Nāme-ye-Oloom-e Pāye

Quarterly Review of Basic Sciences

The Academy of Sciences (Islamic Republic of Iran)

Nāme-ye-Oloom-e Pāye, the quarterly Journal of Iran's **Academy of Sciences** focuses on publishing articles on fundamental sciences topics, including biology, chemistry, geology, mathematics and physics, with the priority given to studies dealing with main educational and research issues on these fields. The journal aims at promoting the communication between basic science authorities with scholars of other academic fields and the public. Articles with integrative, inter-, multi-, and trans-disciplinary views in science education and research with respect to sustainable development are also considered with primacy. The journal welcomes manuscripts highlighting broad aspects of basic sciences' formal and informal education, concerned with the advancement .of scientific knowledge and attitude in the society

---

Mailing Address: The Academy of Sciences, Shahid Haqani Highway, Tehran, Iran,
ZIP code: 1538633111, **P O Box:** 19395-5318, **Tele Fax:** 88645595

Website: **www.ias.ac.ir**

Email: **basic@ias.ac.ir**

ISSN 2783-3666

Abstract of Contents

Human in the Post-Anthropocene Era: A Reassessment of the Relationship between Human, Non-Human, and Inhuman from a Bio-art Perspective

Seyed Mehdi Alavi

Plant Molecular Biotechnology Group, Agricultural Biotechnology Department, National Institute of Genetic Engineering and Biotechnology, Pajoohesh Blvd., 22th district, Tehran, Iran.

mealavi@nigeb.ac.ir

Abstract

Among the challenges facing the postmodern man, issues such as his power, future and even the possibility of his extinction have received the attention of academics. Man›s success in science and technology, and consequently, his mastery over the components of nature, has led to the emergence of unprecedented consequences, not only in geological history but also in the history of human species. This is why the current era is referred to as the Anthropocene. One of the most significant and challenging achievements of postmodern man is the advancements in biological sciences, particularly biotechnology and genetic manipulation, which have caused tremendous transformations in various areas, including the realm of arts and philosophy. Jan Jagodzinski (b. 1948), a social sciences expert at the University of Alberta, has provided an anthropological and ontological view on this great achievement of postmodern human which was published as an essay on Bio-art. The Persian translation of this article, which was published in issue 6 of Nãme-ye-Oloom-e Pãye in 2022, has been criticized by Dr. Reza Davari Ardakani, the former head of the Academy of Sciences of the Islamic Republic of Iran. This present article is developed in response to his concerns and arguments.

Keywords: Post-Anthropocene era, Human Power, Human Future, Biotechnology, Technologism, Bio-art

An Introduction to Popper's Thoughts In Scientific Approach, Biology and Evolution

Ali Farazmand

Faculty of Biology, University of Tehran
Biology Branch of the Iran Academy of Sciences

afarazmand@ut.ac.ir

Abstract

Karl Popper, as a philosopher of science and sociology, is a well-known figure, especially for his two thoughtful works, The Logic of Scientific Discovery and The Open Society and Its Enemies. He is less well known for his views on biology and specifically on evolutionary theories. His other prominent works, including his two works with the titles Self and Brain and Body-Mind Problem deal with the mind, the issue of consciousness and how the individuals affect evolution. Popper is generally considered one of the greatest philosophers of science of the 20th century. John Eccles says about his work, «Science is nothing more than its method, and its method is nothing more than Popper.» This article reviews Popper›s thoughts on the scientific method, the falsifiability hypothesis, and his views on biology, and evolution. Popper, as a philosopher approaching biology and evolution, with a critical view of Darwinism, has very thought-provoking views that biologists may even need to address in some university courses. After nearly 200 years of publication Darwin›s lasting work (Origin of Species), in the official teaching of evolution in the biology curriculum, not all critical views are adreesed, while Darwin himself in the same work many times respectfully considers some of Lamarck›s opinions as worthy of consideration, Darwin's old and new followers have less such an attitude. In the history of science, thinkers who look at issues outside of the specialized and professional field, propose concerns with a critical attitude, the awareness of which can be enlightening in the development of scientific hypotheses and theories. Popper›s deep thinking in every subject he deals with, usually leaves an incomparable role in its richness, and his works on the functions of the mind, biology itself and evolution are no exception to this rule.

Science as a Vocation

Ata Kalirad

Max-Planck-Institut für Biologie Tübingen, Germany

ata.kalirad@tuebingen.mpg.de

Abstract

Max Weber, the famed German sociologist, historian, jurist, and political economist, is ranked among the most notable theoreticians in the realm of history. This text is an abridged translation of a lecture on the nature of science, delivered by Weber in 1917 at the Munich University. Despite being more than a century old, a plethora of relevant ideas can be found in this text. Weber dedicated a substantial part of this lecture to the difficulties associated with science as a vocation. These difficulties reflect the academic milieu in fin-de-siècle Germany. However, a number of these difficulties are familiar to scientists and researchers in the 21st century. Apart from his detailed description of the academic life, in this lecture, Weber addressed the nature of science, the role of inspiration in research, and the ability of science to answer the most fundamental questions of life. The Farsi translation of this text is based on the original German text and Rodney Livingstone's English translation.

Keywords: Purpose of science, Academic life, Specialization, Intellectualization

Mathematics: Building and Dwelling

Khosrow Monsef Shokri

Faculty of Mathematical Sciences, Shahid Beheshti University

k_shokri@sbu.ac.ir

Abstract

Exploring the profound influence of mathematics and language on human existence, this article discuss the interconnected origins of these fundamental aspects of knowledge. Drawing on historical evidence and the deep principles and theorems of arithmetic and logic, we argue that both mathematics and language stem from a common source. Exploiting Gödel›s incompleteness and Plato›s theory, we explore the existential nature of arithmetic and numbers. In conclusion, we address contemporary scientific crises, drawing insights from Heidegger›s concept of being to propose a solution.

A look at the Motivation of Iranian Students to Enter the World of Basic Sciences

Salim Vosoughi Kiasari

Mathematics Teacher at Allameh Helli High School (1), Tehran, Iran. salimvosooghi@gmail.com

Gholam Reza Rokni Lamouki

School of Mathematics, Statistics and Computer Science, College of Science, University of Tehran, Iran.

rokni@ut.ac.ir

Abstract

Entering the basic sciences and pursuing a career in is one of the vital needs of the Iranian scientific community. However, the motivation of Iranian students to enter and stay in the world of basic sciences has declined both quantitatively and qualitatively. To overcome the situation, we need to examine how a person›s inclination towards basic sciences forms within the framework of Iran›s scientific community. In this regard, the concept of motivation requires careful consideration. In this article, we view motivation as a part of an event explaining the nature and extent of a person›s relationship with basic science in society. Then, we explore the role of various factors in influencing the motivation to enter and continue in the field of basic sciences.

A Perspective on the Educational System of Schools in Finland

Elmira Rezaei Pajouhesh[1], M. R. Mokhber Dezfoli[2,3], Ali Akbar Moosavi-Movahedi[1,3]*

1. Institute of Biochemistry and Biophysics (IBB), University of Tehran, Tehran, Iran .
2. Faculty of Veterinary, University of Tehran, Tehran, Iran . Islamic Republic of Iran Academy of Sciences, Tehran, Iran
3. Islamic Republic of Iran Academy of Sciences, Tehran, Iran

*moosavi@ut.ac.ir

Abstract

Finland as a member of the European Union, has a relatively young population of about 5.6 million people. One of the most recognized achievements of Finland during the last four decades is the achievement of an equity and qualitative education system, which has been achieved as a result of gradual changes and reforms after the Second World War. After Finland›s success in the international pupils' assessment test in 2002, the education system of this country was specialized by other countries. After that, extensive research was conducted to identify the content and educational policies of this country, which resulted in significant issues. According to these factors such as equality education conditions for all, employing professional teachers and granting them the authority to act, active and continuous revision of the educational program, mutual accountability of school managers and officials and educational policy makers to each other in relation emplaned to the quality of education system. Used an «open» model in the design of classrooms that allow pupils to discuss and participate with each other and strengthen their physical and mental abilities through making physical education compulsory play a role in the success of the Finnish educational system. The educational system of Finland has had a tremendous impact on the economic stability and social development of this country. This issue has made the educational policies of Finland and suitable model for other countries. In this article, the effective factors in the success of the Finland education system are briefly discussed.

Keywords: Finland, Comprehensive schools, International education assessment program, Equity education system, Physical and mental education

Development of School Mathematics in Iran

Alireza Medghalchi

Kharazmi University, Tehran, Iran
Academy of Sciences of the I.R.Iran

a-medghalchi@khu.ac.ir

Abstract

The article deals with the national curriculum of school developments and its content, examining the evolution of school education and the history of mathematics books in the contemporary era. Our main goal is to look at the developments of the past as a beacon for the future, so that by using the past experiences and taking advantage of content developments and new educational theories and methods, a suitable ground for creating a noble structure should be provided in school education. School mathematics is the basic and main subject of most academic branches: basic sciences, engineering and even humanities and medicine. Undoubtedly, the transformation in school education and the improvement and promotion of school mathematics will promise to improve the level of many related sciences and knowledge.

The Global Rank of Chemical Industries in terms of Gross Domestic Product of Countries

Ahmad Shabani

Faculty of Chemistry, Shahid Beheshti University
Member of the Chemistry Branch of the Academy of Sciences of the Islamic Republic of Iran

a-shaabani@sbu.ac.ir

Abstract

One of the important indicators of countries› soft power is the amount and share of their national gross domestic product (GDP) in the world gross product. Iran›s share of about 86 trillion dollars in global gross product is about half a percent, which is expected to be at least one percent based on the population index alone. Chemical industry accounts for %10 of global GDP on average, and in some countries such as America and China, this share is %24 and %16 of their GDP, respectively. Considering Iran›s many advantages in chemical industries, such as having expert manpower, providing feed and fuel (energy) for petrochemical processes such as gas and oil, which rank first and third, respectively, even the second according to some reports. There is, the vastness of the territory that is necessary for large chemical-petrochemical industries, as well as access to open waters and shipping, chemical industries in Iran can have a large contribution to the gross national product. Iran›s export in the field of petrochemicals currently is around 12 billion dollars; and according to some reports 20 billion dollars, and 100 million dollars in the field of medicine, includes less than %5 of the country›s gross national product. In this article, by drawing the current situation of chemical industries (petrochemical and pharmaceutical), in Iran and the world, by analyzing the situation in Iran we suggest some solutions to increase the share of chemical industries in the national GDP.

Biophysics Research and Nobel Prizes

Niku MohebAlizadeh[1] , Ali Akbar Moosavi-Movahedi[1,2,3]*

1. Institute of Biochemistry and Biophysics, University of Tehran, Tehran, Iran
2. Chemistry Division, Academy of Sciences of the Islamic Republic of Iran, Tehran, Iran
3. Fellow, The World Academy of Sciences (TWAS); Fellow, Islamic World Academy of Sciences

*moosavi@ut.ac.ir

Abstract

Biophysics is an interdisciplinary field of science that takes a deep and multifaceted look at biological, natural, and paleontological phenomena. The roots of Biophysics are embedded in the basic and fundamental sciences which deal with discovery of molecular, cellular, organ and system of biological and natural phenomena. One of the important advantages of this field of science is that when a researcher theorizes on the subject of Biophysics and its deep philosophies, accurate measurement tools are mostly available for that theory and it can even take laser photographs of the depth of objects in a very short time (e.g. zeptosecond is a trillionth of a billionth of seconds). This science is equipped with precise experimental instruments and data science tools in the form of computing and artificial intelligence to investigate the past and present phenomena and has a lot of deep vision in the future of science research. That is why it has won precious Nobel Prizes in Chemistry (23), Physics (1), Physiology or Medicine (11). A significant part of diagnostic tools in science and medicine have been included the Nobel Prize, which has been in the field of biophysical research.

In Iran, this great body of science has remained unknown, which is in the realm of basic and fundamental sciences and has many applications in engineering and especially in the field of medical sciences. Therefore, it is appropriate that the importance of Biophysics is better known so that it can be better used in the recognition and analysis of diseases and in-depth knowledge of biological and natural phenomena.

Keywords: Biophysics, Nobel Prizes, Accurate Measurement Tools, Deep and Precise Science, Diseases Diagnoses

Hydrogen as Clean and Renewable Energy on Earth, An Overview

Mehdi Zare

Engineering Seismology Department

International Institute of Earthquake Engineering and Seismology (IIEES), Tehran, Iran

Associate Member, Geology Division, Academy of Sciences of the I.R.Iran.

mehdi.zare.iran@gmail.com

Abstract

Hydrogen is recognized as a clean alternative to carbon-based fuel because it does not emit CO2 when releasing its energy. In addition, large-scale subsurface hydrogen storage supports the energy transition in several ways: 1) Decarbonization of energy storage in a zero-carbon future. 2) Reducing the main forms of wind and solar, i.e. its dependence on atmospheric fluctuating events by storing green hydrogen in times of low energy demand. and 3) increasing energy security by replacing imported fuel with locally produced hydrogen. The physical properties of hydrogen pose several challenges for storage, leading to potentially different flow behavior in storage compared to other subsurface gases. Natural or golden hydrogen, which can be produced from subsurface deposits, has recently attracted much attention. Its detection and production, as well as the use of naturally stored hydrogen as an analogue for engineered storage, may change the way we think about hydrogen storage in the future. With its important oil and gas reserves, Iran has a high potential for hydrogen exploration in the future.

Application of Basic Science in the Sustainable Development of Fisheries and Food Security of the Country

Mostafa Sharif Rohani

Research professor of Iranian Fisheries Science Research Institute(IFSRI)

mostafasharif@yahoo.com

Abstract

An expert in basic sciences in the fields of biology, ecology, physiology, nutrition, chemistry, biophysics, genetics, breed improvement, statistics and probabilities, microbiology, food hygiene, along with researchers in fisheries sciences, veterinary medicine, and animal sciences focused on the sustainable development of the country›s fisheries and aquaculture fields. The Fisheries Science Research Institute (IFSRI)of the country is considered as the largest fishery research network in the Middle East, West Asia and North Africa. In this article, while honoring the important place of basic sciences in the sustainable development of the country, some effective and stream-forming actions of these experts in the field of fisheries sciences and aquatic environment are mentioned.

Keywords: Basic science, fisheries research, sustainable development, aquatic environment

From an Idea to an Invention, and the Establishment of a Highly Specialized Laboratory in the Field of Nanoemulsion Technology of Medicinal Plant compounds

Hamed Ahari

Islamic Azad University Science and Research Branch

DR.H.AHARI@gmail.com

Abstract

With the advancement of science, people around the world are seeking healthy and safe food, and extensive and advanced research is being conducted daily in this regard. Currently, nanoemulsions have received significant attention in various industries, especially the food industry, and pose valuable challenges to researchers. Awareness of emulsion systems is vital for researchers, especially in the food industry. Nanoemulsions have small droplet sizes, and emulsions with particle sizes ranging from 5 to 100 nanometers are classified as nanoemulsions and are known as stable colloidal systems. They have better functional properties compared to conventional emulsions. Increasing the surface area by reducing the particle size of nanoemulsions can enhance the utilization of phytochemicals present in nanoemulsions. The composition and structure of nanoemulsions can be controlled for encapsulating and effectively delivering bioactive lipid compounds. The use of nanoemulsion formulations has the potential application in the food industry for adding nutritional value, improving shelf life, ensuring safety, reducing costs, and enhancing nutritional benefits. They can improve the quality of food, such as colors, flavoring agents, preservatives, or antimicrobial agents in foods, and can be used for the production of biodegradable coatings and packaging films to enhance the quality, functional properties, nutritional value, and shelf life of foods. They also have applications in various other industries such as agriculture, pharmaceuticals, environmental, and oil recycling. This review article discusses the terminology and formulation of nanoemulsions, various approaches for producing nanoemulsions using high-energy and low-energy methods, and describes their physical properties, stability, and concentrated microstructures. From an idea to an international invention to a highly specialized laboratory in the field of medicinal plants in food science and engineering, which has been ongoing since 2017 and has been presented to the Academy of Sciences during two consecutive sessions.

Keywords: nanoemulsions, encapsulation, low-energy methods, bioactive compounds, biodegradability

Magnetotactic Bacteria Research and Nobel Prizes

Fatemeh Honarbakhsh[1], Fatemeh Mohammadi panah[1*], Mohammadali Faramarzi[2]

1. Pharmaceutical biotechnology Labratory, Faculty of Biology, University of Tehran
2. Enzyme biotechnology Labratory, Department of Pharmaceutical biotechnology, Faculty of Farmacy, University of Tehran

fmohammadipanah@ut.ac.ir

Abstract

Nowadays, magnetotactic bacteria have attracted the attention of scientists due to their green synthesis of nanoparticles. Magnetic nanoparticles enclose within the magnetosome; the bacterial intracellular organelle with a double-layered membrane which causes them to taxi the south and north poles of the earth. Bacteria synthesize magnetosomes in low oxygen conditions. Magneto-tactic bacteria are often isolated from the water sediments.

All the magnetosome-forming bacteria are Gram-negative. Until now all of the identified Magnetotactic bacteria are among 13 phyla of 34 culturable phyla: Proteobacteria, Nitrospirota, Omnitrophota, Latescibacterota, Planctomycetota, Nitrospinota, Hydrogenedentota, Elusimicrobiota, Fibrobacterota, Riflebacteria, Bdellovibrionota, UBA1019, and desulfobacterota. The origin of magnetic behavior and magnetosome genes among all MTB is supposed to be acquired by horizontal gene transfer in different phyla. Magnetotactic bacteria have an -891gene core genome related to magnetotaxis named the magnetosome island. Some of the genes associated with proteins as Mam B, MamQ, MamT, MamM, MamK, and MamA (Mam: magnetosome membrane) are essential for magnetosome formation.
Magnetosomes have various applications, such as sensing, diagnostics, remediation, immobilization of catalysts, and targeted delivery. Biosynthetic magnetite nanoparticles compared to those synthetic chemicals have exciting properties: they are permanently magnetic at room temperature, have high purity, and illustrate a uniform shape and size, low toxicity due to their membrane envelope, ferrimagnetic attributes, and dispersal capability, which are essential for their potential industrial applications. Due to the importance of magnetosomes in various applications and their unique characteristics, it is necessary to find and identify new sources and new bacteria

Think Tank and its Functions

Ali Farazmand

Faculty of Biology, University of Tehran
Biology Branch of the Iran Academy of Sciences

afarazmand@ut.ac.ir

Abstract

In recent years, the topic of «thinking rooms» is raised by the Academy of Sciences, and some were proposed and set up to investigate related issues. Looking at the titles of the proposed rooms, we see that some have overlapping goals and others do not have the defined criteria of a think tank and can only be considered a specialized scientific group. As a result, with an introduction on the goals of a think tank and its functions, as well as suggestions for merging/changing the existing ones, the necessity of forming several think tanks is pointed out. It is hoped that these suggestions will be heeded, and with the establishment of necessary think tanks and their serious activity, the Academy of Sciences will be able to make its worthy position more observable in the country.