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Blockchain: A Revolution in Science and Technology

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In biological science, blockchain is a decentralized, secure digital ledger that records and verifies biological data, experiments, and research outcomes. It ensures transparency, immutability, and traceability of datasets such as genomic sequences, clinical trials, and laboratory records, protecting intellectual property while fostering collaboration and reproducibility across the scientific community.

In the era of digital transformation, blockchain technology has emerged as one of the most innovative achievements of the 21st century and a foundational force driving change across scientific and technological domains. Originally introduced in 1991 for timestamping digital documents, blockchain gained widespread attention with the advent of Bitcoin in 2008. Contrary to the common perception that associates blockchain solely with cryptocurrencies, it is in fact a technological infrastructure that enables the recording, storage, and transfer of data in a secure, transparent, and immutable manner. These features make blockchain a powerful tool in scientific and technological fields, where data integrity, intellectual property, and transparency in research processes are of critical importance. As a result, blockchain has extended its influence beyond digital currencies, playing a transformative role in research, healthcare, education, and the future of cryptography. To visualize blockchain more tangibly, one might compare it to a massive Excel spreadsheet in which each cell contains specific data. Updates do not overwrite previous entries but instead append new information, and all cells are interconnected. Imagining such a structure on a large scale, spanning diverse domains, is both exciting and at times conceptually challenging.

Blockchain can play a meaningful role throughout the scientific research cycle, from hypothesis registration to the publication of results. Key applications include timestamping ideas and datasets, protecting intellectual property, and establishing data lineage. Projects such as ARTiFACTS and the Bloxberg consortium have demonstrated that blockchain can provide a secure platform for storing and sharing scientific data, even when participating institutions have conflicting interests.

During data analysis, integrating blockchain with tools like Jupyter Notebooks or Electronic Lab Notebooks (ELNs) ensures that data entries are immutable and fully auditable.

This is especially crucial in fields such as drug discovery and clinical trials, where data integrity can determine the success or failure of a treatment. In the healthcare and pharmaceutical industries, blockchain enhances data quality, accelerates research processes, and enables transparent audit trails. It also serves as a shared registry for tracking medical equipment and clinical trial results across the supply chain. In higher education, blockchain facilitates the verification of academic credentials, student identity, and the secure storage of educational records. Students can receive tamper-proof versions of their diplomas and share them with others, while universities maintain greater control over data validation and management.

One of blockchain's most profound implications lies in its potential to disrupt traditional scientific publishing. If experimental data, including timestamps, locations, equipment used, and researcher identities, are transparently and immutably recorded on the blockchain, the value of final published articles may diminish. In such a paradigm, raw data and the process of scientific discovery become the primary sources of credibility, rather than the polished article itself. This shift could break the monopoly of academic journals, enable instant dissemination, and elevate scientific transparency to unprecedented levels.

Despite its many advantages, blockchain faces several challenges. The absence of decentralized peer review systems, the need for integration with existing tools, and threats posed by quantum computing are among the most pressing concerns. The emergence of quantum computers could undermine current cryptographic algorithms and jeopardize blockchain security. Nevertheless, initiatives like Quantum Blockchains are working to develop quantum-resistant encryption methods and lay the groundwork for future-proof blockchain systems.

In conclusion, blockchain is shaping a scientific and technological ecosystem that is more transparent, trustworthy, and community-driven than ever before. It is not merely a tool, but a platform for redefining scientific and technological interactions in the new century.

Lawlor, B., Chalk, S., Frey, J., Hayashi, K., Kochalko, D., Shute, R. and Sopek, M., 2025. Blockchain technology: driving change in the scientific research workflow. *Pure and Applied Chemistry*, *97*(4), pp.279-330.

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Featured Article

Scientists at the Institute of Biochemistry and Biophysics, University of Tehran (IBB), succeeded in publishing an innovative article in the journal npj Flexible Electronics, a sub-journal of the Nature Publishing Group with an impact factor of 15.5. This research achievement is titled: "Aesthetic, Wire-free and Bioresorbable Dermal Tattoo TENG System for Self-powered On-the-go Biomedical Applications." The work was conducted in the Biophysics and Bioengineering Laboratory under the supervision of **Dr. Mohammad Ali Khiamian**, a faculty member of the Biophysics research group.

In this study, for the first time, a fully bio-based, wireless, and bioresorbable system has been developed that uses normal human body movements for energy harvesting and therapeutic process stimulation. Thin and conductive electrode patterns were used beneath the outer skin layer so that the skin itself acts as an active electronic substrate. This system requires no external equipment and can operate automatically with simple patient movements (such as walking), aiding wound healing or vital sign monitoring.

One innovative aspect of this work is the use of bioresorbable conductive inks (based on Zinc metal) that gradually absorb into the tissue without medical intervention after fulfilling their role. Furthermore, the ability to design electrodes in artistic shapes paves the way for combining technology and aesthetics for the future of personalized medicine.

The link to the article:
https://www.nature.com/articles/s41528-025-00473-w

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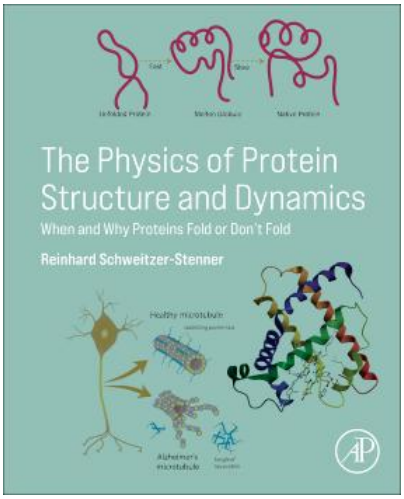
New books

1. The Physics of Protein Structure and Dynamics



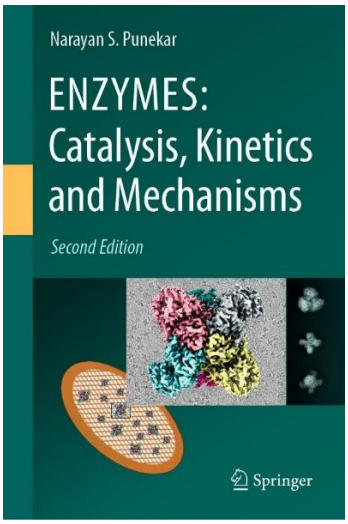
Edition: 1
Published: September 26, 2024
No. of pages (Paperback): 326
Imprint: Academic Press
Language: English
Paperback ISBN: 9780443159640
eBook ISBN: 9780443159657

About this book

The "Physics of Protein Structure and Dynamics" looks at various aspects of protein structure and dynamics from a physico-chemical point of view. It goes into some depth regarding the description of non-covalent forces that determine the relative stability of folded and unfolded proteins. Anharmonic protein dynamics involving motions between different minima of a rugged Gibbs energy landscape is described in great detail. The book combines various aspects of the protein.

folding/unfolding processes with an overview of intrinsically disordered proteins, which have attracted considerable interest of the protein community over the last 25 years but are thus far underrepresented in classroom-oriented textbooks. The book looks at protein folding and intrinsically disordered proteins as heavily interrelated topics that need to be viewed together. Furthermore, it presents some basic physico-chemical aspects of protein/peptide self-assembly into nanoscale fibrils. Intrinsically disordered peptides and proteins play a major role particularly in aggregation and self-assembly processes that lead to various diseases (Alzheimer, Parkinson, Huntington, Mad-Cow). Therefore, the relevance of protein disorder for protein self-assembly deserves a closer look. Protein self-assembly cannot be separated from protein folding since it is frequently the product of misfolding. With regard to modern theories, the folding processes are linked to insights on protein dynamics and the discovered relationship between proteins and spin glasses.

2. Enzymes- Catalysis, Kinetics, and Mechanisms



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About this book

The second edition of the textbook “Enzymes- Catalysis, Kinetics, and Mechanisms” focuses on the two broad mechanistic facets of enzymology namely, the chemical and the kinetic. It endeavors to bring out the synergy between enzyme structures and mechanisms. Written with a self-study approach in mind, the emphasis is on how to begin experiments with an enzyme and subsequently analyze the data. The book is divided into six major sections: 1) Enzyme Catalysis – A Perspective, 2) Enzyme Kinetic Practice and Measurements, 3) Elucidation of Kinetic Mechanisms, 4) Chemical Mechanisms and Catalysis, 5) Exploiting Enzymes, and 6) An end piece on Frontiers in Enzymology. The individual concepts are treated as stand-alone short sections. In case the reader needs to use any one concept, it should be possible with minimal cross-referencing to the rest of the book. Further, the book presents specialized techniques and complex approaches that require involved experimentation in theory with suitable references to guide the reader. The book is proposed as a textbook in a self-learning mode to students of modern biology, particularly those with limited exposure to quantitative aspects and organic chemistry.

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New conferences

50th FEBS Congress
4 - 8 July 2026
Maastricht, The Netherlands
Biochemistry for the next 50 years

https://febscongress.org

BPS2026
FEBRUARY 21–25, 2026
SAN FRANCISCO, CA, USA

https://www.biophysics.org/2026meeting

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Postdoctoral Opportunity

Subject/Field: Postdoctoral Fellowship in Biotechnology (Mammalian Cell-Based Protein Expression or Bioreactor-Based Protein production)

·**Title of the Position:** Postdoctoral Fellowship
·**Host Institution / Venue:** Biotechnology Research Center, Tabriz University of Medical Sciences
·**Name of the Responsible Contact Person:** Professor Siavoush Dastmalchi
·**Official Email and Telephone Number:** dastmalchi.s@tbzmed.ac.ir

Subject/Field: Postdoctoral Fellowship in Medicinal Chemistry (Systems-Based Drug Design and Polypharmacology)

·**Title of the Position:** Postdoctoral Fellowship
·**Host Institution / Venue:** Biotechnology Research Center, Tabriz University of Medical Sciences
·**Name of the Responsible Contact Person:** Professor Siavoush Dastmalchi
·**Official Email and Telephone Number:** dastmalchi.s@tbzmed.ac.ir

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Biochemistry in Profile

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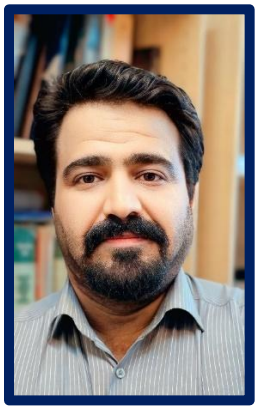

1. What is your view about your membership in Iran Society of Biophysical Chemistry (ISOBC)?

Being a member of ISOBC offers me a unique opportunity to connect with a national network of scientists dedicated to advancing interdisciplinary research at the interface of chemistry, physics, and biology. The society fosters collaboration and dialogue, which are vital for addressing complex biomedical challenges. Through participation in ISOBC's meetings, workshops, and publications, I aim both to contribute to and benefit from this collective effort, thereby enhancing the visibility and impact of Iranian research within the global scientific community. ISOBC provides a platform for knowledge exchange, collaboration, and bridging fundamental and applied aspects of biophysical chemistry. I regard my membership not only as a professional affiliation but also as a responsibility to help drive innovative solutions in biomedical sciences and to support the development of young scientists in Iran.

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2. Would you please explain your biography sketch, University and your including prizes?

I received my B.Sc. in General Biology (2012) and M.Sc. in Cell and Molecular Biology (2014) from Shiraz University, where I worked on the anticancer potential of platinum (II) complexes. I then pursued my Ph.D. in Cell and Molecular Biology (2017–2024) at Shiraz University under the supervision of Prof. Reza Yousefi and Nobel Laureate Prof. Robert Huber. My thesis focused on the role of insulin B chain C-terminal modifications on protein structure, stability, and fibrillation propensity, providing insights into the molecular basis of insulin amyloidogenesis.

Currently, I am a postdoctoral researcher at the Institute of Biochemistry and Biophysics (IBB), University of Tehran, working on recombinant therapeutic peptides, particularly incretin mimetics (GLP-1 analogues) and multi-domain chimeric proteins for type 2 diabetes and dyslipidemia.

Throughout my academic career, I have published more than 30 peer-reviewed papers in international journals, including *BBA, PLOS ONE, Biochimie, FEBS Letters, Scientific Reports,* and *IJBM*. Among my recognitions, I was selected as a Young Scientist by the Scientific Committee of the 74th Lindau Nobel Laureate Meeting (Chemistry, 2025, Lindau, Germany). Additionally, I have been recognized as a top-ranked graduate student at Ph.D. level and received elite accreditation by the National Elite Foundation of Iran.

3. Please let us know about your projects and your research achievements.

My research centers on protein biochemistry and recombinant peptide therapeutics, with a focus on understanding and controlling protein misfolding, aggregation, and stability for biomedical applications.

- **Ph.D. Thesis**: I engineered insulin B chain mutants with additional positive charges at the C-terminal region, which successfully delayed fibrillation and provided new insights into insulin amyloidosis and analog design.

- **Current Postdoctoral Project (IBB, Tehran)**: I am leading the design and evaluation of a triple chimeric therapeutic protein (GLP-1/CP/L-4F) that simultaneously targets,

hyperglycemia, dyslipidemia, and chronic inflammation—three hallmarks of metabolic syndrome. This project integrates bioinformatics modeling (AlphaFold, MD simulations), recombinant expression in *E. coli*, purification, structural/functional assays, and biological activity testing.

- **Broader Research Achievements**:
  - Development of recombinant GLP-1 analogues with improved stability and activity.
  - Contribution to studies on αB-crystallin mutations, revealing their structural basis in cataract and cardiomyopathy.
  - Exploration of natural product inhibitors (e.g., silymarin, polyphenols) against protein fibrillation.
  - Participation in interdisciplinary projects on regenerative medicine and nanobiotechnology.

4. What is your suggestion for promotion of relation for ISOBC members?

To enhance collaboration among ISOBC members, I suggest:

1. Establishing thematic working groups (e.g., protein therapeutics, nanobiophysics, computational biochemistry) to facilitate targeted collaborations.
2. Launching an ISOBC collaborative research grant scheme to support joint projects between institutions in Iran and abroad.
3. Strengthening international visibility by co-organizing symposia with societies such as IUPAB (International Union for Pure and Applied Biophysics) and EBSA (European Biophysical Societies' Association).
4. Encouraging mentorship and training by creating structured programs that connect senior researchers with early-career scientists and students.
5. Digital platforms and databases to share research tools, protocols, and datasets among members, which would accelerate collective progress.

In my view, by combining mentorship, collaboration, and internationalization, ISOBC can become a regional hub for innovation in biophysical chemistry.

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Lafour Dam (also known as Alborz Dam) is one of the most important dams in the Mazandaran region and the northern city of Savadkuh. Located in the heart of the ancient Hyrcanian forests and the pristine nature of northern Iran.

In the spring of 2025, students, faculty members, experts, and researchers from the Institute of Biochemistry and Biophysics enjoyed a delightful picnic by the scenic Lafour Dam. We warmly encourage all researchers and nature enthusiasts to visit this breathtaking landmark.

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