Yizhaq Engelberg, Ph.D.

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EDUCATION

Ph.D. in Biochemistry and Biophysics, 2016 – 2022
The Technion – Israel Institute of Technology, Haifa, Israel
Dissertation: "Functional Supramolecular Structures of Self Assembled Proteins" Advisor: Prof. Meytal Landau

B.Sc. in Biology, 2008 – 2012
The Technion – Israel Institute of Technology, Haifa, Israel

ACADEMIC APPOINTMENTS

Assistant Proffesor (Senior Lecturer), 2026 - present
Tel-Hai University of Kiryat Shmona in the Galilee, North district, Israel
Department of Biotechnology

Postdoctoral Research Associate, 2022 – 2025
Massachusetts Institute of Technology (MIT), Cambridge, MA
Department of Biological Engineering
Advisor: Prof. Christopher Voigt

RESEARCH EXPERIENCE

Assistant Proffesor (Senior Lecturer) – Biological Engineering
Tel-Hai University of Kiryat Shmona in the Galilee, North district, Israel, 2026- present

- Establishing an interdisciplinary research program in synthetic biology, living materials, and biosensing.
- Engineering bacterial sensing platforms with measurable biological outputs.
- Developing hybrid bacteria–material systems for robust field use.
- Advancing hyperspectral and laser-speckle imaging for biological monitoring.
- Studying microbe–material interactions to define predictive design rules.
- Developing applications in environmental monitoring, agriculture, biosecurity, and defense.
- Building on expertise in protein self-assembly, antimicrobial peptides, genetic circuits, and microbial motility.

Postdoctoral Research – Synthetic Biology and Biological Engineering
Massachusetts Institute of Technology, 2022 – 2025

- Directed a five organization, multi-agency research consortium (DARPA ×2, U.S. Army, MAFAT) to architect engineered biological devices; translated high level program goals into technical milestones and sponsor ready deliverables.

- Spearheaded multidisciplinary collaborations between academic labs and high-throughput automation CROs, aligning data sharing protocols and technical handoffs for computational biology teams.
- Established standardized scientific infrastructure and quality control gates across the consortium, ensuring reproducible research outputs for five collaborating teams.
- Engineered a standardized library of 500+ genetic parts adopted as the primary resource for 4 collaborating laboratories, optimizing design cycles and reducing redundant troubleshooting.
- Validated 17 functional biological sensors and established 3 reproducible, field relevant protocols to enhance signal consistency and technical scalability.
- Mentored and managed 2 postdoctoral associates while serving as the primary scientific liaison for federal stakeholders and cross-partner integration.

Doctoral Research – Protein Self-Assembly and Antimicrobial Peptides
The Technion, 2016 – 2022

- Built and ran state of the art crystallization and structure determination workflows for selfassembling peptides, delivering 3 atomic-resolution X-ray structures (<1.5 Å) that enabled mechanistic, publication quality structure–function conclusions. Established design rules linking between atomic structure, supramolecular morphology and antimicrobial activity, pinpointing assembly driven features that modulate efficacy against bacterial pathogens.
- Designed 15+ engineered peptide variants and peptides chemical conjugates with tunable self-assembly to control physicochemical properties (architecture, stability, aggregation behavior) and improve biological performance. Developed a protein-based oral delivery strategy using self-assembled food proteins and lipids for controlled release of poorly soluble lipophilic compounds, translating material design into functional performance readouts.
- Led day to day research execution and mentored 4 students, guiding experimental planning, troubleshooting, reproducible documentation, and data interpretation from hypothesis to deliverable results.

PUBLICATIONS

Peer-Reviewed Publications

1) **Engelberg, Yizhaq***; Refael, G.; Romano, A.; Amiram, G.; Barnea, E.; et al. Digestive fate of milk and egg-derived amyloids: Attenuated digestive proteolysis and impact on the trajectory of the gut microbiota. *Food Hydrocolloids*, 2024. *Equal contribution

2) **Engelberg, Yizhaq***; Romano, A.; Landau, M.; Lesmes, U. Alpha-lactalbumin amyloid-like fibrils for intestinal delivery: Formation, physiochemical characterization, and digestive fate of capsaicin-loaded fibrils. *Food Hydrocolloids*, 2023. *Equal contribution

3) **Engelberg, Yizhaq**; Ragonis-Bachar, P.; Landau, M. Rare by natural selection: Disulfidebonded supramolecular antimicrobial peptides. *Biomacromolecules*, 2022.

4) Romano, A.; **Engelberg, Yizhaq**; Shani-Levi, C.; Lesmes, U. Bovine alpha-lactalbumin particulates for controlled delivery: Impact of dietary fibers on stability, digestibility, and gastrointestinal release of capsaicin. *Food Hydrocolloids*, 2022. Ragonis-Bachar, P.; Rayan, B.; Barnea, E.; Engelberg, Yizhaq; et al. Natural antimicrobial peptides self-assemble as alpha/beta chameleon amyloids.

Biomacromolecules, 2022.

6) Bachar Peleg, Rayan Bader, Eilon Barnea, **Engelberg Yizhaq.**, et al., "Natural antimicrobial peptides self-assemble as α/β chameleon amyloids". Biomacromolecules (2022)

7) Golan, N.; **Engelberg, Yizhaq**; Landau, M. Structural mimicry in microbial and antimicrobial amyloids. *Annual Review of Biochemistry*, 2022.

8) Alon Romano, **Engelberg Yizhaq**, Shani-Levi Carmit and Lesmes Uri. "Bovine alpha-lactalbumin particulates for controlled delivery: Impact of dietary fibers on stability, digestibility, and gastro-intestinal release of capsaicin", Food Hydrocolloids (2022).

9) **Engelberg, Yizhaq**; Landau, M. The Human LL-37 (17-29) antimicrobial peptide reveals a functional supramolecular structure. *Nature Communications*, 2020.

Other Publications

1) **Engelberg, Y.** (2026). "Cue, Not Confirmation: Air Sensing in Irregular Warfare." Small Wars Journal.

2) **Engelberg, Y.** (2025). DARPA BTO contract deliverable, Contract HR001124C0423. Contributions included terrestrial strain engineering, chromoprotein/hyperspectral reporter development, and laser-speckle biological module sections. Restricted distribution.

3) **Engelberg, Y.** (2024). CHARMME contract deliverable, Army Center for Synthetic Biology / MIT. Contributions included P. putida heavy-metals sensor library optimization and B. subtilis biliverdin engineering. Restricted distribution.

4) **Engelberg Yizhaq,** and Meytal Landau. "Novel Fibril Structure of a Human Derived Antimicrobial Peptide". Photon Science and Annual Report, Deutsches Elektronen- Synchrotron DESY, Germany (2021).

5) **Engelberg Yizhaq**, and Meytal Landau. "Gorilla to the rescue – using homologs to determine challenging crystal structure of a human derived antimicrobial peptide showing a novel fibril structure". The European Synchrotron ESRF Highlights (2021).

TEACHING EXPERIENCE

Co-Facilitator, LEAPS Leadership Program, 2024 – 2025
Massachusetts Institute of Technology

- Curriculum Design: Co-designed and delivered interactive workshops for scientists on leadership, stakeholder communication, and professional development.
- Coaching: Mentored participants through iterative practice, providing structured feedback on technical presentations and written narratives to enhance messaging clarity.
- Program Optimization: Collaborated with faculty to refine materials and support strategies based on participant learning outcomes.

Teaching Assistant and Lecturer, 2017 – 2022
The Technion – Israel Institute of Technology

- Teaching and instruction: Led undergraduate and graduate biochemistry lectures and laboratories, implementing active learning strategies to reinforce core concepts. Course Management: Developed lesson materials, lab protocols, and assessments; managed grading and office hours to support student mastery.
- Research Mentorship: Supervised six years of student projects, coaching experimental design, data

interpretation, and scientific writing for publication.

AWARDS AND HONORS

1) Millipore Sigma Award for Public Interest, Nucleate Program, 2025
2) 13th HOPE meeting, Nobel Laureates, Japan Society for the Promotion of Science (JSPS), nationally selected by the Ministry of Science and Technology of Israel, 2022
3) Russell Berrie Nanotechnology Institute (RBNI) award, Excellence in Nanoscience & Nanotechnology, 2021
4) Faculty Award for Excellence, Department of Biology, The Technion, 2020
5) EIT Food Innovation Competition, First Place Award (Team Captain), International Competition, 2020
6) Lev Margulis Memorial Prize, Israel Society for Microscopy, 2020
7) Daniel Turnberg Fellowship, Cambridge University, UK, 2019

CONFERENCES

Conference Presentations (selected):

- Invited chair - The Israeli Association for Aquatic Sciences (IAAS), Israel, 2026
- Invited speaker - Lev Margulis Prize Awardee. Israel Society for Microscopy Meeting, 2021.
- German – Israel Foundation (GIF) - Leibniz Young Scientists meeting, Israel, 2021
- Annual Meeting of Israel Society of Biochemistry and Molecular Biology (ISBMB), The Weizmann Institute, Israel, 2021.
- Material Science & Nanotechnology Conference, Lisbon, Portugal, 2021.
- POLYMERS, PLASTICS AND COMPOSITES Conference, Budapest, Hungary, 2021.

Poster Presentations (selected):

- 13th HOPE Meeting with Nobel Laureates, Japan Society for the Promotion of Science (JSPS), virtual, 2022
- Annual Meeting of Israel Society of Biochemistry and Molecular Biology (ISBMB), The Weizmann Institute, Israel, 2021.
- 4th Ulm Meeting "Biophysics of Amyloid Formation", Ulm, Germany, 2020.
- The Fourth Instruct Biennial Structural Biology Conference, Alcalá de Henares, Spain, 2019.
- Israel Crystallographic Association and Structural Biology Meeting, Israel, 2019.

RESEARCH EXPERTISE AND TECHNICAL CAPABILITIES

Synthetic and Molecular Biology: Microbiology, directed evolution and high-throughput screening, molecular cloning and DNA assembly, microbial systems engineering.

Protein Biochemistry and Structural Biology: Protein expression and purification, multi-modal chromatography (ion exchange, size exclusion, affinity-based), structural characterization, immunoassays.

Biophysical and Analytical Characterization: Spectroscopy (UV-Vis, FTIR, circular dichroism), differential scanning calorimetry, fluorescence-based assays, gel electrophoresis, dynamic light scattering, flow cytometry and FACS, microscale thermophoresis.

Advanced Microscopy: Confocal laser scanning microscopy, transmission electron microscopy, cryo-electron microscopy, hyperspectral imaging.

Computational and Data Analysis: Bioinformatics pipelines, protein structure prediction (AlphaFold), statistical analysis, flow cytometry analysis, Python programming, molecular visualization, image analysis.

OTHER PROFESSIONAL EXPERIENCE

Founder & Scientific Lead | Stealth Biotech Venture | USA **2025 – 2026**

- Developed an enzyme stabilization platform using silk-based formulations, optimizing protein stability and durability for diverse industrial applications.
- Conducted 40+ customer discovery interviews to validate market demand and translate commercial requirements into technical design specifications.
- Advanced technology from initial concept to bench-scale validation, including the establishment of a documented regulatory pathway for commercialization.
- Selected for the Nucleate Activator accelerator program and the NSF-SPARK, demonstrating the technical feasibility and translational potential of the platform within the biotech ecosystem.

Strategy & Scientific Consulting | Ketryx Corporation & TRET tx | USA **2025 – 2026**

- Directed a seven-member cross-functional team to complete a high-stakes FDA submission for medical device software (SaMD), ensuring all deliverables met rigorous audit-ready documentation standards.
- Designed and facilitated operational workshops that streamlined product development lifecycles and established key international partnerships to support market expansion.
- Authored comprehensive investor materials and defined technical preclinical milestones to drive pipeline valuation and align with federal regulatory pathways.

Operations Team Lead & Forensic Investigation, Shabak and Police | Israel **2007– 2016**

- Led field teams (2–4 personnel) and planned and executed 300+ time-critical operations, including real time risk assessment, task delegation, and strict protocol compliance.
- Served as a crime scene investigator and a team lead (1–3 personnel), directing 50+ E2E scene processing with rigorous chain of custody controls, cross agency coordination, and defensible documentation.
- Produced court-ready deliverables: 25 court admissible reports and 7 expert testimonies; additionally authored and defended 10+ forensic reports in court.
- Applied analytical evaluation of chemical/biological/physical evidence and standardized documentation practices to ensure integrity, reproducibility, and audit readiness under high scrutiny.

Full military service, special forces **2004 – 2007**

PROFESSIONAL SERVICE AND OUTREACH

Mentorship and Community Engagement

- Mentored at-risk youth in Israel through educational outreach programs (Follow Me and Youth Seeking Science associations), 2016 – 2018

- Member of COVID-19 emergency response task force providing critical assistance to socially isolated and vulnerable populations, 2020
- Traveling student, hosted at Dr. Tamir Gonen's lab, Dept. of Biochemistry, UCLA, 2018

Media Coverage

- YNET and Jerusalem Post, "Technion students win international competition in Europe", 2020.
- Radio interview, "Three who know", Kan Tarbot, 2020
- Technion magazine, "Researchers at The Technion determined the atomic structure of an important antibiotic fibril in the human immune system", 2020
- YNET and Rotter Health "The atomic structure of important peptide's fibril was determined, 2020
- Big New Network article, "Israeli researchers decipher structure of vital component in immune system", 2020.