Mahmoud Nady Abdelmoez
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Education

Ph.D. in micro engineering April 2016 – September 2019

Department of Micro Engineering, Kyoto University, Japan.
Thesis title: "On-chip electrophoretic fractionation of cytoplasmic and nuclear RNA from single cells."

M.Sc. in mechanical engineering September 2009 - December 2014

Department of Mechanical Engineering, Assiut University, Egypt
Thesis title: "Optimization of thermal storage system integrated in a solar driven adsorption cooling system."

B.Sc. in mechanical engineering September 2003 – August 2008

Department of Mechanical Engineering, Assiut University, Egypt
Cumulative score: (90.35%)
Graduation project title: "Study on the performance of radiation panels for air-conditioning applications."

Research interests

1. Microfluidics for biomedical applications,
2. Biotechnology,
3. Micro-engineering applications,
4. Dynamic simulations of electrokinetic and transport phenomena,
5. Renewable energy systems and environment,
6. Energy and food storage.

Work Experience

1. **Program-Specific Researcher** July 2024 – Present

Nano Bioengineering lab., Institute for Life and Medical Science, Kyoto University

- Studying micro-mechanical confinement of dormant cancer cells and micro/nano electro-kinetics involved in biophysical processes such as RNA extraction from living cells.

2. **Assistant Professor** November 2020 – Present

Mechanical Engineering Department, Assiut University

- Taught undergraduate and postgraduate courses on Fluid Mechanics and Energy Systems
- Appointed the academic advisor of the microfluidics laboratory and clean room at the faculty of engineering of Assiut University.
- Conducted research on nanoparticles synthesis with microfluidics, viral detection with isotachophoresis, solar heating and cooling systems.

3. **Postdoc Researcher** December 2019 – October 2020

Microfluidics RIKEN Hakubi Research Team

- Developed microfluidics technology for spatial, temporal, and hierarchical analysis of biological samples at single-cell level.

4. **Technical and Research Assistant** April 2019 – December 2019

Microfluidics RIKEN Hakubi Research Team

- Developed microfluidics system for parallel analysis of multiple single cells by electrophoresis.

5. **Student Trainee** April 2018 – April 2019

Microfluidics RIKEN Hakubi Research Team

- Studied RNA extraction dynamics under focused electric field.
- Developed microfluidic devices for subcellular components analysis.

6. **Research Student** September 2015-March 2016

Micro-Engineering Department, Kyoto University

- Optimized the design of a microfluidic structure to capture and lyse single cells using FEM.
- Studied theoretically, nucleic acid adsorption on microchannels surfaces.

7. **Research Assistant** April 2015-September 2015

Assiut Microfluidics Lab (AML)

- Built an experimental setup to visualize fluid flow inside micro droplets.

8. **Assistant Lecturer** January 2015-September 2015

Mechanical Engineering Department, Faculty of Engineering, Assiut University

- Assisted in teaching some courses in the Mechanical Engineering Department (fluid mechanics, Thermodynamics, Energy systems, Air conditioning and refrigeration).
- Assisted teaching the performance evaluation of solar collectors (Flat Plate and Evacuated tube collectors).

9. **Demonstrator** January 2009 – January 2015

Mechanical Engineering Department, Faculty of Engineering, Assiut University

- Assisted in teaching some courses in the Mechanical Engineering Department (fluid mechanics, Thermodynamics, Energy systems, Air conditioning and refrigeration, Renewable energy)

Research Funds

1. LiMe Office of Directors' Research Grants Program 2025 to develop a high precision machine for heat-accelerated time-resolved cryo electron microscopy for analysis of viral protein dynamics. Funding amount: 800,000 JPY. (**Principal Investigator**)
2. Joint Research Center for Virus and Stem Cell Systems in Medical and Biological Sciences (2024) for the analysis of cancer cells under mechanical confinement. Fiscal year: 2024-2025. Funding amount: 600,000 JPY.
3. ITIDA grant for collaborative research between academy and industry to support the design and development of microfluidic viral detection tools. Fiscal year: 2023-2025. Funding amount: 1,375,000 EGP. (**Principal Investigator**)
4. Marubun Research Promotion Foundation, the 22nd financial assistance for young researchers. Fiscal year: 2019-2020. Funding amount: 1,000,000 JPY. (**Principal Investigator**)

5. ITAC grant for funding graduation projects. Project title "design of a small-scale hydroelectric system for purification and detection of charged macromolecules". Fiscal year: 2022-2023. Funding amount: 30,000 EGP. (**Project Supervisor**)
6. ASRT grant for funding graduation projects. Project title "sustainable solar power-driven underground cooling system. Fiscal year: 2022-2023. Funding amount: 69,000 EGP. (**Project Supervisor**)
7. ASRT grant for funding graduation projects. Project title "Cooling of Educational Space by Solar PV driven Underground Water-Cooling System". Fiscal year: 2021-2022. Funding amount: 75,000 EGP. (**Project Supervisor**)
8. ASRT grant for funding graduation projects. Project title "Evaluating the Performance of a New Design of a Direct Thermosiphon Effect Collector". Fiscal year: 2021-2022. Funding amount: 65,000 EGP. (**Project Supervisor**)

Scholarships and awards

1. Japan Student Service Organization (JASSO), this scholarship supported my research at Kyoto University for the first 90 days. (July 2024 – October 2024)
2. RIKEN Research Incentive Award, this award was given to young researchers for their research activities during the previous year. (March 2019)
3. MEXT scholarship, I got the Japanese government scholarship for foreign students to cover my Ph.D. studies at Kyoto University, Japan. (October 2015 – March 2019)
4. ImPACT Serendipiter Award, 内閣府革新的研究開発推進プログラム「セレンディピティの計画的創出による新価値創造」（代表：合田圭介） (March 2017)

List of publications

A. Journal papers

1. Kotaro Torii, **Mahmoud N. Abdelmoez**, Keiko Watanabe, Alissa Gordon, Masahiro Yo, Asako Sakaue-Sawano, Atsushi Miyawaki, Kaori Nishikawa, Asuka Takeishi, Hirofumi Shintaku. "Live-embryonic transcriptomics dissects organismal fates." *Nat. Commun.* (2025), Manuscript under consideration.
2. Junichi Murai, **Mahmoud N. Abdelmoez**, Keisuke Kondo, Kohei Takamuro, Keiji Nozaki, Tim Schiller, Thomas R. Scheibel, Keiji Numata, Hisano Yajima, Kanako Terakado Kimura, Takao Hashiguchi, Taikopaul Kaneko, Misa Minegishi, and Hirofumi Shintaku. An open source for multiplexed, stable and transient flows to advance life science using microfluidic control automation, *LabChip* 25, no. 20 (2025). (Bioengineering & Biomedical Engineering, JCR = Q1; IF = 5.6)
3. Marwa Abdelhak, Adel A. Abdellah Mohamed M Abd El-Wahab, Sayed Mostafa, El-Sayed Abdel-Rahman, and **Mahmoud N. Abdelmoez**. " Optimization of Beet Thick Juice Storage: The Impact of Storage Conditions on the Rheological Behavior as an Indicator of Sugar Crystallization Efficiency." *Sugar Tech* (2025): 1-17. (Agronomy and Crop Science, JCR = Q1, IF = 2.7)
4. Marwa Abdelhak, Osama A. H. M. Al-Bedak, **Mahmoud N. Abdelmoez**, Adel Abdellah, Elsayed Abdel-Rahman & Mohamed Abd El-Wahab. Bacterial biodiversity and optimization of pilot plant-based storage parameters of beet thick juice under Egyptian environmental conditions. *Scientific Reports* 15.1 (2025): 1-14. (Multidisciplinary Sciences, JCR = Q1, IF = 3.8)
5. **Mahmoud N. Abdelmoez**, K. Ibrahim, Ahmed S. Ali, and M. Heshmat. "A Standalone Sensing and Actuation IoT Solution for Water Management, Leakage Detection, and Localization

Problems." *Water Conservation Science and Engineering* 9.1 (2024): 1-13. (Environmental Engineering, JCR = Q3, IF = 2.0)

6. Hamdy Hassan, Osman Omran Osman, **Mahmoud N. Abdelmoez**, and Saleh Abo-Elfadl. "Experimental assessment of novel designed solar hot water storage collector incorporating an array of partitioned ducts absorber." *Solar Energy* 262 (2023): 111838. (Energy & Fuels, 37/119, JCR = Q1, IF = 7.128)
7. Hamdy Hassan, Osman Omran Osman, **Mahmoud N. Abdelmoez**, and Saleh Abo-Elfadl. "Energy and exergy evaluation of new design nabla shaped tubular solar air heater (∇ TSAH): Experimental investigation." *Energy* 276 (2023): 127451. (Energy & Fuels, 23/119, JCR = Q1; Thermodynamics, 3/63, JCR = Q1; IF = 8.857)

   In the previous two papers, I contributed significantly to the design, implementation, and experimentation of the solar air heater in addition to contributing to the analysis of the results and writing the manuscript.
8. Hamdy Hassan, **Mahmoud N. Abdelmoez**, Osman Omran Osman, and Saleh Abo-Elfadl. "Experimental evaluation of the performance of newly designed tubular SAH with infinity (∞) shaped inner tubes." *Solar Energy* 256 (2023): 202-214. (Energy & Fuels, 37/119, JCR = Q1, IF = 7.128)
9. Ahmed S. Ali, **Mahmoud N. Abdelmoez**, M. Heshmat, and Khalil Ibrahim. "A solution for water management and leakage detection problems using IoTs based approach." *Internet of Things* 18, (2022): 100504. (Engineering, Electrical & Electronic, 53/275, JCR = Q1; IF = 5.9)
10. Yusuke Oguchi, Yuka Ozaki, **Mahmoud N. Abdelmoez**, and Hirofumi Shintaku. "NanoSINC-seq dissects the isoform diversity in subcellular compartments of single cells." *Science Advances* 7, no. 15 (2021): eabe0317. (Multidisciplinary Sciences, 7/73, JCR = Q1, IF = 13.6)

    In this paper, I contributed to the experimental part by preparing the high-quality samples of cytoplasmic and nuclear RNA by microfluidics, in addition to the contribution through revising the manuscript.
11. Sangamithirai S. Parimalam, **Mahmoud N. Abdelmoez**, Arata Tsuchida, Naoyuki Sotta, Mayuki Tanaka, Takashi Kuromori, Toru Fujiwara et al. "Targeted permeabilization of the cell wall and extraction of charged molecules from single cells in intact plant clusters using a focused electric field." *Analyst* 146, no. 5 (2021): 1604-1611. (Chemistry, Analytical, 23/86, JCR = Q1, IF = 4.2)
12. **Mahmoud N. Abdelmoez**, Yusuke Oguchi, Yuka Ozaki, Ryuji Yokokawa, Hidetoshi Kotera and Hirofumi Shintaku, " Distinct kinetics in electrophoretic extraction of cytoplasmic RNA from single cells." *Analytical Chemistry* 92, no. 1 (2019):1485-1492. (Chemistry, Analytical, 7/86, JCR = Q1, IF = 7.4)
13. Sangamithirai S. Parimalam, Yusuke Oguchi, **Mahmoud N. Abdelmoez**, Arata Tsuchida, Yuka Ozaki, Ryuji Yokokawa, Hidetoshi Kotera, and Hirofumi Shintaku. "Electrical lysis and RNA extraction from single cells fixed by dithio-bis (succinimidyl propionate)." *Analytical Chemistry* 90, no. 21 (2018): 12512-12518. (Chemistry, Analytical, 7/86, JCR = Q1, IF = 7.4)

    In this paper, I contributed to the experimental part of microfluidic extraction of RNA from fixed cells by electrical lysis.
14. **Mahmoud N. Abdelmoez**, Kei Iida, Yusuke Oguchi, Hidekazu Nishikii, Ryuji Yokokawa, Hidetoshi Kotera, Sotaro Uemura, Juan G. Santiago, and Hirofumi Shintaku. "SINC-seq: correlation of transient gene expressions between nucleus and cytoplasm reflects single-cell physiology." *Genome Biology* 19, no. 1 (2018): 66. (Biotechnology & Applied Microbiology, 9/158, JCR = Q1; Genetics & Heredity, 5/171, JCR = Q1; IF = 12.3)

B. Book Chapters

1. **Mahmoud N. Abdelmoez** and Hirofumi Shintaku. "A SINC-Seq Protocol for the Analysis of Subcellular Gene Expression in Single Cells." Single-Cell Assays: Microfluidics, Genomics, and Drug Discovery. New York, NY: Springer US, 2023. 179-189.

C. Conference presentations and posters

1- Jin Kitamura, Junichi Murai, Akifumi Shiomi, Misa Minegishi, Mahmoud N. Abdelmoez, Taikopaul Kaneko, and Hirofumi Shintaku, Identification of the mechanical causality of extruding directionality of loser cells under cell competition by mechanical inference integrated with cell surface tension, GloBIAS Bioimage Analysis Conference, Kobe, Japan, 26th-31st October (2025).

2- Mahmoud N. Abdelmoez, Junichi Murai, Keisuke Knondo, Kouhei Takamuro, Keiji Nozaki, Hisano Yajima, Kanako Terakado Kimura, Takao Hashiguchi, Taikopaul Kaneko, Misa Minegishi, and Hirofumi Shintaku, A Study on Dynamics of Protein Complex through Heat-operated Time-resolved Cryo Electron Microscopy, 11P4-PN-7, 16th Micro and Nano Engineering Symposium, Tochigi, Japan, 10th – 12th November (2025).

3- Mahmoud N. Abdelmoez, Hisano Yajima, Kanako Terakado Kimura, Takao Hashiguchi, Hirofumi Shintaku, "A Study on Dynamics of Protein Complex through Heat-accelerated Time-resolved Cryo Electron Microscopy," 5th Research Networking Salon, Kyoto University, Japan, 3rd – 4th September (2025).

4- Junichi Murai, Mahmoud N. Abdelmoez, Akifumi Shiomi, Misa Minegishi, Taikopaul Kaneko, Hirofumi Shintaku, Development of Microfluidic Sequence Automation for Spatio-tensional Transcriptomics, Physics and Chemistry of Microfluidics Gordon Research Seminar, Italy, 31st May -1st June (2025).

5- Keiji Nozaki, Misa Minegishi, Keisuke Kondo, Mahmoud N. Abdelmoez, Kaori Nishikawa, Hirofumi Shintaku, Dissecting molecular mechanisms behind cancer cell dormancy induced by mechanical confinement using MECH-seq, Physics and Chemistry of Microfluidics Gordon Research Seminar, Italy, 31st May -1st June (2025).

6- Junichi Murai, Mahmoud N. Abdelmoez, Akifumi Shiomi, Misa Minegishi, Taikopaul Kaneko, Hirofumi Shintaku, Spatio-tensional transcriptomics to dissect mechanical cell-cell interaction, Physics and Chemistry of Microfluidics Gordon Research Conference, Italy, 1st-6th June (2025).

7- Misa Minegishi, Keiji Nozaki, Keisuke Kondo, Mahmoud N. Abdelmoez, Kaori Nishikawa, Hirofumi Shintaku, Molecular mechanisms behind the induction to dormant state of cancer cells under mechanical microenvironment, Physics and Chemistry of Microfluidics Gordon Research Conference, Italy, 1st-6th June (2025).

8- Junichi Murai, Mahmoud N. Abdelmoez, Keisuke Kondo, Kohei Takamuro, Keiji Nozaki, Tim Schiller, Thomas R. Scheibel, Keiji Numata, Hisano Yajima, Kanako Terakado Kimura, Takao Hashiguchi, Taikopaul Kaneko, Misa Minegishi, Hirofumi Shintaku, " MiSA: Microfluidic Sequence Automation for In-Situ Sequencing, Protein Dynamics, and Spinning of Spider Silk," Data-creation and Application-oriented Materials Research and Development Project Meeting, Tokyo, Japan, 17th March (2025).

9- Keiji Nozaki, Misa Minegishi, Mahmoud N. Abdelmoez, Kaori Nishikawa, and Hirofumi Shintaku, Molecular mechanisms behind the dormant state of cancer cells in a mechanical microenvironment, Global Young Scientist Summit 2025, Singapore, 6th-10th January (2025).

10- Mahmoud N. Abdelmoez, Keiji Nozaki, Misa Minegishi, Hirofumi Shintaku, "Profiling Dormant Cancer Cells through Mechanical and Transcriptomic Analysis," 4th Research Networking Salon, Kyoto University, Japan, 25th – 27th September (2024).

11- Misa Minegishi, Keiji Nozaki, Mahmoud N. Abdelmoez, Kaori Nishikawa, Takahiro Kuchimaru, and Hirofumi Shintaku, Tools for dissecting interactions between cancer cells and their surrounding microenvironment, 4th Research Networking Salon, Kyoto University, Japan, 25th – 27th September (2024).

9- Arata Tsuchida, Mahmoud N. Abdelmoez, Taikopaul Kaneko, Ryuji Yokokawa, Hirofumi Shintaku, "Multimodal profiling of single cells via on-chip electrophoresis and RNA sequencing," The 2021 International Chemical Congress of Pacific Basin Societies, Virtual, 20th December (2021), 3607657.

10- Mahmoud N. Abdelmoez, Hirofumi Shintaku and Yusuke Oguchi, "Electrophoretic fractionation of subcellular components of single cells for multi-omics analyses," EMBL Conference: Microfluidics, Virtual Conference, Heidelberg, Germany, 13th – 15th July (2020).

11- Mahmoud N. Abdelmoez, Yusuke Oguchi, Yuka Ozaki, Ryuji Yokokawa, Hidetoshi Kotera and Hirofumi Shintaku, "Length bias-free extraction of cytoplasmic RNA from single cells by electrical lysis and electrophoresis," 30th 2019 International Symposium on Micro-NanoMechatronics and Human Science, Nagoya, Japan, 1st – 4th December (2019).

12- Mahmoud N. Abdelmoez, Yusuke Oguchi, Yuka Ozaki, Ryuji Yokokawa, Hidetoshi Kotera and Hirofumi Shintaku, "Dynamics of RNA in single cells under focused electric field," the JSME annual meeting 2019, Akita, Japan, 8th – 11th September (2019), J22109.

13- Mahmoud N. Abdelmoez, Yusuke Oguchi, Yuka Ozaki, Ryuji Yokokawa, Hidetoshi Kotera and Hirofumi Shintaku, "Dynamics of RNA extraction from single cells under focused electric field," The EMBO Workshop on Single Cell Biology, Tokyo, Japan, 20th – 22nd May (2019).

14- Mahmoud N. Abdelmoez, Yusuke Oguchi, Ryuji Yokokawa, Hidetoshi Kotera and Hirofumi Shintaku, "RNA extraction from single cells via focused electric field at a hydrodynamic trap in a microfluidic channel," the EMBS Micro and Nanotechnology in Medicine Conference, Koloa, HI, USA, 10th – 11th December (2018).

15- Mahmoud N. Abdelmoez, Ryuji Yokokawa, Hidetoshi Kotera and Hirofumi Shintaku, "Numerical analysis on single-cell electroporation and RNA extraction under focused electric field," the JSME annual meeting 2018, Suita, Osaka, Japan, 10th September (2018), J0530202.

16- Mahmoud N. Abdelmoez, Kei Iida, Yusuke Oguchi, Sotaro Uemura, Juan G. Santiago, and Hirofumi Shintaku, "On-chip Electric Fractionation of Cellular Components for Sequencing at Subcellular Resolution," 2017 Microfluidics, Physics and Chemistry of GRC, Barga, Italy, 4th – 9th June (2017).

17- Hirofumi Shintaku, Mahmoud N. Abdelmoez, Kei Iida, Yusuke Oguchi, Sotaro Uemura, "Integrated nuclear and cytoplasmic RNA sequencing of single cells," the AGBT 2017, Orland, USA, 13th – 16th February (2017).

18- Shota Hata, Mahmoud N. Abdelmoez, Ryuji Yokokawa, Hidetoshi Kotera, Hirofumi Shintaku, "Extraction efficiency of RNA at single cell level via microfluidic isotachophoresis," the Mechanical Engineering Congress, Kyushu, Fukuoka, Japan, 11th – 14th September (2016), J0540301.

19- Hassan A. Ali, Waleed M. Salman, Mahmoud. N. Abdelmoez, Mohamed E. Heragy, Mohamed S. Abdelsalam, Mohamed F. F. Eldosoky, and Mohammed Abdelgawad, "Effect of interfacial electrical shear stresses on hydrodynamic flows inside droplets actuated by electrowetting on dielectric," the 10th International Meeting on Electrowetting, Taipei, Taiwan, 19th – 22nd June (2016).

20- Mahmoud N. Abdelmoez, Ahmed H. H. Ali, Ibrahim. M. Ismail, Ali K. Abdel-Rahman, Ahmed M. Reda and Peter Schwerdt. "Effect of hot and cold buffers on the performance of a residential scale solar driven adsorption cooling system." the 7th Annual Conf. on Future of new and renewable energy in the Arab world, Assiut, Egypt, 12th – 13th February (2013).

21- Ahmed M. Reda, Ahmed H. H. Ali, Ibrahim S. Taha, Mahmoud N. Abdelmoez, Mahmoud G. Morsy and Peter Schwerdt. "Performance Assessment of a Solar Powered Residential Scale Adsorption Cooling System at Assiut, Egypt." the 7th Annual Conf. on Future of new and renewable energy in the Arab world, Assiut, Egypt, 12th – 13th February (2013).

List of courses that I have taught

A- Undergraduate courses

1. Machine Drawing and Construction (1st year students)
2. Engineering Mechanics (Statics, 1st year students)
3. Engineering Mechanics (Dynamics, 1st year students)
4. Engineering Mathematics (2nd year students)
5. Engineering Analyses (2nd year students)
6. Fluid Mechanics I (2nd year students)
7. Thermodynamics (2nd year students)
8. Fluid Mechanics II (3rd year students)
9. Renewable Energy (4th year students)
10. Energy Systems (4th year students)
11. Solar Energy Laboratory (4th year students)
12. Mechanical Engineering System Seminar (2024 年度後期　機械工学システムセミナー, 京都大学工学部物理工学科機械システム学コース科目)

B- Postgraduate courses

1. Advanced Fluid Mechanics (Common course for master's and doctoral students)
2. Advanced Topics in Hydraulic and Pneumatic Systems (Special course for master's and doctoral students)

C- Special training courses for 3rd – 4th years students and engineers

1. Design of large-scale solar thermal systems (in collaboration with RENAC (Germany) – OASIS (Egypt) Solar Academy)
2. Design and optimization of solar photovoltaic and energy storage systems (in collaboration with MAIA TAQA)