Raphael Kay; LinkedIn

## Highlights

Building an **ecosystem of nature-inspired climate technologies**, based on:
**20+ granted/filed patents** as lead/co-lead inventor
**40+ personnel led** (scaled teams from 0 to 10+)
**45+ awards** in energy/sustainability (Forbes 30 under 30 in Science)
**20+ keynotes/invited talks** (NASA, World Governments Summit, Forbes Summit)
**10+ publications** (9 as first-author)
**150+ interviews**/research highlights (Nature, Bloomberg, Fast Company, CBC)
**$1M+** raised/offered in grants/fellowships
Invited to present to **5+ Presidents/PMs/Sheikhs**

## Education

2023/27 **Ph.D.,** Materials Science & Mechanical Engineering, Harvard University, Mentored 25+, 4.0/4.0, ~10 Awards.
2020/22 **M.A.Sc.**, Mechanical Engineering, U. of Toronto, Mentored 10+, 4.0/4.0, 10+ Awards, *Top Thesis*, Rank: ***1/89***
2016/20 **B.A.**, Architectural Technology**,** U. of Toronto**,** 3.95/4.0; 15+ Awards, *Top Graduate*, Rank: ***1/230***

## Selected Awards & Honors (***45+ total, >$1M USD total***)

2026 Forbes 30 Under 30, Science (***top ~5%*** of individuals nominated, ***top <0.01%*** of eligible individuals)
2024 Department of Defense Graduate Fellowship (~$300k, ***top ~4%*** of applicants)
2024 Link Energy Fellowship (~$70k, ***top ~4%*** of applicants)
2024 Canada Graduate Scholarship, Doctoral (~$140k, top national STEM doctoral fellowship, declined)
2024 Trudeau Scholarship (~$200k, top national humanities doctoral fellowship, ***top ~3%*** of applicants, declined)
2024 Chen Harvard Graduate Fellowship (***top ~0.5%*** of faculty)
2024 NSERC Postgraduate Scholarship (~$120k)
2023 Stanford Graduate Fellowship ($300k, ***top ~0.8%*** of applicants, declined)
2022 Berkeley Fellowship ($70k, ***top ~1%*** of applicants, *singular recipient*, declined)
2022 Top graduate thesis in department (***top ~1%*** of class, *singular recipient*)
2022 Hatch Sustainability Scholarship, Institute for Sustainable Energy ($10k)
2022 MITACS Research Award ($6k, declined)
2022 Hogg Energy Fellowship ($30k, declined)
2021 Canada Graduate Scholarship ($17k, ***top ~0.4%*** of national graduate student body)
2021 Ontario Graduate Scholarship ($15k, ***top ~1%*** of provincial graduate student body, declined)
2021 Bowman Energy/Environment Scholarship, Centre for Global Engineering ($5k)
2021 Wasmund Sustainable Energy Fellowship (~$1k)
2020 Top Faculty Prize (***top ~0.4%*** of class, ranked first in graduating faculty)
2019 Leaders of Tomorrow Award ($2.5k, ***top ~0.4%*** of class, *singular recipient*)
2019 U of Toronto Scholar ($1.5k, ***top ~4%*** of undergraduate class)

## Selected Invited Talks/Keynotes (***20+ total***)

2026 Invited presenter, *Prototypes for Humanity,* Dubai, UAE.
2026 Invited speaker. *Biomimetics International Symposium.* Minneapolis, MN.
2026 Invited panelist. *Harvard Institute of Politics,* Cambridge, MA.
2026 Invited panelist. *Forbes 30 Under 30 Summit,* Pheonix, AZ.
2026 Invited speaker. *Harvard Urban AI Conference,* Cambridge, MA.
2026 Invited speaker. *Harvard Salata Institute/Kennedy School of Government,* Cambridge, MA.
2026 Invited speaker. *Navajo Technical University,* Crownpoint, NM.
2026 Invited speaker. *Harvard Graduate School of Design, Professional Pathways,* Cambridge, MA.
2026 Invited speaker. *AI+X Conference,* Cambridge, MA.
2025 Invited speaker. *University of Michigan* (remote).
2025 Invited speaker. *Urban Technology Summit,* New York City, NY.
2025 Invited speaker. *Etihad Global Rail Summit,* Abu Dhabi, UAE.
2025 Invited speaker, *Science in the News,* Boston, MA.
2025 Invited keynote speaker, *New England Junior Science Symposium,* Bristol, RI.
2025 Invited speaker, *Roger Williams University,* Bristol, RI.
2024 Invited speaker, *Yonsei University,* Seoul, Korea.
2024 Invited speaker, *City College New York,* New York City, NY.
2024 Invited speaker, *Bioinspired Materials and Design Conference,* Toronto, Canada.
2024 Invited presenter, *World Governments Summit,* Dubai, UAE.
2022 Invited speaker, *Yale University* (remote).
2022 Invited speaker, *NASA Lunar Habitat Design Team* (remote).

Selected Interviews, Radio Show, & Podcast Appearances *(**50+**, more here)*

2026 A window into heating and cooling. *Harvard. Article. YouTube.*
2025 Slime mold urbanism. *Who Killed the Starter Home Podcast*. *Apple*.
2024 Slime subway intelligence. *MBR Center for Government Innovation, UAE*. *YouTube*.
2023 Could seafood-inspired skins slash emissions from buildings? Interviewed for: *CBC What On Earth.*
2023 How Does Nature Modify Light and Color? *Learning from Nature: The Biomimicry Podcast*. *Apple*. *Spotify.*

Selected Features in Academia/Popular Media *(**75+**, more here)*

2026 Harvesting heat and electricity from the sun, when you need it. *Harvard.*
2023 Squid-inspired smart windows could slash building energy use. *Anthropocene.*
2022 Sea creatures' sunshades inspire low-cost 'smart' windows. Research Highlight, *Nature*.
2023 'Liquid windows' could be the answer to more sustainable buildings. *Fast Company.*
2023 Chameleon Skins Slash Building Energy Use. *IEEE Spectrum.*
2022 The Krill Building. *Bloomberg Navigator*.

Selected Intellectual Property Filed/Granted *(**~20** patents filed/granted as lead/co-lead inventor)*

2026 **Kay, R**; Aizenberg, J; Konings, M; Omair, R. *Multi-mode Self-regulated Energy Harvesting,* PCT/US26/52400.
2026 **Kay, R**; Stricker, F; Aizenberg, J. *Fluidic Systems,* PCT/US2026/039400.
2026 **Kay, R**; Zhang, S; Aizenberg, J. *Convertible Materials,* US 19/763,103.
2026 **Kay, R**; Aizenberg, J. *Stimuli-Responsive Fluidic Windows,* US 64/126,378.
2026 **Kay, R**; Aizenberg, J; Konings, M. *Temperature-Responsive Solar Harvesting,* US 64/126,299.
2026 **Kay, R**; Hou, E.K; Aizenberg, J. *Flowable Luminescent Solar Concentrating Windows,* US 64/123,701.
2026 **Kay, R**; Panicker, A; Aizenberg, J. *Universally-adaptive visibility materials,* US 64/054,594.
2026 **Kay, R**; Aizenberg, J. *Modular design of energy regulation technologies based on liquid flow cells*, US 64/006,905.
2026 **Kay, R**; Omair, R; Aizenberg, J. *Dual-mode self-regulated energy harvesting*, US 63/988,689
2025 **Kay, R**; Aizenberg, J. *Dual-mode self-regulated energy harvesting*, US 63/905,013.
2025 **Kay, R**; Aizenberg, J. *Dynamic insulation and passive coatings for low-energy building design*, US 63/855,890.
2025 **Kay, R**; Zhang, S; Aizenberg, J. *Method for growing and disassembling materials across states of matter, compositions, and geometries for generalized light and heat regulation*, US 63/855,868.
2025 **Kay, R**; Lucini, D; Stricker, F; Aizenberg, J. *Actively-tunable photoswitch equilibrium…memory…*, US 63/855,981.
2025 **Kay, R**; Schroeder, T; Aizenberg, J. *A fluidic system for climate control*, US 19/483,022. PCT/US24/28944.
2023 **Kay, R**; Aizenberg, J. *Liquid Windows for Universal Indoor Climate Management*, US 63/501,657.
2022 **Kay, R**; Jakubiec, JA; Hatton, B. *System for control of optical properties of light,* US 18/071,496.
2022 **Kay, R**; Katrycz, C, Nitièma, K; Hatton, B. *Fluidic device for regulating light transmission through the device,* PCT/CA2022/051747.

Selected Publications *(**9** first/lead author, **10** total, *equal contribution)*

2026 **Kay, R**; Omair, R; Aizenberg, J. Self-regulated dual-mode solar energy harvesting. *PNAS*.
2026 **Kay, R***; Cocks, RJ*, Katrycz, C; Jakubiec, JA; Wilborn, AM; Omair, R; Aizenberg, J; Hatton, B. Indoor thermoregulatory homeostasis using hydrodynamic instability. *PNAS*.
2023 **Kay, R**; Jakubiec, JA; Katrycz, C; Hatton, B. Multilayered optofluidics for sustainable buildings. *PNAS*.
2022 **Kay, R**; Katrycz, C; Nitièma, K; Jakubiec, JA; Hatton, B. Decapod-inspired pigment modulation for active building facades. *Nature Communications.*
2023 **Kay, R**. What crustaceans can teach us about designing efficient buildings. Commissioned article. *Ar. Aktl.*
2022 **Kay, R**; Mattacchione, A; Katrycz, C; Hatton, B. Stepwise slime mould growth as a template for urban design. *Scientific Reports*.
2022 **Kay, R**; Katrycz, C; Heimlich, EJ; Hatton, B. Programmable droplets: Leveraging digitally-responsive flow fields to actively tune liquid morphologies. *PLOS One*.
2022 **Kay, R**; Nitièma, K; Katrycz, C; Jakubiec, JA; Hoban, N; Hatton, B. Shape-programmable fluid bubbles for responsive building skins. *Journal of Building Engineering*.
2020 **Kay, R**; Nitièma, K; Correa, D. The bio-inspired design of a self-propelling robot driven by changes in humidity. *Proceedings of the 38th eCAADe Conference*.
2025 Wilborn, AM; Almohammadi, H; Qu, P; Wang, Y; Yang, Y; **Kay, R**; Kim, D; Bertoldi, K; Weitz, D; Aizenberg, J. Towards Differentiation in Untethered Microactuators: A Soft Fabrication Strategy. *Advanced Materials*.

Commercial Positions

2026- Advisory Board Member, *Water Filled Glass Ltd*.

Selected Ventures I'm Building w/ Accolades

2025- Mireta (urban resiliency tools inspired by 500-million-year-old single-celled organisms):
- Original publication (Nature family) w/ **>30k** accesses.
- Selected as **1 of 7 top global innovations** to impact government, 2024 World Governments Summit.
- Showcased to **5+ Presidents/Prime Ministers**, Crown Prince of Dubai.
- Signed **partnerships with organizations worth $20+B**, e.g., McKinsey, SJ, for which we've **delivered 5 pilots**, and signed **4 LOI**.
- **60+ features, 40+ interviews, ~5 awards**.

2025- Liquafilm (liquid-based window add-ons inspired by mammalian vasculature):
- Original publications in PNAS, Nature family, w/ **>50k** accesses, **>10 filed/granted patents**.
- Received letters of support from **3 of 5 largest global glass manufacturers**.
- Completed **commercial-scale pilot** in occupied building.
- Received offers from manufacturers to contribute > 220 hours of in-kind manufacturing, systems design, and simulation advisory support, **worth ~$50k USD**.
- **100+ features, 50+ interviews, ~15 awards**.
- Commercial plan, founding team, being developed by MIT Climate and Energy Ventures team.

2026- Solar Skin (solar panels that harvest heat when cold, electricity when hot, inspired by dessert beetle skins):
- Original publication in PNAS, **4 filed patents**.
- Selected as 1 of 100 global **Prototypes for Humanity**, Future Foundation.
- Commercial plan, founding team, being developed by MIT Climate and Energy Ventures team.

Selected Fundraising

2026 Pollinator Award, Harvard Wyss Institute. *Solar Skin: Solar panels that autonomously harvest electricity when hot, and heat when cold.* ($25k, *lead contact/contributor*)

2025 Director's Fund, Harvard Wyss Institute. *Dissolvable and re-growable energy metamaterials*. ($50k, *lead contact/contributor*)

2024 Director's Fund, Harvard Wyss Institute. *Liquafilm: Liquid-infused window films for sustainable universal climate control.* ($50k, *lead contact/contributor*)

2023 Salata Seed Grant, Harvard Salata Institute. *Liquid-infused windows for universal indoor climate control*. (~$25k, *lead contact/contributor*)

Selected Students I've Mentored/Managed *(**50+** students)*

2022- Maxine Park, Dawn San-Luis, Madison Valley, Aeden Marcus, Natalie Wong, Hannah Nguyen, Jack Emiliano Hansen, Berk Kasimcan, Jonah Gezelter, Megan Santamore, Alden Panicker, Kimberly Thompson, Bryce Austin, Alain Molleyres, Sofia Zhang, Eric Garza, Joel Yazzie, Daniele Lucini, Rafiq Omair, Patrick Smyth, Alyssa Kang, Manon Konings, Evan Hou, Richard Ding, Alina Miranda, Gaile Martin, Aaron Bordeaux, Paulina Lopez, Ibrahim Piri, Kirby Chapo, Harry Huang, Cynthia Tian