making activities. This research found that the everyday practice of the crafters has strongly formed a ‘social infrastructure’ within their society to conduct their everyday craft making and keep the craft culture alive, and at the same time, they also have a unique way to build a strong relationship with their surrounding natural system and to support its biodiversity. By investigating the craft making activities we are able to comprehend how nature and culture are not clearly separated, but they are supporting each other to maintain their strong identity as a craft society and its surrounding natural system. This research also uses a digital platform to document the artifact and craft making process (see [https:// museumbenda.id/](https://museumbenda.id/)).

**“Smong” means more than tsunami:  
The understanding of tsunami in the Indonesian context**

*Alfi Rahman*

*Tsunami and Disaster Mitigation Research Center (TDMRC) Universitas Syiah Kuala*

*Email: [alfi.rahman@unsyiah.ac.id](mailto:alfi.rahman@unsyiah.ac.id)*

Smong is an indigenous knowledge related to the tsunami. The word of smong comes from the Devayan language of Simeulue and refers to the complex of earthquake/sea receding/giant wave that is typical of tsunami events in Indonesia. Now their pride in the word smong has spread to Aceh and is being adopted in their efforts to adapt to earthquake and tsunami disasters. Simeuluean people, grateful to their nation for the reconstruction after 2004 and want to grow their pride in smong to a national level. They wanted to make a gift of smong to be owned by the Indonesian people. To do this, they feel this study initiates that the word smong should be part of the narrative in Indonesian as the basis for a new understanding of the tsunami disaster by Indonesian people. Initiating the word smong in Indonesian vocabulary does not mean removing the word tsunami that now an international word. But the acceptance of smong should be a source of pride in the protection of our greatest wealth of people.

Keywords: tsunami, smong, indigenous knowledge, local knowledge, disaster risk reduction

## Human Agency in using Technology and the Effect on Customer Wellbeing

**Nila A. Windasari**<sup>1</sup>

<sup>1</sup> School of Business and Management, Bandung Institute of Technology, Indonesia

Technology is inevitable in the current daily lives. People of all ages started to use technology to help them efficiently arrange their tasks, starting from doing household chores, a reminder of appointments, exercise and managing personal health, etc. Since it has been infused and become part of our daily activity, it creates a new habit and soon becomes reliant.

Studies found that habitual involvement with technological devices can have a negative and lasting impact on users' ability to think, remember, pay attention, and regulate emotion (Wilmer, Sherman, & Chein, 2017). Technology reliance can also have a series of unintended negative consequences, such as technology addiction, diminished sense of competence and free will, reduced actual and perceived consumer autonomy, and degradation of automated skills (Castelo and Lehmann, 2019, Wertenbroch et al., 2019). High engagement and continuous reliance on the external agent, for example wearable device, could decrease users' self-efficacy which previously has been exerted well through a healthy lifestyle. The imbalance between a user's reliance on a device and his/her agency can affect his/her wellbeing shown as people with increased wellbeing is the one with higher efficacy (Lin & Windasari, 2018). It might be left asking, for example, whether my fitness wearable knows if I need to reduce more calories intake for dinner than myself (?)

Perceived loss of autonomy has been discussed by Davenport et al. (2020) as a consequence of the usage of technology. However, there is very limited study exploring when and which factors exactly made us lose it. Usage of technology also can induce dehumanization, and make us less human (Wirtz et al., 2018). Therefore, this study aims to explore at what specific points does an individual feel less human (as a consequence of technology use) and whether it impacts his/her wellbeing.

Technological features embedded in a personal device often enrich with some features that can generate data to be meaningful recommendations. It is now also more sensible with some social presence that mimics human expertise. We use a critical incident technique (CIT) to enable us identify certain occurrences during their interaction with tech-devices that impact their physical, psychological, and social wellbeing. Participants are male and female, aged 20- 50 years old, that experienced (and still) using one of three types of personal tech devices, which are Fitness Wearable, Virtual Assistant, and Smart Homes, for at least six months. The three devices are chosen as they have features of AI-based information provision (Belanche et al., 2020) and automated social presence (Wirtz et al., 2018).

In this study, categorizations of factors were identified to explain specific incidents are realized by the users' when technology starts affecting their wellbeing. This study is expected to contribute to the theory by providing insight to what extent the user can be too much negatively affected by technological devices by proposing two mechanisms, value co-creation and nudging mechanisms. This study provides practical contributions on how or when to give boundaries and limitations to gain control, exercise their human agency, and make the best use of technology for users' positive wellbeing. A very limited study exploring when and which factors exactly made users lose their agency and perceived autonomy when interacting with technological devices. This study identifies certain points where individuals feel less human (as a consequence of technology use) and whether it impacts his/her wellbeing.

**2022 Indonesian-American  
Kavli Frontiers of Science Symposium**

**Indonesian Academy of Sciences - U.S. National Academy of Sciences  
The David and Lucille Packard Foundation**

Yogyakarta, Indonesia – August 1-5, 2022

**Attendee Roster**

**Vina Adriany**

Professor  
Department of Early Childhood  
Education  
SEAMEO CECCEP & Universitas  
Pendidikan Indonesia  
Jalan Setiabudi No 229  
Bandung, 40154  
Indonesia

Tel: +62-081-1212-2601

E-mail: [vina.adriany@seameo-ceccep.org](mailto:vina.adriany@seameo-ceccep.org)

Social Media: @vinaadriany

*Research: Early Childhood Education*

My research interest evolves around the issues of early childhood education (ECE). Specifically, I am interested to study the issues of gender in the early years setting, the impact of neoliberalism to ECE, and sociology of children and childhood. At the moment, I am preparing a book on gender and power in the ECE in Indonesia (to be published by Routledge)



**Dhia Al Uyun**

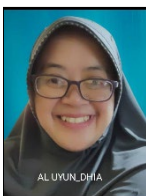
Assistant Professor  
Law Department  
Brawijaya University  
Veteran Street  
Malang, 86554  
Indonesia

Tel: +62-85-6355-0976

E-mail: [diah.al@ub.ac.id](mailto:diah.al@ub.ac.id)

*Research: Academic freedom and law*

The campus is responsible for the Ruthless of the State  
This state is messed up? If the state is good, of course there will be synergy between civil society and the government. The political gap seems to be widening between the political elite which runs according to its own track and civil society as observers outside the circle, even though it is the owner of sovereignty.



**Rita Andini**

Middle-Senior Researcher (Peneliti  
Madya)  
Genetic Engineering Peer Group  
Badan Riset Inovasi Nasional (BRIN)  
- National Agency of Research and  
Innovation

Jl. Kerapu No.5, Aluenaga,  
Kecamatan Syiah Kuala  
Banda Aceh, 23113  
Indonesia

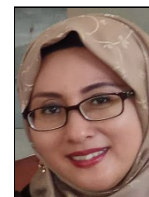
Tel: +62-852-7779-3220

E-mail: [rita.andini@brin.go.id](mailto:rita.andini@brin.go.id)

Social Media: [andini@gmx.net](mailto:andini@gmx.net)

*Research: Plant Genetics*

I am interested for further analyses of genetic diversity as well as in studying the Next Generation Sequencing (NGS) as well as for Single Nucleotide Polymorphisms (SNP) for further identification attempts at the molecular level. This would be also interesting to be applied in Coffea spp. Climate change has been deliberately threatening the major commodities of many important crop in many Asian countries, such as in Indonesia. This would be also interesting to study.



**Nungki Anggorowati**

Assistant Professor  
Department of Anatomical Pathology  
Faculty Of Medicine, Public Health,  
And Nursing, Universitas Gadjah  
Mada

Jalan Farmako, Sekip Utara  
Sleman,  
Indonesia

Tel: +62-081-1257-0304

E-mail: [nungkiaw@gmail.com](mailto:nungkiaw@gmail.com)

*Research: Pathology, Cancer*

Diffuse Large B-cell Lymphoma (DLBCL) is the most frequent aggressive lymphoma. Gene expression profiling (GEP) has divided molecular classification into two different categories of cell of origin such as germinal center B-like (GCB) DLBCL which showed genes characteristic of germinal center B cells and non-GCB or activated B-cell (ABC) as post germinal center. Because of inconsistent study, it is still very important to explore the molecular characteristics of DLBCL in relation with clinicopathological study.





**Osi Arutanti**

Research Center for Chemistry  
National Research and Innovation  
Agency

Serpong Puspiptek  
tangerang selatan, 15314  
Indonesia

Tel: +62-822-9534-9889

E-mail: [osiarutanti@yahoo.com](mailto:osiarutanti@yahoo.com)

Web: <https://www.linkedin.com/in/osi-arutanti-19b24738>

**Research: Nanomaterial**

The abundance of solar energy as a sustainable light source makes photocatalysis possible and suitable to be applied in Indonesia. Accordingly, the current research is focused on developing titanium dioxide-based photocatalyst material which can be activated under natural light for environmental problems, especially for water treatment from organic pollutants and conversion of CO<sub>2</sub> gas. Initiating research collaborations with academics, researchers, and industry is one of the efforts to focus on the ultimate goal.

**Dharma Aryani**

Department of Electrical Engineering  
Politeknik Negeri Ujung Pandang  
Perumahan Dosen UNHAS Blok AC  
No 1D

Makassar, 90245

Indonesia

Tel: +62-088-8488-8000

E-mail: [dharma.aryani@poliupg.ac.id](mailto:dharma.aryani@poliupg.ac.id)

**Research: Control Engineering**

My current research is on the topic of "Identification and Mapping of Solar Energy Potential In Indonesia", which could be a reference for renewable energy utilization in Indonesia. However, the research is only limited to evaluate the physical resource potential, while other issues such as economic, and environmental are excluded. The needs to accommodate these socio-economic variables could become the rationale for further research and a discussion topic for the symposium participants.

**Rini Astuti**

Crawford School of Public Policy  
Gadjah Mada University & Australian  
National University

Yogyakarta

Bantul, 55762

Indonesia

Tel: +62-0821-3603-3699

E-mail: [rini.astuti@anu.edu.au](mailto:rini.astuti@anu.edu.au)

Web:

<https://crawford.anu.edu.au/people/academic/rini-astuti>

**Research: Human Geography**

Rini Astuti's research focuses on environmental and resource governance in Indonesia, including on climate change mitigation and adaptation policies. Her recent research is on transboundary haze & peatland governance. She is currently developing new research agenda on the "critical geographies of decarbonisation". She studies Indonesian small islands as frontiers of critical material extraction for green economy agenda and traces who bears the burden and shares the benefits of global energy transitions.

**Widi Astuti**

Research Center for Mining  
Technology

National Research and Innovation  
Agency (BRIN)

Jl. Ir. Sutami Km. 15 Tanjung Bintang  
Lampung Selatan, 35361

Indonesia

Tel: +62-813-1900-2393

E-mail: [widi005@brin.go.id](mailto:widi005@brin.go.id)

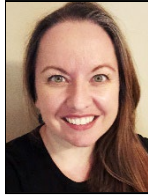
**Research: Materials and Metallurgy**

I plan to study about the comprehensive and sustainable mineral processing and extractive metallurgy from Indonesian mining ores and urban mining such as electronic waste, spent catalyst from industries, spent batteries, and residues from mining activities to prepare metals or metal compounds as raw materials for advanced material and other functional materials to support the development of energy transition, electric vehicle, health sciences, constructions etc. to propose the zero waste and total extraction technologies.



**Sarah Barber**

Associate Professor  
 Department of Psychology  
 Georgia State University  
 1744 Brockett Road  
 Tucker, GA 30084  
 United States



Tel: +1-919-619-7797

E-mail: [sbarber10@gsu.edu](mailto:sbarber10@gsu.edu)

Web: <https://www.cognitionaginglab.com/>

*Research: Cognitive Aging*

Older adults typically perform worse than younger adults on tests of memory abilities, and this difference is often attributed to age-related declines in brain structure and function. However, adopting a purely biological approach to cognitive aging research overlooks the key role of socioemotional factors in contributing to age differences in performance. In my research, I am broadly interested in how social context and socioemotional goals affect memory and cognition in both younger and older adults.

**Nadia Brashier**

Assistant Professor  
 Department of Psychological  
 Sciences  
 Purdue University  
 Department of Psychological  
 Sciences  
 703 Third St



West Lafayette, IN 47906

United States

Tel: +1-706-892-4068

E-mail: [brashier@purdue.edu](mailto:brashier@purdue.edu)

Web: <http://nadiabrashier.com>

Social Media: @nadiabrashier

*Research: cognitive psychology and neuroscience*

Dr. Brashier studies memory and judgment across the lifespan, with a specific focus on cognitive “shortcuts” people use to evaluate truth. Her lab uses neuroimaging and behavioral methods to identify why young and older adults fall for fake news and misinformation.

**Mirza Buana**

Associate Professor  
 Department of Constitutional Law  
 Faculty of Law, Lambung Mangkurat  
 University  
 Jl. Simpang Gusti VI No. 68 RT 31,  
 Kayutangi, Banjarmasin,  
 Kalimantan Selatan  
 Banjarmasin, 70125  
 Indonesia



Tel: +62-0813-5147-1008

E-mail: [mirza.buana@ulm.ac.id](mailto:mirza.buana@ulm.ac.id)

*Research: Human Rights and Constitutional Law*

I have interests in socio-legal/interdisciplinary legal research. I am recently involved in development issues relating to economics and socio-cultural impacts of development. I look forward to working with fellow researchers in development studies, political sciences and other fields of research.

**Danny Coffey**

Assistant Research Scientist  
 Harte Research Institute for Gulf of  
 Mexico Studies  
 Texas A&M University-Corpus Christi  
 6300 Ocean Drive  
 Corpus Christi, TX 78404  
 United States



Tel: +1-808-286-5772

E-mail: [daniel.coffey@tamucc.edu](mailto:daniel.coffey@tamucc.edu)

Social Media: <https://twitter.com/drelasmo>

*Research: Marine Ecology*

Marine environments are a concealing medium, where direct observations of natural animal behavior are challenging. As a marine movement ecologist, I utilize novel animal-borne tracking technologies to remotely observe the migration and behavior of top predators across different spatial (meters to ocean basins) and temporal (seconds to years) scales. This information has led to significant breakthroughs in our understanding of top predator ecology and physiology that are informative for managing and conserving living marine resources.

**Richard Coleman**

Early Career Fellow  
 Department of Integrative Biology  
 University of Texas, Austin  
 1765 Ala Moana Blvd.  
 Apt 986  
 Honolulu, HI 96815  
 United States  
 Tel: +1-916-524-3734



E-mail: [hetheru@hotmail.com](mailto:hetheru@hotmail.com)

Web: <https://www.richard-coleman.com>

*Research: Marine Ecology and Evolution*

I will be taking a multi-species approach to investigate patterns of genetic connectivity among ecological and economical important fish species, as well as species of conservation concern, for the Caribbean Sea. Additionally I will be characterizing mesophotic coral ecosystems (MCEs) of the North Caribbean Sea and integrating MCE associated species to characterize food web dynamics across a vertical gradient.

**Korri El Khobar**

Eijkman Research Centre for  
 Molecular Biology  
 National Research and Innovation  
 Agency (BRIN)  
 Jl. Raya Jakarta-Bogor Km. 46,  
 Cibinong  
 Kec. Cibinong, Kabupaten Bogor,  
 Jawa Barat 16911



Cibinong,

Indonesia

Tel: +62-812-9421-3579

E-mail: [k.elkhorbar@gmail.com](mailto:k.elkhorbar@gmail.com)

*Research: Viral hepatitis*

My research interests are on viral hepatitis and viral-hepatitis related pathogenesis of liver cancer. Our group have been studying the genetic characteristics and seroepidemiology of hepatitis B virus (HBV) and hepatitis C virus (HCV) in Indonesia, and their clinical implication on the development of viral-hepatitis related liver diseases. We are also looking more on viral and host factor interaction in viral hepatitis infection and development of translational hepatology model for studying liver disease.

**Evi Eliyanah**

Associate Professor  
 Department of English  
 Universitas Negeri Malang (UM)  
 Jl. Danau Sentani III E3H8  
 Malang, 65138  
 Indonesia



Tel: +62-81-1313-0097

E-mail: [evi.eliyanah.fs@um.ac.id](mailto:evi.eliyanah.fs@um.ac.id)

*Research: Gender Studies - Cultural Studies*

My current research includes GESI in film education in Indonesia, GEDSI in Indonesian research ecosystem and higher education, marriage patterns and social change in Indonesia, and representations of gender in Indonesian popular culture.

**Nur Fadli**

Associate Professor  
 Department of Marine Science  
 Universitas Syiah Kuala  
 Jln. T. Nyak Arif  
 Fakultas Kelautan dan Perikanan  
 Banda Aceh, 23111  
 Indonesia



Tel: +62-0813-6003-4100

E-mail: [nurfadli@unsyiah.ac.id](mailto:nurfadli@unsyiah.ac.id)

Web: <http://www.fsd.unsyiah.ac.id/nurfadli/>

Social Media:

<https://www.facebook.com/nurfadli.yunus>

*Research: Marine Biology*

I and my colleagues are actively doing some researches related the grouper fish (family Epinephelidae) in Aceh region. The groupers are among the most important commercial fish groups globally. We utilized molecular markers (mainly mitochondrial DNA) to DNA barcoding of commercially important groupers in Aceh and observe phylogeography pattern of several grouper species in Indonesia. The molecular data collected from this study would be beneficial for the future management plan of grouper in Indonesia.

**Sri Fatmawati**

Assistant Professor  
Department of Chemistry  
Institut Teknologi Sepuluh Nopember  
Kampus ITS Sukolilo  
Surabaya,  
Indonesia

Tel: +62-31-594-3353

E-mail: [fatma@chem.its.ac.id](mailto:fatma@chem.its.ac.id)

Social Media:

<https://web.facebook.com/srifatmawati/>

*Research: Natural Product Chemistry*

I am an Assistant professor at Institut Teknologi Sepuluh Nopember (ITS) - Surabaya, with an interest in contributing to a research and development of natural product and Indonesian traditional plants. Currently, I have been the President of Indonesian Young Academy of Sciences (ALMI), Chair of Organization for Women in Science for the Developing World (OWSD) – Indonesia chapter and Executive Committee of Global Young Academy (GYA).

**Kelle Freel**

Postdoctoral Researcher  
Hawai'i Institute of Marine Biology  
University of Hawai'i at Mānoa  
46-007 Lilipuna Rd.  
Kaneohe, HI 96744  
United States

Tel: +1-831-359-6763

E-mail: [kfreel@hawaii.edu](mailto:kfreel@hawaii.edu)

Social Media: @KC\_Freel (Twitter)

*Research: Marine Microbial Ecology*

I am interested in understanding the distribution and ecology of marine microbes and what drives the cohesion of bacterial lineages. I focus on the cultivation of abundant bacteria from the environment to study their physiology in the lab, and use isolate genomes as a reference to provide context for the abundance and distribution of discrete populations. Ultimately I strive to link closely related bacterial lineages to their role in the environment.

**Tyrone Grandison**

CTO Public Sector  
Global Partner Solutions  
Microsoft

300 Lenora Street, 955  
Seattle, WA 98121

United States

Tel: +1-408-823-4866

E-mail: [tgrandison@gmail.com](mailto:tgrandison@gmail.com)

Web: <http://www.tyronegrandison.org>

*Research: Computer Science*

I work at the intersection of computing, data science, and social good. I am examining ways of solving hard social problems. For example, community-informed ways for addressing disinformation and misinformation.

**Gunadi**

Associate Professor  
Department of Surgery, Pediatric  
Surgery Division/Genetics Working  
Group

Universitas Gadjah Mada  
FK-KMK UGM

Yogyakarta

Indonesia

Tel: +62-878-8574-4234

E-mail: [drgunadi@ugm.ac.id](mailto:drgunadi@ugm.ac.id)

Web: <https://pokjagenetik.fk.ugm.ac.id/>

*Research: Human Genomics & Genetics*

Next-generation sequencing for human genetic disorder/rare disease, neuromuscular disorder.

**Triyanda Gunawan**

Assistant Professor  
Department of Chemistry  
Institut Teknologi Sepuluh Nopember  
Faculty of Sciences and Data  
Analytics

60111 Sukolilo  
Surabaya, 60111

Indonesia

Tel: +62-853-3004-1003

E-mail: [triyanda@its.ac.id](mailto:triyanda@its.ac.id)

Social Media:

<https://www.linkedin.com/in/triyanda-gunawan-7860bb152/>

*Research: Membrane Science*

Currently I am conducting research in membrane science, especially for gas separation and photocatalytic membrane and have achieved 5 (five) research grants for the topics. My research interest is related to the carbon based membrane and CO<sub>2</sub> capture, storage and utilization. I am planned to conduct direct CO<sub>2</sub> capture from air next year and focusing on those topic for supporting the SDGs no. 13, which is climate action.



**Allon Hochbaum**

Associate Professor  
Department of Materials Science and  
Engineering  
University of California, Irvine  
544 Engineering Tower  
Irvine, CA 92697-2585  
United States



Tel: +1-949-824-1194

E-mail: [hochbaum@uci.edu](mailto:hochbaum@uci.edu)

Web: <https://sites.uci.edu/hochbaum/>

*Research: Bioinspired materials*

My lab focuses on the development of functional materials from living bacterial and biomolecular components, and on developing methods to rapidly assay bacterial physiology. We study:

- Conductivity in supramolecular biomaterials, including structure-function relationships in synthetic and natural biomaterials.

- Methods to assess bacterial metabolism, including three distinct spectroscopic techniques for mapping bacterial metabolism in complex environments and assaying bacterial susceptibility or resistance to antibiotics.

**Gregory Holland**

Professor  
Department of Chemistry and  
Biochemistry  
San Diego State University  
5500 Campanile Drive  
San Diego, CA 92182-1030  
United States



Tel: +1-307-760-6756

E-mail: [gholland@sdsu.edu](mailto:gholland@sdsu.edu)

*Research: Chemistry*

The Holland Lab explores the molecular structure and dynamics of complex biological and technologically relevant materials. We are interested in scientific problems that lie at the interface of chemistry, biology and materials science including biologically inspired materials and bio-nano interfaces. Although we use a suite of characterization techniques, the primary focus is on developing nuclear magnetic resonance (NMR) methods. A continuing theme is linking the role of molecular structure to material properties and biological function.

**Matthew Iacchei**

Assistant Professor of Marine  
Science  
Department of Natural Science  
Hawai'i Pacific University  
41-202 Kalaniana'ole Highway  
Waimanalo, HI 96795  
United States



Tel: +1-808-226-8744

E-mail: [miacchei@hpu.edu](mailto:miacchei@hpu.edu)

*Research: Marine Molecular Ecology*

My lab uses a combination of fieldwork and genomic approaches to assess biodiversity at multiple spatial scales to inform fisheries management, conservation, and restoration efforts. We collaborate with local communities and government agencies to identify questions that may benefit from genomic approaches. Example projects include eDNA monitoring of community change after mangrove removal, DNA metabarcoding to examine fish diets, DNA barcoding to identify fish recruits, and genetic evaluation of aquacultured broodstock contributions to wild populations.

**Andi Masyitha Irwan**

Assistant Professor  
Faculty of Nursing  
Universitas Hasanuddin  
Jl. Perintis Kemerdekaan KM.10  
Makassar, 90245  
Indonesia



Tel: +6285342600183

E-mail: [citha\\_ners@med.unhas.ac.id](mailto:citha_ners@med.unhas.ac.id)

*Research: Health Science*

We conducted a three-year study aimed to determine the level of physical activity of post-stroke survivors at the home setting. This portable sensor accurately measured activity daily performance and showed a decrease in daily activity from time to time. However, the device is very costly and only produced in European countries. Our next step is to develop a similar device at a cheaper price so it could be affordable for the larger community.



**Berry Juliandi**

Dean and Associate Professor  
Department of Biology  
IPB University  
Jl. Meranti Kampus IPB Dramaga  
Bogor, 16680  
Indonesia

Tel: +62-877-7182-9252

E-mail: [bjuliandi@apps.ipb.ac.id](mailto:bjuliandi@apps.ipb.ac.id)

Web:

<https://biologi.ipb.ac.id/web/en/faculty/profile/48/berry-juliandi>

**Research: Biology**

Berry Juliandi is an Associate Professor in Department of Biology, and the Dean of Faculty of Mathematics and Natural Sciences, IPB University, Indonesia. His research interests include morphometrics, molecular neuroscience and learning-memory. Berry obtained both bachelor and master degree in Biology from IPB University studying human and macaques using geometric morphometrics, and doctoral degree in Biological Sciences from Nara Institute of Science and Technology, Japan studying epigenetics regulation of neural and embryonic stem cells.

**Grandprix Thomryes Marth Kadja**

Assistant Professor  
Division of Inorganic and Physical  
Chemistry  
Institut Teknologi Bandung  
Jalan Ganesha no. 10  
Bandung, 40132  
Indonesia

Tel: +62-0856-9168-9733

E-mail: [grandprix.thomryes@itb.ac.id](mailto:grandprix.thomryes@itb.ac.id)

Web: <https://kadjalab.com/>

**Research: Nanomaterials**

My research group concentrates on the design and synthesis of nanomaterials, especially those with two-dimensional (2D) morphology (MXenes) and unique pore architecture within their frameworks (zeolite, MOF, mesoporous silica). We are developing novel strategies to tailor the nanostructure and control the physicochemical properties. Our nanomaterials are used in various applications, such as catalysis, membrane separation, adsorption, and electrochemistry. In addition, we are also interested in material characterizations using diffraction, spectroscopy, and electron microscopy techniques.

**Brian King**

Professor  
Department of Geography  
Pennsylvania State University  
302 Walker Building  
University Park, PA 16802  
United States

Tel: +1-814-308-4498

E-mail: [bhk2@psu.edu](mailto:bhk2@psu.edu)

Web: <https://www.geog.psu.edu/directory/brian-king>

**Research: Geography**

I am a broadly trained geographer whose research, teaching, and outreach focuses on livelihoods, conservation and development, environmental change, and human health. My book, "States of Disease: Political Environments and Human Health", received the Julian Minghi Distinguished Book Award, and was reviewed in April 2019 in The AAG Review of Books. More recently, my laboratory group (HELIX: Health and Environment Landscapes for Interdisciplinary eXchange) is examining how COVID-19 is transforming the US opioid epidemic.

**Kiki Kurnia**

Researcher  
Chemical Engineering  
Institut Teknologi Bandung  
Jalan Ganesha No 10  
Bandung, 40132  
Indonesia

Tel: +62-0812-1144-4155

E-mail: [kurnia.kikiadi@gmail.com](mailto:kurnia.kikiadi@gmail.com)

**Research: Green Chemistry**

My research focus on developing green solvents for chemical reactions and separation processes, namely ionic liquid, deep eutectic solvent, and biosolvent. I utilize the computational tool, namely Turbomole and COSMO-RS. I would like to share my work on integrating experimental and computational methods to improve the chemical reaction and separation process, such as absorption of CO<sub>2</sub> from natural gas, absorption-refrigeration working pair, and extraction of valuable compound from Indonesian herbal plant and marine organism.



**Pradiptajati Kusuma**

Postdoctoral Researcher  
Division of Genome Diversity and  
Diseases

Mochtar Riady Institute for  
Nanotechnology  
Jl. Boulevard Jendral Sudirman  
No.1688

Lippo Karawaci, 15811

Tangerang,

Indonesia

Tel: +62-8953-8882-6981

E-mail: [pradiptajati.kusuma@mrinstitute.org](mailto:pradiptajati.kusuma@mrinstitute.org)

Social Media: <https://twitter.com/paikusuma>

*Research: Population genetics, Evolution*

I am a population geneticist, currently working closely with a nomadic hunter-gatherer group in Kalimantan, the Punan Batu/Cave Punan, one of a vanishingly small number of groups worldwide still occupying karstic rock shelters, living in a network of shifting camps in the forest. Together with my collaborators, I conduct a multidisciplinary research to study the Cave Punan history and the biological impact of their lifestyle transition, involving linguistic, social networks, mobility patterns, diet, and genetics.

**Rina La Distia Nora**

Lecturer

Department of Ophthalmology

Universitas Indonesia

Kompleks Bulog A no 1, Jl. Haji Ten,  
RT/RW 01/06

Kayu Putih, Pulogadung

Kota Jakarta Timur, 13210

Indonesia

Tel: +62-08-1119-8910

E-mail: [rina.ladistia@ui.ac.id](mailto:rina.ladistia@ui.ac.id)

*Research: Ophthalmology Immunology*

**Wilbur Lam**

Professor

Departments of Pediatrics and  
Biomedical Engineering

Emory University/Georgia Institute of  
Technology

229 Mead Rd.

Decatur, GA 30030

United States

Tel: +1-415-385-3446

E-mail: [wilbur.lam@emory.edu](mailto:wilbur.lam@emory.edu)

Web: <https://lamlab.bme.gatech.edu/>

Social Media: @WilburLam

*Research: medicine, diagnostic testing,  
bioengineering*

Wilbur Lam, MD, PhD is a physician-scientist-engineer trained in clinical pediatric hematology/oncology and bioengineering. His research interests involve the development and application of "microsystems" technologies as research-enabling platforms to improve our understanding of blood biophysics in health and disease (e.g. sickle cell disease, clotting disorders) and as novel home-based, patient-operated diagnostic tests for the management of pediatric and hematologic diseases. He also leads an NIH-funded center charged with assessing COVID-19 tests at the national level.

**Witri Wahyu Lestari**

Associate Professor

Department of Chemistry

Universitas Sebelas Maret

Jl. Ir. Sutami No. 36A, Kentingan,  
Jebres, Surakarta, 57126

Surakarta, 57126

Indonesia

Tel: +62-822-2783-3424

E-mail: [witri@mipa.uns.ac.id](mailto:witri@mipa.uns.ac.id)

Web: <https://porous-mater.uns.ac.id/>

Social Media:

<https://www.facebook.com/witri.w.lestari>

*Research: Inorganic Chemistry*

I am currently focusing my research in the field of organometallic chemistry especially in hybrid porous materials, both synthetic and natural, such as zeolite, metal-organic frameworks, mesoporous silica nanoparticles. My research examines aspects of synthesis pathway innovation as well as the development of more environmentally friendly methods, modifying materials and applying them in direction of sustainable development goals, for example in the areas of health, environment, energy and catalysis.



**Nichole Lighthall**

Assistant Professor  
Department of Psychology  
University of Central Florida  
Psychology Department, Building 99,  
Rm. 330  
4111 Pictor Lane  
Orlando, FL 32804  
United States  
Tel: 2135953066  
E-mail: [nichole.lighthall@ucf.edu](mailto:nichole.lighthall@ucf.edu)  
Web:



<https://sciences.ucf.edu/psychology/person/nichole-lighthall/>

Social Media: <https://www.linkedin.com/in/nichole-lighthall-a09aa21b7/>

**Research: Cognitive Neuroscience**

My research is driven by a fascination with how people make decisions and what leads to the range of behaviors we observe across contexts and life stages. Leveraging theory and methods from psychology, neuroscience, and gerontology, my research examines mechanisms of decision processing. The overarching goal of my work is to determine how age-related changes to cognitive and affective components of decision making impact decision processing and quality in normal aging and age-related neurodegenerative diseases.

**Jacqueline Linnes**

Marta E Gross Associate Professor  
Weldon School of Biomedical  
Engineering  
Purdue University  
206 South Martin Jischke Drive  
West Lafayette, IN 47907  
United States  
Tel: +1-206-730-5451  
E-mail: [jlinnes@purdue.edu](mailto:jlinnes@purdue.edu)  
Web: <https://engineering.purdue.edu/LinnesLab>  
Social Media: @jac\_linnes

**Research: Point-of-Care Diagnostics**

Dr. Linnes's work emphasizes the application of fundamental microfluidic principles and biological assays to develop and translate point-of-care diagnostics for global health and health disparities research. Research in the lab advances paper microfluidics, molecular biosensors, and human-centered instrumentation design to enable sensitive, robust, and rapid diagnostics for informed healthcare decision-making. Future directions include moving technologies out of the lab towards implementation by demonstrating and field-testing diagnostic devices with global partners.

**Prananda Luffiansyah**

Lecturer/Researcher  
Faculty of Art and Design  
Institut Teknologi Bandung  
Jalan Setra Duta Kencana Blok A3  
No. 6.  
Ishikawa International Student House  
Kelurahan Ciwaruga, Kecamatan  
Parongpong  
Kabupaten Bandung Barat, 40514  
Indonesia  
Tel: +62-081-1959-9963  
E-mail: [pranandaluffiansyah@gmail.com](mailto:pranandaluffiansyah@gmail.com)  
Social Media:



<https://www.linkedin.com/in/prananda-luffiansyah-malasan-13004130/>

**Research: Design Studies, Anthropology**

I am Prananda L. Malasan and currently working as a researcher at Faculty of Art and Design, Institut Teknologi Bandung (ITB). My research interests have been engaged in critical approaches to the design and innovation studies in the context of Global South. I primarily focus on the activities of the informal and small-medium enterprise in Indonesia. It ranges from street vending activities to the traditional craft communities in several urban and rural areas in Indonesia.

**Rita Maliza**

Assistant Professor  
Departement of Biology  
Andalas University  
Limau Manih, Pauh  
Padang, 25175  
Indonesia  
Tel: +62-0813-1909-1984  
E-mail: [malizarita@gmail.com](mailto:malizarita@gmail.com)  
**Research: molecular endocrinology**



In my previous research, I studied the effects of derivatives of vitamin A compounds on genes that play an important role in growth hormones, receptors, and regulation. My current and future research will focus on the problem of malnutrition or stunting in Indonesia by utilizing local food sources to prevent metabolic disorders and diseases caused by malnutrition. At the moment, studying for functional food that is effective, safe, and cost-effective is a top priority.



**Megan McCain**

Associate Professor  
 Department of Biomedical  
 Engineering  
 University of Southern California  
 1042 Downey Way  
 DRB 140  
 Los Angeles, CA 90089  
 United States  
 Tel: +1-617-710-8097



E-mail: [mlmccain@usc.edu](mailto:mlmccain@usc.edu)

Web: <https://livingsystemsengineering.usc.edu/>

Social Media: Twitter: @mccainlab

*Research: tissue engineering*

Megan McCain leads the Laboratory for Living Systems Engineering, an interdisciplinary research group that engineers and implements novel "Organ on Chip" platforms for human disease modeling and drug screening, with a focus on cardiac and skeletal muscle.

**Mohammad Moniruzzaman**

Assistant Professor  
 Marine Biology and Ecology  
 University of Miami  
 4600 Rickenbacker Causeway  
 Miami, FL 33133  
 United States  
 Tel: +1-865-221-0147



E-mail: [m.monir@miami.edu](mailto:m.monir@miami.edu)

Web:

[https://scholar.google.com/citations?hl=en&user=2JXF6oUAAAAJ&view\\_op=list\\_works](https://scholar.google.com/citations?hl=en&user=2JXF6oUAAAAJ&view_op=list_works)

Social Media: Twitter: @giant\_virus

*Research: Marine Microbial Ecology*

My research interest includes the ecological and evolutionary aspects of interactions of giant viruses with their hosts in the marine environment. Current and future projects in my lab includes: a) Dynamics of giant virus – host interactions in the coastal environment. b) Deciphering the molecular underpinnings of host-virus interactions using model and non-model protist systems, and c) Assessing the impact of endogenous giant viruses on the physiology and genome evolution of their eukaryotic hosts.

**Harry Murti**

Research Manager  
 Translational Research Stem Cells  
 Stem Cell and Cancer Institute, PT.  
 Kalbe Farma, Tbk.  
 Jl. Jend. Ahmad Yani No. 2  
 (Kompleks Bintang 7) PuloMas,  
 Jakarta Timur  
 Jakarta, 13210  
 Indonesia



Tel: +62-81-7040-8518

E-mail: [harry.murti@gmail.com](mailto:harry.murti@gmail.com)

Social Media: IG: @harry.murti

*Research: Regenerative Medicine (Stem Cell)*

Our previous study demonstrated that cGMP grade UC-MSCs could be reprogrammed to iPSCs using a safer and regulatory-friendly method, as healthy iPSCs and could be developed as a potential source of cell therapy. In addition, we can also generate patient-specific iPSCs that can be used for disease modelling and drug discovery. There is still a wide opportunity for collaborations and improvements in the field of stem cell therapy, especially using iPSCs and their derivatives research.

**Vishnu Murty**

Assistant Professor  
 Department of Psychology and  
 Neuroscience  
 Temple University  
 821 N. 15th Street, Unit 3  
 Philadelphia, PA 19130  
 United States  
 Tel: +1-740-632-8932



E-mail: [vishnu.murty@temple.edu](mailto:vishnu.murty@temple.edu)

Web: <https://sites.temple.edu/adaptivememorylab/>

Social Media: <https://twitter.com/vpmurty>

*Research: Cognitive Neuroscience*

Dr. Murty's current research program characterizes how engagement of neuromodulatory systems influence both memory and memory-guided decisions using novel behavioral paradigms, computational modeling, and human neuroimaging. He studies these processes in a variety of motivational and affective states including reward, threat, curiosity, and novelty. In addition, he applies these models developed in normative adults to understand the development of adaptive memory as well as maladaptive memory in clinically-relevant populations, such as psychosis and stress-related disorders.

**Vanny Narita**

Senior Officer  
Science and Technology Division  
ASEAN Secretariat  
70A Sisingamangaraja  
Jakarta, 12110  
Indonesia



Tel: +62-878-8876-1262

E-mail: [vanny.narita@asean.org](mailto:vanny.narita@asean.org)

Social Media: <https://id.linkedin.com/in/vannynarita>

*Research: Molecular Biology, STI Policy*

Vanny has been working on recombinant proteins and antibiotic resistance in human-impacted environments. Currently, she is responsible for ASEAN science diplomacy, managing regional cooperation and policy development in science, technology, and innovation. Initiatives under her purview include ASEAN COVID-19 Genomics and Sero-Surveillance Projects, Diagnostics, Green Technology, High Performance Computing, Regional Research Infrastructure, and Technology Management Hub. She is now in charge of the development ASEAN Plan of Action on Science, Technology, and Innovation (APASTI) 2026-2035.

**Agung Nugroho**

Professor  
Department of Agroindustrial  
Technology  
Lambung Mangkurat University  
Faculty of Agriculture, ULM Campus  
Banjarbaru, Jl. Ahmad Yani Km. 36  
Banjarbaru, 70714  
Indonesia



Tel: +62-0858-6736-3340

E-mail: [anugroho@ulm.ac.id](mailto:anugroho@ulm.ac.id)

Web:

<https://www.scopus.com/authid/detail.uri?authorId=56549100500>

*Research: Natural Product Chemistry*

My research interest is in the process technology of agricultural and natural products. More than 50 of our research articles related to the analysis and development of natural products have been published in international journals (Scopus h-index: 17). I have authored several books: Natural Product Technology, CCP and CP on Production Process of Crude Palm Oil, Oil Palm Agroindustry Technology, Current Issues of Food in Indonesia, and Food Technology Innovation.

**Kanti Pertiwi**

Assistant Professor  
Department of Management  
University of Indonesia  
Jalan Melinjo Blok C4/9 Sektor 1.6  
Griya Loka



Bumi Serpong Damai

Tangerang Selatan,  
Indonesia

Tel: +62-0811-1380-5012

E-mail: [kanti.pertiwi@ui.ac.id](mailto:kanti.pertiwi@ui.ac.id)

Web: <https://scholar.ui.ac.id/en/persons/kanti-pertiwi>

Social Media: <https://twitter.com/kpertiwi29>

*Research: Organisational Studies*

My current research focuses on the production of knowledge and discourse in management/organisational studies and how it contributes to the perpetuation of inequality in society. I am interested in issues such as public policy and administration, gender, disability, and the future of work.

**Masteria Yunovilsa Putra**

Senior Researcher  
Research Center for Vaccine and  
Drugs, Research Organisation for  
Healths  
National Research and Innovation  
Agency (BRIN)  
Jl. Raya Jakarta-Bogor No.Km46,  
Cibinong,  
Bogor, 16911  
Indonesia



Tel: +62-081-1194-8283

E-mail: [masteria.yunovilsa.putra@brin.go.id](mailto:masteria.yunovilsa.putra@brin.go.id)

Web:

<https://www.researchgate.net/profile/Masteria-Putra/publications?editMode=1&sorting=recentlyAdded>

*Research: Drug Discovery and Development*

Drug Discovery and Development From Indonesian Marine Organisms particularly for infectious disease and generative disease

**Mohamad Rafi**

Assistant Professor  
Department of Chemistry  
Institut Pertanian Bogor  
Kampus IPB Dramaga  
Jalan Tanjung  
Bogor, 16680  
Indonesia

Tel: +62-0813-1835-8054

E-mail: [mra@apps.ipb.ac.id](mailto:mra@apps.ipb.ac.id)

Web: <https://mra.staff.ipb.ac.id/>

*Research: Analytical Chemistry*

Currently my research mostly used metabolomics and chemometrics for development identification and authentication method of food/medicinal plants, finding metabolite having antioxidant, antigout, and anticancer activities, wood identification, and post-harvest technology.

**Alfi Rahman**

Researcher  
Department of Human Security and  
Knowledge Management  
Tsunami and Disaster Mitigation  
Research Center (TDMRC)  
Universitas Syiah Kuala

Jl. T. Hamzah Fansuri  
Kopelma Darussalam  
Kecamatan Syiah Kuala  
Banda Aceh, 23111  
Indonesia

Tel: +62-065-1805-2009

E-mail: [alfi.rahman@unsyiah.ac.id](mailto:alfi.rahman@unsyiah.ac.id)

*Research: Disaster Risk Reduction, Disaster Risk Communication*

Alfi currently works as a lecturer at the Faculty of Social and Political Sciences Universitas Syiah Kuala (USK) and a researcher at the Tsunami and Disaster Mitigation Research Center (TDMRC) of USK, Banda Aceh, Indonesia. He awarded a Doctoral degree from Tohoku University, Japan (2018) in Human Security and Society Program. His research topic areas are Knowledge Management for Disaster Risk Reduction (DRR), Indigenous Knowledge for DRR, Disaster Policy, Disaster Education, Disaster Risk Communication.

**Inaya Rakhmani**

Associate Professor  
Asia Research Centre  
Universitas Indonesia  
Jakob Oetama Multipurpose  
Intellectual Room  
Building H, 6th floor  
Faculty of Social and Political  
Sciences, Universitas Indonesia  
Depok, 16425  
Indonesia

Tel: +62-8-1189-1750

E-mail: [inaya.r@ui.ac.id](mailto:inaya.r@ui.ac.id)

Web: <https://arc.ui.ac.id/>

*Research: Asian Studies*

Inaya Rakhmani is the Director of the Asia Research Centre, Universitas Indonesia and honorary member of the Indonesian Young Academy of Sciences (ALMI). She is trained in communications and media studies, and uses cultural political economy to understand the way human practices and natural resources could help us understand broader social changes. She has recently completed leading an 11-country study on the role of social sciences in Southeast Asia's pandemic responses.

**Angela Richards Dona**

Algal Physiological Ecologist  
School of Life Sciences  
University of Hawaii at Manoa  
2538 McCarthy Mall  
Edmondson 216  
Honolulu, HI 96822  
United States

Tel: +1-718-812-0828

E-mail: [angelard@hawaii.edu](mailto:angelard@hawaii.edu)

*Research: Marine Biology*

I am a coral and algal physiologist and ecologist, focused primarily on marine photosynthesis and pigments. I am currently working on two projects that seek to better understand the physiological differences between native and invasive algal species in Hawaii and how these differences determine whether or not an invasive can dominate. This research has important implications for reefs under climate change scenarios since predicted conditions may favor invasives while displacing native algae and coral.

**Hanggoro Tri Rinonce**

Universitas Gadjah Mada  
Indonesia

Tel: 0878-3872-5371

E-mail: [hanggoro\\_rinonce@ugm.ac.id](mailto:hanggoro_rinonce@ugm.ac.id)

**Zulfa Sakhiyya**

Assistant Professor  
English Department  
Universitas Negeri Semarang  
B8 Building, Jl. Raya Sekaran,  
Gunungpati  
Semarang, 50229  
Indonesia

Tel: +62-0877-7977-7707

E-mail: [zulfa.sakhiyya@mail.unnes.ac.id](mailto:zulfa.sakhiyya@mail.unnes.ac.id)

*Research: Education, Discourse Analysis, Gender*  
Zulfa has been researching about educational issues from critical perspectives including gendered perspectives, critical literacies and critical discourse analysis. Her work has been published in journals such as Gender and Education; Critical Policy Studies; Globalisation, Societies and Education; and Pedagogy, Culture and Society. Educational problems are multi-dimensional; thus, our research too must be inter-disciplinary. Her current research explores this multidimensionality of educational problems, including the relationship between education and democratic development.

**Antonia Saktiawati**

Lecturer, researcher  
Department of Internal Medicine  
Universitas Gadjah Mada, Faculty of  
Medicine, Public Health, and  
Nursing

Jalan Farmako no.1, Sekip Utara  
Yogyakarta, 55281  
Indonesia

Tel: +62-812-2797-6434

E-mail: [a.morita@ugm.ac.id](mailto:a.morita@ugm.ac.id)

*Research: infectious disease*

I am interested in infectious disease, immunology, and pulmonary research. Currently, I am working to improve tuberculosis diagnosis and treatment through inhalation by investigating the electronic nose as a screening tool and clinical trial of inhalation drugs. Besides, I studied e-nose for diagnosing COVID-19. I am also embarking on more molecular-genetic research with a fellowship from the European Respiratory Society to find conservative amino acids of M. tuberculosis that can be a drug target

**Shella Permatasari Santoso**

Assistant Professor  
Department of Chemical Engineering  
Widya Mandala Surabaya Catholic  
University

Kalijudan No. 37  
Surabaya, 60114  
Indonesia

Tel: +62-81-1338-0555

E-mail: [shella@ukwms.ac.id](mailto:shella@ukwms.ac.id)

*Research: Biomass Utilization*

Our current research focuses on utilizing nature-based materials for conversion into value-added materials such as adsorbents, catalysts, and nanomaterials, which are used in adsorption, drug delivery, and renewable energy applications.

**Lisa Scott**

Professor  
Department of Psychology  
University of Florida  
945 Center Drive  
P.O. Box 112250  
Gainesville, FL 32611  
United States

Tel: +1-413-230-4204

E-mail: [lscott@ufl.edu](mailto:lscott@ufl.edu)

Web: <https://bcdlab.psych.ufl.edu/>

Social Media: Twitter: @lisascottbcd

*Research: Developmental Cognitive Neuroscience*

Dr. Scott's research utilizes a multi-method approach to understanding how infants, children, and adults attend, perceive and learn about the visual world. To better understand how experience impacts neural and behavioral outcomes her work utilizes measures of visual fixations using eye-tracking and brain activity using both EEG and MRI methods. Her work lies at the intersection of developmental psychology, cognitive neuroscience, cognitive psychology, social perception, and early childhood education.



**Shawnita Sealy-Jefferson**

Associate Professor  
College of Public Health, Division of  
Epidemiology  
Ohio State University  
1841 Neil Avenue  
Room 344  
Columbus, OH 43210  
United States  
Tel: +1-614-292-9534



E-mail: [sealy-jefferson.1@osu.edu](mailto:sealy-jefferson.1@osu.edu)

Web: <https://cph.osu.edu/people/sjefferson>

Social Media: @Dr\_S\_Jefferson

*Research: Reproductive Justice Epidemiology*

Dr. Sealy-Jefferson's scholar-activism draws from the Reproductive Justice Framework and seeks to: (1) empirically document associations between systems of oppression and poor maternal and birth outcomes in Black people, (2) explicate the intervening biologic, social, and psychosocial mechanisms, as well as (3) identify effect modifiers of these associations. The goal of her scholarship is to inform future intervention studies, policy change, and social activism, aimed at the liberation of her community.

**Mada Triandala Sibero**

Assistant Professor  
Department of Marine Science  
Universitas Diponegoro  
Universitas Diponegoro, Jl. Prof.  
Soedarto SH, Tembalang Campus  
Semarang,  
Indonesia



Tel: +62-852-7551-5793

E-mail: [madatriandalasibero@lecturer.undip.ac.id](mailto:madatriandalasibero@lecturer.undip.ac.id)

Web: <https://siberolab.com/members/>

Social Media: <https://twitter.com/SiberoLab>

*Research: Marine Microbiology*

I am interested in cultivable marine microorganisms, especially fungi and bacteria. My research group utilizes DNA barcoding to discover their diversity and then study their ecological function and their metabolites such as antimicrobial and antioxidant properties. In addition, we also work on the presence of multidrug-resistant (MDR) bacteria and yeast in the coastal areas.

**Nyssa Silbiger**

Associate Professor  
Department of Biology  
California State University,  
Northridge  
18111 Nordhoff Street  
Northridge, CA 91330  
United States  
Tel: 1-818-677-4427



E-mail: [nyssa.silbiger@csun.com](mailto:nyssa.silbiger@csun.com)

Web: <https://silbigerlab.com>

Social Media: twitter: @Nsilbiger ; Instagram:

@DrNyssaSilbiger/@SilbigerLab\_CSUN

*Research: Marine Ecology*

As a marine ecologist, my research lies at the intersection of local and global issues and on scales from individual organisms to ecosystem responses, while examining both mechanistic drivers and ecological outcomes. Because coastal ecosystems contribute disproportionately to marine productivity and fisheries catch, I focus on understanding the drivers of, and threats to, coastal ecosystem functioning, which is necessary for resource management and food security in a changing world.

**Felycia Edi Soetaredjo**

Professor  
Departement of Chemical  
Engineering  
Widya Mandala Surabaya Catholic  
University  
Jalan Kalijudan 37  
Surabaya, 60114  
Indonesia



Tel: +62-821-8918-9239

E-mail: [felyciae@ukwms.ac.id](mailto:felyciae@ukwms.ac.id)

*Research: Chemical Engineering*

Current research activities are:

- advanced oxidation of Fenton for hazardous organic pollutants in wastewater
- utilization of biomass and clay material for wastewater treatment



**Edwin Risky Sukandar**

Department of Chemistry  
Institut Teknologi Sepuluh Nopember  
Kampus ITS Keputih, Sukolilo  
Surabaya, 60111  
Indonesia

Tel: +66 638 900 839

E-mail: [edwin.risky.s@gmail.com](mailto:edwin.risky.s@gmail.com)

*Research: Natural Product Chemistry*

My research interest is in the field of natural product chemistry, dealing with isolation, structure elucidation and modification, and biological evaluation of the isolated compounds. We are currently working on an extensive project to explore phytochemical diversity of Indonesian Garcinia plants, so-called mangosteen family, as anti-inflammatory and anticancer agents and to study structure-activity relationship between the molecular structure of natural products and their biological properties.

**Caecilia Sukowati**

Researcher

Eijkman Research Center for  
Molecular Biology

Badan Riset dan Inovasi Nasional  
(National Research and Innovation  
Agency / BRIN)

Gedung Widyasatwaloka - Cibinong  
Science Center

Jl. Raya Jakarta-Bogor Km. 46  
Cibinong

Kab. Bogor, 16911

Indonesia

Tel: +39-33-1784-7411

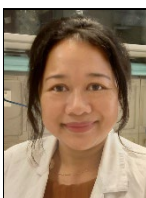
E-mail: [caecilia.sukowati@gmail.com](mailto:caecilia.sukowati@gmail.com)

Social Media:

<https://www.facebook.com/caecilia.sukowati/>

*Research: Molecular biomedicine*

I have been working in the field of liver diseases for the last 16 years, from the genetic variations of hepatitis virus to the molecular aspects of hepatocellular carcinoma (HCC). Despite rapid advances in medicine, HCC incidence and mortality remain high, also related to its vast heterogeneity. Here, we combine various experimental approaches using in vitro, in vivo, in silico, and validation in human samples to discover new biomarkers and to develop new treatment.

**Henry Surendra**

Postdoctoral Research Fellow  
Geospatial Epidemiology  
Oxford University Clinical Research  
Indonesia

Jalan Diponegoro 69

Jakarta, 10430

Indonesia

Tel: +62-081-7074-1253

E-mail: [henrysurendra.15@gmail.com](mailto:henrysurendra.15@gmail.com)

Social Media:

<https://www.researchgate.net/profile/Henry-Surendra-2>

*Research: Infectious Diseases Epidemiology*

My ongoing research include the epidemiology of COVID-19, impact of COVID-19 pandemic on Tuberculosis, HIV, and Child Immunization Program, evaluation of COVID-19 vaccine effectiveness, evaluation of the emerging zoonotic P. Knowlesi malaria transmission and agricultural land use, and other malaria epidemiological studies in Indonesia. My future research will focus on improving diagnostics and surveillance of COVID-19, malaria, and other neglected tropical diseases of public health importance in Indonesia, through interdisciplinary and interregional collaborations.

**Arjon Turnip**

Department of Electrical Engineering  
Universitas Padjadjaran, Indonesia

Jl. Raya Bandung Sumedang KM.21,  
Hegarmanah, Kec. Jatinangor,

Kabupaten Sumedang, Jawa Barat  
Bandung, 45363

Indonesia

Tel: +62-813-1314-3674

E-mail: [turnip@unpad.ac.id](mailto:turnip@unpad.ac.id)

Web: <https://arjonturnip.com/>

*Research: Brain Engineering, Neuroscience,  
Signal Processing, Image Processing,  
Instrumentation and Control*

My research areas are integrated vehicle control, Intelligent Control, signal processing, Image Processing, Artificial Intelligence, Brain Engineering such as brain-computer interface. Meanwhile, I accomplished four governmental projects as a project leader entitled the Development and Application of Assistive Intelligent System based Bio-feedback Signal for Clinic Instrumentation; Development and Application of a Smart System Detector for ECG Signal Abnormalities; Brain Computer Interface for Narcotics, Deception, Impulsivity, Sleepy, Emotion, and Food Effect Detection.



**Ariane Utomo**

Senior Lecturer in Demography and Population Geography  
School of Geography, Earth and Atmospheric Sciences (UoM) and Asia Research Centre (UI)

The University of

Melbourne/Universitas Indonesia

School of Geography, Earth and

Atmospheric Sciences, The

University of Melbourne

221 Bouverie St, Carlton

Melbourne, VIC, 3053

Australia

Tel: +61-41-358-5976

E-mail: [ariane.utomo@unimelb.edu.au](mailto:ariane.utomo@unimelb.edu.au)

Web:

<https://findanexpert.unimelb.edu.au/profile/827278-ariane-utomo>

Social Media: @ariane\_utomo (twitter)

*Research: Demography*

Ariane Utomo is a social demographer, and Senior Lecturer in Demography at the School of Geography, Earth and Atmospheric Sciences, The University of Melbourne. Her research focuses on the intersecting themes around youth, education and the labour force; ageing and migration; and on marriage, family change, and transition to adulthood in Indonesia. Ariane is also currently affiliated with the Asia Research Centre, Universitas Indonesia and the Indonesia Project, Australian National University.

**Widiastuti Widiastuti**

Assistant Professor

Department of Marine Sciences

Udayana University

Kampus Bukit Jimbaran

Badung, 80361

Indonesia

Tel: +62-812-4557-9316

E-mail: [widiastutikarim@unud.ac.id](mailto:widiastutikarim@unud.ac.id)

*Research: The coral ecophysiology and its associated macro-and microorganisms*

My research interest is to preserve and ensure the biodiversity and sustainability of the Indonesian coral reefs, particularly the endemic and rare coral species. The research activities include: understanding the response of the coral-associated macro-and microorganisms to changing environments, investigating the reef's health, examining the potential diseases and compromised health syndromes, as well as exploring the reproduction methods that either can conserve and provide income through culturing the coral for the marine ornamental export industry.

**Nila Windasari**

Assistant Professor

School of Business and Management

Bandung Institute of Technology

(ITB)

Jl Ganesha No 10

Bandung, 40132

Indonesia

Tel: +62-0851-3244-7668

E-mail: [nila.armelia@sbm-itb.ac.id](mailto:nila.armelia@sbm-itb.ac.id)

Web: <https://www.sbm.itb.ac.id/member/nila-armelia-windasari-sa-mba-phd-2/>

Social Media:

<https://www.instagram.com/nilaarmelia/?hl=en>

*Research: Service Marketing*

Nila Windasari's research interest lies on technology-enabled service (i.e. wearable devices, AR/VR, service robots, and chatbots), service marketing, and service design. It explores how individuals experienced technology to improve his/her wellbeing and co-create value with other actors within service systems. The research applications include wide ranges of areas such as healthcare, tourism, finance, and public services. Currently, she is working on tech adoption in consumer service and how users' agency impact their wellbeing.

**Maria Yuliana**

Assistant Professor

Department of Chemical Engineering

Widya Mandala Surabaya Catholic

University

Jl. Kalijudan 37, Surabaya 60114

Surabaya, 60114

Indonesia

Tel: +62-813-3056-3170

E-mail: [mariayuliana@ukwms.ac.id](mailto:mariayuliana@ukwms.ac.id)

*Research: Biomass Utilization*

My current research revolves around the field of health, clean energy and environment, specifically to utilize the natural resource and waste to adsorbent, biomedical material and clean energy. Currently, I have several projects in hand; one of them has a theme of waste-to-drug carrier which is funded by the Ministry of Education, Culture, Research and Technology. Several planned future projects include the fabrication of cellulose-metal-based material-polymer composites for industrial purposes.



## Student Observers

### Hamzah Alfarisi

Institut Pertanian Bogor

Email: [hamzah\\_alfarisi@apps.ipb.ac.id](mailto:hamzah_alfarisi@apps.ipb.ac.id)

### Kurnia Arofah

Universitas Indonesia, Jakarta

Email: [kurnia.arofah01@ui.ac.id](mailto:kurnia.arofah01@ui.ac.id)

### Achmad Reza Kurniawan

Universitas Gadjah Mada, Yogyakarta

Email: [arezakur@gmail.com](mailto:arezakur@gmail.com)

### Ika Oktavianawati

Department of Chemistry

Institut Teknologi Sepuluh Nopember

Kampus ITS Sukolilo

Surabaya, ID 60111

Indonesia

Tel: 081336628911

E-mail: [ika.fmipa@unej.ac.id](mailto:ika.fmipa@unej.ac.id)

*Research: Chemistry*

I am a lecturer at Universitas Jember, with an interest in contributing to a research and development of organic chemistry. My previous research profile was related to the extraction of plant essential oils and its derivative products for empowering local communities in Jember. Currently, I am a doctoral student at Institut Teknologi Sepuluh Nopember performing research on natural product isolation of wood products and further synthesis of its derivative compounds.



### Vincentia Meta Widya Paramita

Universitas Gadjah Mada, Yogyakarta

Email: [metaparamita@gmail.com](mailto:metaparamita@gmail.com)

### Yenni Pintauli Pasaribu

Doctoral Student

Department of Chemistry

Institut Teknologi Sepuluh Nopember

Semampir Tengah VIII Blok D Nomor

22 Sukolilo Surabaya

Surabaya,

Indonesia

Tel: +62-0813-4243-0063

E-mail: [pasaribuyenni@yahoo.com](mailto:pasaribuyenni@yahoo.com)

Social Media:

<https://instagram.com/yenni.pasaribu?igshid=YmMyMTA2M2Y=>;

<https://www.facebook.com/yenni.pasaribu.5>

*Research: Medicinal Chemistry*

I have been working on natural product research of Clusiaceae especially *Garcinia* to discover novel compounds as antimalarial or anticancer drugs. In the future, I am interested in exploring natural compounds of endemic Papuan plants that have the potential as antimalarials. The research results are expected to help the community to find alternative drugs and support the government to overcome the problem of malaria which is still an endemic disease in Papua.



### Henggar Allest Pratama

Universitas Gadjah Mada, Yogyakarta

Email: [henggarap@gmail.com](mailto:henggarap@gmail.com)

### Fajar Islam Sitanggung

Institut Pertanian Bogor

Email: [fajar.sitanggung@apps.ipb.ac.id](mailto:fajar.sitanggung@apps.ipb.ac.id)

### Jeane Angelica Yulianadi

Susanto

Master Student

Department of Chemical Engineering

Widya Mandala Catholic University

Surabaya

Pesapen Pasar 15

Surabaya,

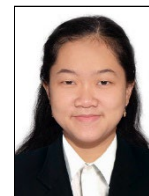
Indonesia

Tel: +62-0813-5995-2999

E-mail: [jeaneangelica.y.susanto@gmail.com](mailto:jeaneangelica.y.susanto@gmail.com)

*Research: Biomass based silica*

My current research activities is to synthesis chiral nanoparticle mesoporous silica (CNMS) from coconut husk waste for cardiovaacular disease drug delivery application. The reason for choosing this topic is to maximize application of coconut husk waste into something that highly beneficial in many aspect. Therefore, the coconut husk waste will be use as the main raw material to synthesis the silica, and with further process will produce CNMS for drug delivery application





**Anastasia Widyaningrum**

Universitas Indonesia, Jakarta  
Email: [anastasia.yuni@ui.ac.id](mailto:anastasia.yuni@ui.ac.id)

**Christian Julius Wijaya**

Doctoral Student  
Department of Chemical Engineering  
Institut Teknologi Sepuluh Nopember  
Kalijudan 37  
Surabaya, 60114  
Indonesia



Tel: +62-0813-3669-9907

E-mail: [christian\\_wijaya@ukwms.ac.id](mailto:christian_wijaya@ukwms.ac.id)

*Research: Advanced materials*

I am interested in the development of advanced materials where this field has very wide further applications. Currently, I am developing synthesis methods for various metal-organic frameworks (MOFs), such as ZIF, HKUST-1, and MIL, to create an optimal, efficient, effective, environmentally friendly and energy efficient synthesis process. Next, I will explore possible modifications that can be made to MOFs to enhance the characteristics of these materials and adapt them to any applications.

**Eka Pratiwi Yuniarti**

Masters Student  
Department of Chemistry  
Institut Teknologi Sepuluh Nopember  
Surabaya  
Ngagel Jaya Selatan 3/No. 4  
Surabaya, 60283  
Indonesia



Tel: +62-085-6338-7302

E-mail: [ekaputranto18@gmail.com](mailto:ekaputranto18@gmail.com)

*Research: Biodegradation*

I am currently working in the field of biodegradation especially methylene blue dye. This research utilizes microorganisms where they work to degrade dyes so that they are safe for disposal into the environment. The plan for this research in the future is to produce a product that can help the textile industry in processing their dyeing waste.

### Advisory Committee

Satryo S. Brodjonegoro  
Budhi Suyitno  
Daniel Murdiyarso  
Sangkot Marzuki

#### Satryo Soemantri Brodjonegoro

President  
Indonesian Academy of Sciences  
Akademi Ilmu Pengetahuan  
Indonesia  
Gd. Perpustakaan Nasional RI Lt.  
17-18



Jalan Medan Merdeka Selatan, No.11  
Gambir, DKI Jakarta 10110  
Indonesia

#### *Research: Mechanical Behavior of Engineering Materials*

Each engineering material has its properties such as threshold size, critical crack length, and crack propagation rate, and the data is available in many publications as well as references and handbooks. Current research works are focused on how to prevent fatigue failure from material point of view, e.g. by inventing new alloys or composites or even new materials with minimum defects or cracks and with certain grain structure and orientation that will block any propagation. Research is also conducted on the contact mechanism of mechanical surfaces of engineering materials, to observe and study the deformation and/or damage caused by the contact. This information is quite useful for predicting the lifetime and/or reliability of the engineering materials as well as of the constructions and equipment.

#### Daniel Murdiyarso

Center for International Forestry  
Research  
Jl. CIFOR, Situgede,  
Bogor 16115, Indonesia  
Tel. +62 251 622622  
Fax +62 251 622100



*Research:* Forest Meteorologist and Senior Scientist at the Center for International Forestry Research (CIFOR). Professor at the Department of Geophysics and Meteorology, IPB, who has published a large number of articles in peer reviewed journals and book chapters. He played an extensive role in the Nobel Peace Prize-winning IPCC as Convening Lead Author. Served the Government of Indonesia as Deputy Minister of Environment (2000-2002). Since 2002 he is a member of the Indonesian Academy of Sciences.

#### Budhi M. Suyitno

Indonesian Academy of Sciences  
Akademi Ilmu Pengetahuan  
Indonesia (AIPI)



Gd. Perpustakaan Nasional RI Lt.  
17-18

Jalan Medan Merdeka Selatan, No.11  
Gambir, DKI Jakarta 10110

*Research:* Graduated aviation engineer of the Institute Technology Bandung (ITB) and the aeronautics and space specialist of l'ENSAE (Ecole Nationale Supérieure d'Aerotechnique) Poitiers, France. A number of articles were published in the Ageing Aircrafts and Journals. As a government engineer he was in charged for the type certification process of the Indonesian CN-235-110 and N-250 aircrafts (1993-1995) and the implementation of ICAO Indonesia Declaration on Aviation Safety and Security (2007-2008). He was also responsible as the government representative in the establishment of the Aviation Law (2008-2009).

#### Sangkot Marzuki

Past President  
Indonesian Academy of Sciences  
Akademi Ilmu Pengetahuan  
Indonesia  
Gd. Perpustakaan Nasional RI Lt.  
17-18



Jalan Medan Merdeka Selatan, No.11  
Gambir, DKI Jakarta 10110  
Indonesia

## Guests, Media and Staff

### Bruce Alberts

Professor Emeritus  
Biochemistry and Biophysics  
MC 2200 Genentech Hall, N312C  
University of California, San  
Francisco  
600 16th Street  
San Francisco, CA 94158-2517  
United States  
Tel: +1-415-476-0806  
E-mail: [bruce.alberts@ucsf.edu](mailto:bruce.alberts@ucsf.edu)



### Danielle Crosser

Associate Program Officer  
Kavli Frontiers of Science  
Symposium Series  
U.S. National Academy of Sciences  
100 Academy  
Irvine, CA 92612  
USA  
Tel: +1-949-721-2269  
Fax: +1-949-721-2216  
Email: [dcrosser@nas.edu](mailto:dcrosser@nas.edu)  
Web: [www.nasonline.org/kfos](http://www.nasonline.org/kfos)



### John Claussen

Program Officer  
The David and Lucile Packard  
Foundation  
343 Second Street  
Los Altos, CA, 94022  
United States  
Email: [JClaussen@packard.org](mailto:JClaussen@packard.org)  
Web: [www.packard.org](http://www.packard.org)



### Chad English

Program Officer  
The David and Lucile Packard  
Foundation  
343 Second Street  
Los Altos, CA, 94022  
United States  
Email: [CEnglish@packard.org](mailto:CEnglish@packard.org)  
Web: [www.packard.org](http://www.packard.org)



### Edward Patte

Director  
Kavli Frontiers of Science  
Symposium Series  
U.S. National Academy of Sciences  
100 Academy  
Irvine, CA 92617  
USA  
Tel: +1-949-721-2268  
Fax: +1-949-721-2216  
Email: [epatte@nas.edu](mailto:epatte@nas.edu)  
Web: [www.nasonline.org/fos](http://www.nasonline.org/fos)



### Januar Putra

Country Advisor  
The David and Lucile Packard  
Foundation  
343 Second Street  
Los Altos, CA, 94022  
United States  
Email: [JPutra@packard.org](mailto:JPutra@packard.org)  
Web: [www.packard.org](http://www.packard.org)

### Prodita Sabarini

Editor  
The Conversation, Indonesia  
Email: [prodita.sabarini@theconversation.com](mailto:prodita.sabarini@theconversation.com)

### Supapan Seraphin

Senior Advisor  
Research Quality Management, National  
Science and Technology Development  
Agency (NSTDA)  
and King Mongkut's University of Technology  
Thonburi (KMUTT), Thailand  
Distinguished Professor Emerita, Department  
of Materials Science and Engineering  
The University of Arizona, Tucson, AZ 85721,  
U.S.A.  
Email: [ssupapan7@gmail.com](mailto:ssupapan7@gmail.com),  
[seraphin@email.arizona.edu](mailto:seraphin@email.arizona.edu)  
Tel: +1-083 911-2220

# Nature-inspired Innovations: From Medicine to Material

Agung Nugroho

Department of Agro-industrial Technology, Lambung Mangkurat University

Banjarbaru, South Kalimantan, Indonesia, 70714

Email: anugroho@ulm.ac.id

## Abstract

Nature provides a great source of inspiration for humankind. Interest in nature inspiration and related topics is growing fast today. A wide range of nature-inspired technologies has been developed to accommodate needs in medicine, food, fashion, material, engineering, electronics, information technology, automotive, transportation, communication, building architecture, and others. A natural product is a chemical entity formed by a naturally occurring living organism with pharmacological properties, which may contribute to vital drug discovery. The natural environment remains a significant origin of novel therapeutic agent compounds. Natural therapeutic agents are prepared from natural substances containing active components, including plants, microbes, minerals, and animals. A story of nature-inspired medicine is the discovery of artemisinin from the *Artemisia annua* plant by Tu Youyou, a Nobel prize winner in medicine. Artemisinin is a drug that has significantly reduced the mortality rates of malaria patients. The ancient Chinese medical texts inspired the discovery. Nature-inspired material is a developed material that enables the imitation of a particular natural material. In general, nature-inspired material is developed to achieve sustainability in the current lifestyle. The anaerobic respiration by some sediment microbes requires shuttling electrons from the cell to remote electron acceptors has inspired the development of self-assembled biomimetic conductive fibers. In efforts to support and realize the sustainable development goals (SDGs), the development of science and technology should be oriented to produce environmentally-friendly and sustainable products. Nature-inspired technologies may have excellent prospects in the future when sustainability becomes the key to all kinds of technology development.

Keywords: *biomimetics, biomimicry, inspiration, material, medicine, nature.*

## Nature-inspired Innovations

Nature has provided a great source of inspiration for humankind in any aspect of life. Nowadays, a wide range of nature-inspired products is available in our daily life, from medicine, food, fashion, material, engineering, electronics, information technology, automotive, transportation, and communication to building architecture. The terms nature inspiration, bio-inspiration, biomimetics, and biomimicry have become familiar.

The term inspiration refers to the early observation stage of a particular design or functionality that stimulates creativity and the idea of developing something similar. Nature refers to the living and non-living natural systems. Non-living natural systems include

traditional culture, local wisdom, religion, social behaviour, and natural creatures such as mountains, sea, sun, moon, sky, ocean waves, water flow, river, wind, thunders, and others. Meanwhile, the bio is associated with living natural (biological) organisms within the broad spectrum of nature, including plants, animals, microorganisms, and their organ systems.

Mimetic implies a further step of inspiration that involves the application of technology to engineer materials inspired by nature to exploit certain functionality observed in nature. In comparison, mimicry is the most advanced form of inspiration and involves applying engineering and technological tools to develop materials similar to nature with the prime objective of achieving sustainability. While inspiration is a primitive step toward mimicking nature, mimicry is the most advanced form that needs engineering perfection to achieve sustainability, while biomimetics represents an intermittent stage between the two (Katiyar et al., 2021).

Interest in nature inspiration and related topics is growing fast today. A simple example is what we know as a self-cleaning building. A building where the building blocks are structured by inspiration of crystal structures to achieve higher strength (Pham et al., 2019). Another sample is building architecture that resembles the shape of natural objects. A bird nest inspired the architecture and the structure of Beijing National Stadium. Further, that innovation can be combined with some additional creativities, such as developing the outer wall surface inspired by a self-cleaning lotus effect or solar energy inspired by tree photosynthesis.

### **Nature-inspired Medicines**

A natural product is a chemical entity formed by a naturally occurring living organism with pharmacological properties, which may contribute to vital drug discovery and design. Natural products have been vital in the pharmaceutical and biotechnology industries, as many modern medicines are based on naturally occurring molecules or derivatives. Therapeutic agents are considered natural, synthetic, or semi-synthetic, dependent on the source from which they were generated. The natural environment remains a significant origin of novel therapeutic agent compounds. Natural therapeutic agents are prepared from compounds found in nature, which contain active components in extract form created from sources, including plants, microbes, minerals, and animals. The plant is the most dominant natural medicine source due to its chemical and structural diversity and biodiversity (Mathur and Hoskins, 2017).

A story of nature-inspired medicine is the discovery of artemisinin by Tu Youyou, a drug that has helped significantly reduce the mortality rates of malaria patients. In 2015, Tu Youyou was awarded the Nobel prize for her discovery of artemisinin (Nobel Prize, 2015). She won the Nobel prize for medicine, although she does not have a medical degree or Ph.D. Tu used the Chinese medical texts from the Zhou, Qin, and Han Dynasties to find a traditional cure for malaria. She also volunteered to be the first human subject. At 16 years old, Tu had to take a two-year break from studying because of tuberculosis. When she returned to school, she knew what she wanted to study: medicine. She wanted to find cures for diseases like the one that had afflicted her.

At Beijing Medical College, Tu studied pharmacology, learning to classify medicinal plants, extract active ingredients and determine their chemical structures. When she graduated in 1955 at 24, Tu was assigned to work at the newly established Academy of Traditional Chinese Medicine, where she would stay for her entire career. From 1959 to 1962, she took a full-time course in traditional Chinese medicine for researchers trained in modern Western methods.

North Vietnam asked China for help battling malaria, causing tremendous casualties among its soldiers in the Vietnam War. The single-celled parasite that causes malaria had become resistant to chloroquine, the standard malaria treatment. Chairman Mao Zedong launched Project 523 on 23 May 1967 to find a cure for chloroquine-resistant malaria.

In 1969, when she was 39 years old, Tu was appointed head of Project 523. Her first order of business was researching the effects of malaria in situ. Furthermore, she traveled to Hainan Island in southern China, which was currently experiencing a malaria outbreak of its own. In those rainforests, Tu witnessed first-hand the disease's devastating toll on the human body.

Upon their return to Beijing, the team reviewed ancient medical texts to understand traditional Chinese ways of fighting malaria. Over 240,000 compounds had already been tested for use in potential antimalarial drugs, and none had worked. Finally, the team found a reference to sweet wormwood (*Artemisia annua*), which had been used in China around 400 AD to treat "intermittent fevers," a symptom of malaria.

In 1971, Tu's team isolated one active compound in wormwood that seemed to battle malaria-friendly parasites. They tested extracts of the compound, but nothing worked. So Tu returned once more to the ancient text. She wondered whether the active ingredient in wormwood was being damaged when they boiled it to prepare the solvent, so she tried another preparation, this time with an ether-based solvent. Since it boils at a lower temperature, the wormwood was not damaged; when she tested it on mice and monkeys, it had a 100 percent success rate.

Other innovations may also be inspired by the traditional culture, local wisdom, and also religion. Many researchers explore the chemical constituents and biological activities of honey inspired by a chapter in Quran (An Nahl Chapter, An Nahl means bee). According to that chapter, all-natural world wonders, such as seas, stars, and mountains, prove God's infinite power. Verse 66 speaks of the miracle in milk formation in cattle. From what is within their bodies, between excretions and blood, We produce for your drink: milk, pure and agreeable to those who drink it. Verse 67 speaks of the miracle of the vine. From the fruit of the date palm and the vine, get out strong drink and wholesome food. Verse 69 speaks that the honey bee builds its cells in hills, on trees, and in men habitations. From within, their bodies produce a drink of varying colors (honey), wherein is healing for men. Nowadays, thousands of scientific publications report all aspects of honey. Thousands of food and health food industries produce many types of honey-based products. Furthermore, many peoples obtained benefits from that.

Now we are interested in studying papaya leaves (*Carica papaya*). Our childhood inspired this interest, where our parents fed us the extract of papaya leaves every day to boost our appetite and treat intestinal worms. We are amazed by the efficacy and safety of the extract that has been proven ourselves. In many areas of Indonesia, papaya leaves are used as vegetables, dishes, and traditional medicine called jamu.

Consumption of papaya leaves jamu is intended for several purposes depending on the local wisdom of each area. In Central Java, a drink of papaya leaves juice is believed to be an effective way to boost the children's appetite and treat intestinal worms. In eastern Indonesia (Papua, Maluku, and Nusa Tenggara), a decoction of papaya leaves are still used to relieve malaria. In many areas, consuming papaya leaves is beneficial to enhancing breast milk production and maintaining fitness. In some Asian countries, papaya leaves are also used to treat diseases such as gastric digestion problems, intestinal worms, amoebic dysentery, and fever.

During the last few decades, significant progress has been achieved regarding the biological activity of papaya leaves. Now, it is considered a valuable nutraceutical plant. Many scientific studies have demonstrated the benefits and biological activities of papaya leaves extract in treating or reducing several diseases, such as dengue, malaria, intestinal worms, and fever. In addition, papaya leaves extract has also been reported to possess some medicinal properties related to antioxidative activity, such as reducing cardiovascular disease risk, anti-inflammatory activity, anti-tumor activity, preventing obesity and diabetes, improving the immune system, and alleviating allergic disorders.

Several scientists have also reported an investigation of the constituents of papaya leaves. Using HPLC-based activity profiling, flavonoids and alkaloids were the active constituents of papaya leaves and suggested the alkaloid carpaine as the primary anti-plasmodial compound (Julianti et al., 2014). Using the UPLC-TOF-ESI-MS method, four flavonoids: manghaslin, clitorin, rutin, and nicotiflorin were also identified (Afzan et al., 2012).

We isolated seven flavonols from papaya leaves: manghaslin, clitorin, rutin, myricitrin, nicotiflorin, quercetin, and kaempferol, and also determined their quantities using the HPLC method. Clitorin and manghaslin were identified as the main flavonoids of papaya leaves with a relatively high concentration in methanol extract (7.23 mg/g and 3.11 mg/g, respectively) (Nugroho et al., 2017). Polyphenols have been extensively reported as bioactive compounds associated with antioxidant properties and health benefits. The association of polyphenols with health benefits is explained by their antioxidant properties that can neutralize free radicals through their inherent redox properties.

Another example of nature-inspired medicine is exploring an ethnobotanical woody plant, *Garcinia picrorhiza*, by Dr. Edwin Sukandar. This plant is endemic to Indonesia and primarily grows in the Maluku Islands. Local people usually use the decoction of its roots as an energy drink, supplement, and latex for wound healing. The known compound garcinopicrobenzophenone is a polyprenylated benzoylphloroglucinol with a bicyclononane backbone with a 3- isopropenyl-2,2-dimethyl-cyclobutyl methyl substituent. This compound also shows antioxidant activity and inhibits the proliferation of leukemia L1210 cancer cells.

In the continuing search for novel bioactive substances in *Garcinia* plants, Dr. Sukandar investigated the stem bark of *G. picrorhiza* and successfully isolated eight new picrorhizones together with three known benzoylphloroglucinols. The isolated compounds were also evaluated for their cytotoxic properties against five human cancer cells (KB, HeLa S3, MCF-7, Hep G2, and HT-29 cells) and their inhibitory activities against COX-1 and COX-2 enzymes (Sukandar et al., 2020).



## Nature-inspired Materials

Nature-inspired material is a developed material that enables the imitation of a particular natural material. In general, nature-inspired material is developed to achieve sustainability in the current lifestyle. One sample is developed materials for artificial photosynthesis that can be used to harvest solar energy for chemical energy (Gust et al., 2009), such as a system having flower-like nanostructures generated from copper phosphate nanocomposites (Wang et al., 2016). This system incorporated TiO<sub>2</sub> (titanium dioxide) nanoparticles over the petals of a flower (or copper phosphate nanosheets). The copper phosphate flower provides a large surface area to bind TiO<sub>2</sub> nanoparticles, whereby the TiO<sub>2</sub> nanoparticles act as photocatalysts. Therefore, a copper phosphate flower functionalized with TiO<sub>2</sub> nanoparticles works as a solar light harvesting device. This system works as an antenna for solar light absorption and splits the water molecules into O<sub>2</sub> and H<sub>2</sub> (clean energy as a hydrogen fuel cell) gas.

A similar strategy has been developed for self-cleaning surfaces (solar panels, walls). TiO<sub>2</sub> as a photocatalyst was coated over a surface to degrade or split organic dirt photo-catalytically into its constituents in the presence of UV light and help water spread over the surface (rinsing the surface) due to hydrophilicity, which allows the surface to become self-cleaned (Xi et al., 2012).

Another example is the design of self-assembled biomimetic conductive fibers that Prof. Allon Hochbaum has developed at the University of California, Irvine (Hochbaum, 2019). The anaerobic respiration inspired this invention by some sediment microbes that require shuttling electrons from the cell to remote electron acceptors. The model bacterium *Geobacter sulfurreducens* produces electrically conductive, protein fiber appendages, representing a new class of materials with electronic properties at intermolecular electron transfer and solid-state electron transport physics. These materials also serve as natural inspiration for new bioelectronics interface materials.

Those efforts establish distinctive biomolecular design principles for long-range electron transport in self-assembling peptide nanofibers and native bacterial appendages. Such materials serve as an experimental platform to understand long-range charge transport in biological materials and as promising technological platforms for bioelectronic interfaces. It is clear that Nature has developed its design principles for long-range electronic conducting systems.

## Future Prospects of Nature-inspired Technologies

In efforts to support and realize the sustainable development goals (SDGs), the development of science and technology should be oriented to produce environmentally-friendly and sustainable products. Nature-inspired technologies may have excellent prospects in the future when sustainability becomes the key to all kinds of technology development. There are many challenges in the production of some nature-inspired medicine and materials. Considering the sustainability of functional nature-inspired products and processes is a significant engineering challenge.



## References

- Afzan, A., Abdullah, N.R., Halim, S.Z., Rashid, B.A., Semail, R.H.R., Abdullah, N., Jantan, I., Muhammad, H., Ismail, Z., 2012. Repeated dose 28-days oral toxicity study of *Carica papaya* L. Leaf extract in Sprague Dawley rats. *Molecules* 17, 4326–4342. <https://doi.org/10.3390/molecules17044326>
- Gust, D., Moore, T.A., Moore, A.L., 2009. Solar fuels via artificial photosynthesis. *Acc. Chem. Res.* 42, 1890–1898. [https://doi.org/10.1021/AR900209B/ASSET/IMAGES/MEDIUM/AR-2009-00209B\\_0001.GIF](https://doi.org/10.1021/AR900209B/ASSET/IMAGES/MEDIUM/AR-2009-00209B_0001.GIF)
- Hochbaum, A., 2019. Self-Assembled Biomimetic Conductive Fibers as a Novel Functional Materials Platform. Arlington, Virginia.
- Julianti, T., De Mieri, M., Zimmermann, S., Ebrahimi, S.N., Kaiser, M., Neuburger, M., Raith, M., Brun, R., Hamburger, M., 2014. HPLC-based activity profiling for antiplasmodial compounds in the traditional Indonesian medicinal plant *Carica papaya* L. *J. Ethnopharmacol.* 155, 426–434. <https://doi.org/10.1016/j.jep.2014.05.050>
- Katiyar, N.K., Goel, G., Hawi, S., Goel, S., 2021. Nature-inspired materials: Emerging trends and prospects. *NPG Asia Mater.* 2021 131 13, 1–16. <https://doi.org/10.1038/s41427-021-00322-y>
- Mathur, S., Hoskins, C., 2017. Drug development: Lessons from nature (Review). *Biomed. Reports* 6, 612–614. <https://doi.org/10.3892/BR.2017.909>
- Nobel Prize, 2015. The Nobel Prize | Women who changed science | Tu Youyou [WWW Document]. URL <https://www.nobelprize.org/womenwhochangedscience/stories/tu-youyou> (accessed 7.17.22).
- Nugroho, A., Heryani, H., Choi, J.S., Park, H.J., 2017. Identification and quantification of flavonoids in *Carica papaya* leaf and peroxynitrite-scavenging activity. *Asian Pac. J. Trop. Biomed.* 7, 208–213. <https://doi.org/10.1016/J.APJT.2016.12.009>
- Pham, M.S., Liu, C., Todd, I., Lertthanasarn, J., 2019. Damage-tolerant architected materials inspired by crystal microstructure. *Nat.* 2019 5657739 565, 305–311. <https://doi.org/10.1038/s41586-018-0850-3>
- Sukandar, E.R., Kaennakam, S., Aree, T., Nöst, X., Rassamee, K., Bauer, R., Siripong, P., Ersam, T., Tip-Pyang, S., 2020. Picrorhizones A-H, Polyphenylated Benzoylphloroglucinols from the Stem Bark of *Garcinia picrorhiza*. *J. Nat. Prod.* 83, 2102–2111. [https://doi.org/10.1021/ACS.JNATPROD.9B01106/SUPPL\\_FILE/NP9B01106\\_SI\\_002.CIF](https://doi.org/10.1021/ACS.JNATPROD.9B01106/SUPPL_FILE/NP9B01106_SI_002.CIF)
- Wang, J., Zhu, T., Ho, G.W., 2016. Nature-Inspired Design of Artificial Solar-to-Fuel Conversion Systems based on Copper Phosphate Microflowers. *ChemSusChem* 9, 1575–1578. <https://doi.org/10.1002/CSSC.201600481>
- Xi, B., Verma, L.K., Li, J., Bhatia, C.S., Danner, A.J., Yang, H., Zeng, H.C., 2012. TiO<sub>2</sub> thin films prepared via adsorptive self-assembly for self-cleaning applications. *ACS Appl. Mater. Interfaces* 4, 1093–1102. [https://doi.org/10.1021/AM201721E/SUPPL\\_FILE/AM201721E\\_SI\\_002.PDF](https://doi.org/10.1021/AM201721E/SUPPL_FILE/AM201721E_SI_002.PDF)

## Author



A professor at the Department of Agroindustrial Technology, Lambung Mangkurat University, Indonesia. His research interest is in the process technology of agricultural and natural products. More than 50 of his research articles related to the analysis and development of natural products have been published in international journals (Scopus h-index: 17). He has authored several books: Natural Product Technology, CCP and CP on Production Process of Crude Palm Oil, Oil Palm Agroindustry Technology, Current Issues of Food in Indonesia, and Food Technology Innovation.

