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Organic Correlation Between Basic Sciences and Sustainable Development

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An international survey of the status of the basic sciences reveal that these sciences, with their goal-directed research fields, can deeply affect the long-term scientific and technological issues related to sustainable economic development, its renewal, and the overall social development of countries. There is no doubt that without engaging in basic sciences and their applications, countries can never be able to solve the fundamental problems that they face in their technological, social and political development. Engaging in the fields of basic and applied sciences leading to unforeseen discoveries and innovations, paves the way to usher in revolutionary changes in science and the creation of new technologies, and therefore provides an access to new international markets. Now that a nation-wide development of science and performance of research has been unfolded in Iran and has had a measure of qualitative success, it is imperative that in this international year of basic sciences and their role in sustainable development, we pay particular attention to the role of these sciences in the scientific and technological progress of our traditional Iranian society. The aim of this paper is to show the close and organic correlation between the basic sciences and technology, and the role that the universities and research centers can play in this regard.

Keywords: Casimir, Transistor, Holography, Feynman Project, Frascati Manual, Basic Research, Applied Research, Applied Development

COVID-19 Recovery: Science Isn't Enough to Save Us

Hetan Shah .Nature | Vol 591 | 25 March 2021

Translated by: Ali Farazmand

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Science isn't enough to save us; it is a very alarming phrase. Perhaps with a different belief from what this phrase implies, many scientists - by focusing solely on scientific work- ignore the importance of their effective role in the integrated development of society! The year that has been dubbed *the Basic Sciences and Sustainable Development* may be an opportunity to look at the importance of the basic sciences, as well as its integration with other sciences, in a correct and effective way. By carefully reviewing the articles we have collected in this issue under the pretext of addressing basic science issues, it is clear that in each of these perspectives, lasting success requires their integration with other related domains. This short article, which reflects the views of the Executive Director of the British Academy, implicitly refers to the chronic problem of the split of the basic sciences and humanities. One of the best writings in this category, historically as well as the type and comprehensiveness of its approach, is the *Two cultures* of the British physicist Charles Percy Snow, explicitly revealed this problem in an instructive, profound and warning manifesto in the 1970s. Due to the vital importance of this view, which is still tangled in the development of science and its integrated view in relation to social development - especially in our country - the work mentioned was comprehensively summarized and introduced in the first issue of the *Name-ye-oloom-e payeh*. Indeed, there will be no complete solution to this development until our view of social issues apprehends the need for the integration of the basic sciences and the humanities. If these sciences live and work in universities in the form of detached islands, perhaps the Academy of Sciences is the only institution that can show the value of the importance of the integration of their views in the country with the presence of experts from all these fields. As a proper exercise in this vital requirement, the issue of dealing with post-covid problems in the country, which of course is urgent, can be a very reasonable start.

Keywords: covid-19, humanities, social sciences, basic sciences

World Scientists' Warning of a Climate Emergency

William J. Ripple, Christopher Wolf, Thomas M. Newsome, Phoebe Barnard, William R. Moomaw,
and 11,258 Scientists Signatures from 153 countries

Translated by: Atabak Roohi Aminjan

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Abstract

The Union of Concerned Scientists of the World, based on its moral duty to warn humanity in the face of climate change crises, has called for actions to be taken to control predictable crises. The climate crisis is closely linked to excessive consumption in a prosperous lifestyle. The richest countries are mainly responsible for greenhouse gas emissions in recent years and generally have the highest per capita emissions. Signs of serious concern for human activities include the steady increase in human populations, ruminant livestock, per capita meat production, global GDP, global deforestation, fossil fuel consumption, air passenger numbers, and per capita carbon dioxide emissions. To ensure a sustainable future, the way of human life must change. Economic and population growth are among the most important factors in increasing carbon dioxide emissions from fossil fuel consumption.

Therefore, bold and drastic changes in economic and demographic policies must take place. Concerned scientists around the world have suggested six important steps that governments, businesses and other people can take to mitigate the worst effects of climate change.

Keywords: Carbon dioxide emissions, deforestation, economic growth, six important steps

World Scientists' Warning to Humanity: A Second Notice

William J. Ripple, Christopher Wolf, Thomas M. Newsome, Mauro Galletti, Mohammed Alamgir, Eileen Crist, Mahmoud I. Mahmoud, William F. Laurence, and 15,364 Scientist signatories from 184 countries

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Abstract

Twenty-five years ago, the Union of Concerned Scientists and more than 1,700 independent scientists, including most of the Nobel Prize winners in science, wrote the 1992 World Scientists' Warning to Humanity. These concerned experts called on humans to reduce environmental degradation and warned that a major change in the use of the planet and life on earth must be made to prevent widespread human problems. Based on the observed worrying trends, humanity is now being warned again. To avoid a severe crisis and catastrophic loss of biodiversity, humans must find environmentally sustainable alternatives to ordinary businesses. The solutions were well presented by the world's leading scientists 25 years ago, but in the most cases, their warnings have not been heeded. Soon it will be too late to change to avoid failure. Time is running out. We need to know that the earth, with all its life, is our only home.

Keywords: Biodiversity, sustainable growth, fossil fuels, renewable energy

Bioeconomy: An Impending Economic Revolution But not a Political One

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Abstract

Bioeconomy, or the part of the economy driven by research and innovation in biotechnology and life sciences, is going to become a major player in the global economy and paint a more beautiful picture of the future of the "current-challenging world." Biotechnology, which has historically and by nature been influential in the biomedical and agricultural sectors, has now dominated other fields. This has been made possible by reducing the cost of developing biological processes, such as DNA synthesis and sequencing, and by increasing the accuracy and efficiency of gene and genome editing tools, such

as CRISPR. This coincidence in biological developments and innovative advances in biology has made the occurrence of deconstructive innovations easier and more cost-effective than ever, and has led to the further development of bio-technologies. Following the COVID-19 crisis and the success of biologists in producing vaccines against the pandemic, the McKinsey & Company predicts that the bioeconomy will have a positive economic impact of up to \$ 4 trillion a year over the next 10 to 20 years. This leading institute in global economics and management believes that the combination of molecular biology, biological systems, machine learning and computational science will enable humans to produce nearly 60% of the world's raw materials biodegradable. New biotechnology, as it provided the best response to the global challenge of COVID-19, will be able to respond and provide effective solutions to other major global challenges, such as climate change and the gradual destruction of biodiversity. Therefore, it seems that a new era is emerging, bio-revolution. Like all historical moments that have given rise to fundamental changes and deconstructions in economics and technology, the present age is a time of emergence of great opportunities, just as the world will witness remarkable uncertainties. In this article, an attempt has been made to address the cognitive and nature dimensions of this new actor in the global economy, namely bioeconomy.

Keywords: Bio-Revolution, Bioeconomy, Modern Biotechnology, Bio-based production, Biomass

Climate Change and Its Effects on IRAN

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Abstract

According to the definition of “desert”, more than 2/3 of the area of Iran is consisted of desert and semi-desert region in terms of climate. In such areas, the effects of climate change are greater than in Europe and North America. For this reason, most of the evaporative mines in the world are located in our country.

Although in the last 200 years, the production of emitted greenhouse gases has increased according to the fossil fuels of the industrialized countries, and the rate of drought in the world has increased in the last 10 years, but its effects in our country have been far more severe than usual. In addition to threatening water resources, agriculture, forestry and coastal areas, its effects on health, biodiversity and especially the country's economy are seriously affected. Because water is under threat as a valuable resource for the survival of the country.

Key words: Desert, Climate Change, Water, Forest, Greenhouse Gases

Relative Effects of Climate Change and Human Activities on Water Crisis

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Abstract

Climate change and mismanagement of water resources are the two causes of the water crisis. In this paper, first, I introduce several tangible and visible pieces of evidence from surface water (lakes, rivers, and storage dams) and groundwater (aquifers) that reflect the reality and seriousness of the water crisis in Iran. Then, through a quantitative analysis of precipitation, as the source of water and the water consumption in three agriculture, municipal and industrial sectors in the last 40 years in the country, the relative role of the above two factors are investigated. The results show that the primary cause of the water crisis is mismanagement and water consumption well above the annual renewable water, and the recent droughts only triggered the water crisis. The country faces hydrological drought, environmental losses, and agricultural dryness. Food and energy production is in jeopardy that may act as a driving force for the socio-economic crisis and unrest. If the drought continues, the land dryness and environmental losses become so severe that they will intensify the climate change effects in the country in the coming years at a much higher speed.

Keywords: Climate change, water consumption, water resources management, Iran.

Agricultural Revolution in Ancient Iran: Domestication of Wheat and Barley, An old story at a Glance

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Abstract

Iran is an ancient Country with a high geographical, climatic and biological variety. Iranian people have passed a long and complex history through the past millennia, and attributing their development process to a few socio-economic factors could be perceived as an example of reductionism. However, agricultural revolution, i.e., the cultivation and domestication of plants, especially grains such as wheat and barley, has had a huge impact on the historical development of Near East in general and Iran in particular. Therefore, we tried to explain the correlation between agricultural break-throughs with the historical, technological and social advancements in Iran in a chronological context on the basis of pieces of evidence extracted by reviewing relevant anthropological, botanical and archaeological literature. The outcome of the study showed an intertwined trend between the surplus sources supplied by agricultural advancements and the constant increase in the social complexity and the technological progress.

Keywords: Paleolithic, Neolithic, Chalcolithic, Bronze Age, Iron Age

Vertical Agricultural Development A solution to the world's food problem in the 21st

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Abstract

The increase in world population and the method of cultivation and food supply is one of the basic human problems/concerns in the twenty-first century. Traditional farming methods as well as modern horizontal greenhouses are not able to provide food for the next generation due to high energy costs and low yields. Therefore, today's farming method must change from the conventional horizontal to vertical method, a method that researchers and scientists have called vertical farming. Vertical farming is the construction of buildings within cities that, instead of cultivating on the land, cultivate in glass buildings with different floors and provide light from artificial sources and uses minimal water, and then recycle water along with breeding some plants and setting animal husbandry. This agricultural method minimizes the consumables for production as well as the post-production wastes; in contrast, the production efficiency is significantly higher due to the control of the culture medium. The rich industrialized countries of the world have invested in vertical farming projects, and this industry could be the savior of the human race in the coming decades.

Keywords: Vertical Agriculture, Plantagon, LED lamp, Water recovery

The Netherlands, a Model of Since-based Sustainable Development in the Agricultural Sector

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Abstract

Agriculture (food production) sector is one of the most important econo-political levers in any country. Today, growing populations have raised concerns about food shortages. Irregular harvesting has dangerously affected soil, water and other primary resources. The use of chemical fertilizers and pesticides has not only contaminated soil and groundwater resources, but also caused genetic erosion and the extinction of many plant and animal species. By 2050, farmers are projected to feed 10 billion people on the planet, which will be even more challenging due to the effects of climate change on farmland. A recent report warns that if the current level of our production efficiency continues, feeding the planet Earth by 2050 will require further deforestation, the destruction of thousands of other plant and animal species. It will also result in increased volumes of greenhouse gasses which subsequently lead into global warming. Therefore, paying attention to sustainable development in the agricultural sector and following the examples of successful countries in this field to protect the environment and increase food production efficiency is inevitable. The Netherlands is a leader in efficient and sustainable agriculture and is the second largest exporter of agricultural products in the

world. Therefore, it is very important that the innovative farming techniques used in countries like the Netherlands be extended worldwide. Thus, the purpose of this article is to help understand and express the discourse on sustainable development in the agricultural sector by providing more accurate information about the meaning, evolution, related key concepts, dimensions, relationships between dimensions, principles and consequences of global, national and individual actions in the effort of sustainable development. In this regard, the Netherlands is described in detail as one of the examples of sustainable development in the agricultural sector, especially horticulture, and the 100-year development process of this country using the agricultural industry by relying on the concepts of sustainable development to emulate a successful economy.

Keywords: Sustainable Development Patterns, Food Security, Knowledge-Based Employment, Successful Economy, Horticulture.

Iran's mineral position in the world

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Abstract

Iran has an area of 1,648,195 square kilometers, which is about one percent of the global land: considering its population of about 80 million people Iran, around one percent of the world's population live in Iran. Existence of special geological features such as multiple phases of tectonomagma, metamorphism and sedimentary basin changes from the Late Precambrian to the present has caused this land to have different igneous-metamorphic and sedimentary zones, each of which has its own deposit characteristics. These special features have led to the presence of more than 70 types of minerals and fossil fuels in this country, so that about 5% of the world's minerals, 10% Oil, 16% gas and 1% of the coal of the globe are formed in this country.

Keywords: Iran's metal resources, mineral products, fossil fuel sources, energy resources, mineral trade

Overview of the Site Selection Process of the Iranian National Observatory and its Monitoring

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Abstract

Choosing the right location for the construction of large optical observatories requires a careful study of site selection parameters, including meteorological, local, and astronomical parameters. Around the end of the seventies, when it was decided to build an observatory in the country, in which a telescope with a diameter of about 3 meters would be used, the process of the site selection of Iranian National Observatory began. In this regard, a site selection committee was formed and by measuring meteorological, geophysical and local parameters, four regions of Qom, Kashan, Birjand and Kerman

were selected as suitable initial areas for further study. In order to find the final site, the astronomical seeing parameter of these areas was measured using an astronomical seeing monitor.

The astronomical seeing parameter is the most important site selection indicator that shows an estimate of the quality of the seeing of each site. Finally, based on the results related to the seeing parameter, the Garkash mountain in Kashan was selected among 4 candidate sites. Now, this quantity has been measured again after about 12 years, the seeing condition of the National Observatory is still stable and of good quality.

Keywords: Iranian national observatory, site selection, astronomical seeing monitor

Is Geothermal Energy A Proper Alternative to Fossil Fuels and Nuclear Energy?

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Abstract

Geothermal energy in the Earth's crust comes from the formation of the planet and the radioactive decay of matter. The high temperature and pressure inside the earth cause some rocks to melt lead to plastic behavior of the solid mantle. This process causes parts of the mantle to move upward, because it is lighter than the surrounding rocks. Temperatures at the core-mantle boundary can reach more than 4,000 degrees Celsius (7,200 degrees Fahrenheit). For instance, geothermal heating, using hot spring water, has been used for bathing since the Paleolithic period and for space heating since ancient Roman times. Recently, geothermal energy, the term used to generate electricity from thermal energy of the earth, has become important. It is estimated that geothermal resources are enough for human energy supply, although only a very small fraction is currently exploited profitably, often in areas close to the tectonic plate boundary.

Keywords: Geothermal Energy, Nuclear, Clean Energy, Geodynamics, Hot Spring, Power Plant

Resilience of Earth System

Ken-ichi Abe

Y. Nara, T. Inamura (eds.), *Resilience and Human History* (Chapter 13).
Springer Nature Singapore Pte Ltd. 2020

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Abstract

This chapter explores how we as humanity can improve the resilience of the Earth system. To meet this need, we must realize that humanity has entered a new geological epoch, the Anthropocene, in which the sum of individual everyday lives has caused irreversible changes on Earth. Indeed, the Earth system has transgressed some of the scientifically-established planetary boundary thresholds, including climate change. Meanwhile, our everyday lives have become more fragile due to unforeseeable risks. Probable underlying causes for this include the development of a complex and sophisticated society that has distorted regional interdependence. In such an era, a link between global thinking and local action is necessary. Though not easy, it is not an impossible task. The key is to establish bundles of small, yet numerous, region-to-region and society-to-society relationships.

Keywords: Resilience, Earth System, Global Environmental, Relation-Value

Earth BioGenome Project

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Abstract

Increasing our understanding of the Earth's biodiversity and the responsible management of its resources is one of the most vital scientific and social challenges of the new millennium. These challenges require new fundamental knowledge about the evolution, functions, and interactions of millions of organisms on Earth. A wide range of major human issues, such as the impact of climate changes on biodiversity, conservation of endangered species and ecosystems, can also be explored in this context. Although there are an estimated 10 to 15 million eukaryotic species, and perhaps trillions of bacterial species, only about 2.3 million of them are actually known, of which only the genomes of less than 15,000 organisms, which are mostly microbes, are complete or partially sequenced. Despite these great advances, the world's biodiversity is largely uncertain and increasingly threatened by climate changes, habitat degradation, species exploitation and other human-related activities. From this small part of the known ecosystem of the earth, a considerable part of modern knowledge in biology and life sciences has emerged. This basic knowledge has facilitated tremendous advances in agriculture, medicine, and biology-based industries and the conservation of endangered species.

Keywords: Biogenome of the earth, biodiversity, sequencing of life

Toxoplasmosis and its Behavioral Abnormalities in Humans

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Abstract

Toxoplasma gondii is a protozoan parasite that is widely distributed among mammals and birds. One of the reasons for its high prevalence among human and animal communities may be due to the ingestion of oocytes released by the feces of stray cats. This parasite has been called "one of the most successful parasites on earth" and at the same time is perhaps one of the best examples of medical secrets.

"Its ability to infect almost any nucleated cell in any warm-blooded animal is remarkable," and it infects most species of mammals and birds. It is estimated that one-third of the world's population is infected, although this rate varies from country to country, depending on the eating habits and exposure of cats. It was once considered in the medical literature as a mere factor in abortion and congenital malformations, and as a result, girls were warned against contact with the cat, which is the common host of the parasite. For years, *Toxoplasma gondii* has been known to cause delirium, auditory hallucinations, and other symptoms of psychosis in those it infects. Due to the prevalence of animal friendliness serious attention among the people and the closeness of most people, especially children, to cats and diseases caused by the parasite, and its widespread prevalence in human societies, which is reported to be more than 30% among the people of Iran. The national health organizations of the country and the people themselves have a fundamental urgency against this infection. This paper gives you a brief overview on *Toxoplasma gondii* and its associated diseases.

Keywords: *Toxoplasma gondii*; Human diseases; Symptoms of psychosis; Cats

An Introduction to Dynamic Energy Budget (DEB) Theory Part 2: Mathematical Foundations and Consequences

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Abstract

Dynamic Energy Budget (DEB) theory provides information about organisms and how they use their energy. In Addition, we can obtain information about the growth of an organism as well as its reproductive activities by looking at how energy is distributed over the body. The approach used by the DEB theory is to start by thinking about the mechanism in which an organism is able to manage its energy. Then, it describes these mechanisms in the form of mathematics, and finally the designed model is implemented on an organism. In the biological sciences, the use of mathematics to produce models and predict how organisms grow has been very useful. In the present paper, we also examine the mathematical foundations and implications of DEB theory. It should be noted that this study only briefly examines some of the basic equations that are necessary for a preliminary understanding of

this theory. Obviously, these equations are as complex as the relationships of organisms to their environment, and understanding them requires a deep insight into biological processes.

Keywords: Dynamic Energy Budget; Metabolic Models; Mathematical Foundations; Biological Processes

Ideology and the Scientific Milieu

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Abstract

This paper attempts to address the relation between ideology, a system of ideas and ideals, and science. To better understand this relation, we first recount the sinuous history of the VII international congress of Genetics in Moscow. Organizing this congress lead to the confrontation between those soviet geneticists who had accepted the modern genetics and Lysenko and the central committee of the communist party. The reverberations of this confrontation reached the west and rattled a number of famous scientists. J. B. S. Haldane, one of the founders of the evolutionary genetics, avoided harshly criticizing Lysenko, due to his communist allegiance. Haldane's reaction to Lysenko provide clues about the relation between science and scientist.

Key words: Ideology, Lysenkoism

The Science of Teaching Science.

Mitchel Waldrop 2015
Nature, Volume 523, 272-274

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Abstract

Traditionally, the university was considered the center of higher education. Over time, following the expansion of research activities in universities, especially through the development of research-oriented universities, education became less important. This view led to the recruitment and promotion of professors based on the research records and research grants they received; the evaluation of educational background in turn focused more on the quantity rather than the quality of teaching by faculty members. The importance of education itself, particularly its innovative methods- including *active learning*- is now highlighted in most of the world's prestigious universities. This article outlines the importance of this approach in higher education and the vital role of the respective methods in the knowledge development and progress of students and lecturers themselves.

Keywords: Science teaching, problem-solving methods, active-learning, discipline-based education

On the Necessity and Mathematics Education Methods for Public

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Abstract

Although the deep connections between mathematics and our daily lives, public culture, habits, collective personality, and moral principles make mathematics education inevitable, different discourses have different and sometimes contradictory justifications for the necessity of public mathematics education. Depending on the different interest groups based on their social status, these different approaches conceived distinct aims for mathematics. This diversity is also reflected in the educational policies and methods of teaching mathematics. In this article, first, we introduce, critique, and compare different discourses that explain the necessity and methods of public mathematics education. In the second part of this note, regardless of the distinct approaches of the first section, we elaborate the social role of public mathematics education in modern society and its relations to the method of mathematics education. The importance is elaborated with the emphasis on the concept of empowerment. On the one hand, we discuss the role of ideal mathematical education and its importance in countries' economic growth and development. On the other hand, we stressed the importance of appropriate mathematical education in students' social and epistemological empowerment.

Keywords: Public education, Mathematics, Utility, Empowerment

Basic Sciences, Public acceptability and Occupations

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Abstract

Statistics shows that basic science programs are not popular in undergraduate level as much as other fields. In other words, these fields are not prestigious in the eyes of many candidates, which lead the students not to choose them as their main field in the national entrance examination, and consequently many of these fields have ended up with vacant seats in universities. This paper explores this issue and proposes a few suggestions as solutions.

These suggestions are reviews and completion of methods such as minor and sub-disciplines that have already been implemented and reported to be unsuccessful. The first suggestion is simple and inexpensive that can improve the current situation. This proposal only requires the enactment of laws and their clear communication. The second proposal would work better, but in addition to requiring setting few laws, it also needs new planning and costs.

Keywords: Basic Sciences, Occupation, Minor, Sub-discipline, Curriculum.

Can today's chemistry curriculum really train tomorrow's chemists?

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Abstract

Although it seems that disciplines related to chemistry have been mainly safe from the technological advances of the 21st century that happened in other academic disciplines, and the possibility of replacing chemists with robots or machined computers is unlikely, the advent of these advanced tools could undoubtedly affect the work environment and the atmosphere that students with a degree in chemistry would face. Here, the question is, to what extent do the current curricula used in universities help these students to adapt to these emerging technological trends, or to what extent does the current educational situation frustrate them? It may be too late to criticize current curricula, but they need to be corrected.

Keywords: General Public, Curriculum, Interdisciplinary/Multidisciplinary, Professional Development