



5TH BRICS Young Scientist Forum Announcement and Call for Abstracts

Announcement for inviting applications for participation in
the 5th BRICS Young Scientist Conclave

Date: 7 – 11 September, 2020

Themes: BRICS Partnership of Young Scientists and
Innovators for Science Progress and Innovative growth

Thematic areas: (i) Ecology, (ii) Materials Science, (iii) Application of Artificial
Intelligence in the areas of Ecology and Materials Science

Country: Chelyabinsk, Russia

1. Background

The decision to establish the BRICS (Brazil, Russia, India, China and South Africa) Young Scientist Forum (YSF) was taken in March 2015 at the 2nd BRICS Science, Technology and Innovation (STI) Ministerial Meeting in Brazil. The following YSF's have been held so far:

- 1st BRICS YSF was held in Bangalore, India on 25 September to 1 October 2016 and focused on the following thematic fields: energy, material and biotechnology and biomedicine.
- 2nd BRICS YSF was held in Hangzhou, China on 11 to 15 July 2017 and focused on the following thematic fields: affordable health, computational intelligence and energy solutions.
- 3rd BRICS YSF was held in Durban, South Africa on 25 to 29 June 2018 and focused on the following thematic fields: water, energy and social science.
- 4th BRICS YSF was held in Rio de Janeiro, Brazil on 6 to 8 November 2019 and focused on the following thematic fields: cybersecurity and, bioeconomy.

The main goals of the BRICS YSF are:

- To provide a platform for connecting & networking amongst the BRICS youth in order to harness their knowledge for resolving common societal challenges through research and innovation. In addition, strengthen advancement of skills & research competencies of the youth primarily below the age of 40 years drawn from science, engineering and other allied disciplines.
- To build BRICS leadership in S&T through creative youth with capacity and capability to accelerate change individually and collectively (BRICS Youth Alumni).
- To reinforce BRICS nation's and regional STI policies and youth policies, skills development and entrepreneurship policies.

2. Conference Themes

The themes for the 5th BRICS YSF are focusing on 3 thematic areas: (i) Ecology, (ii) Materials Science, (iii) and Application of Artificial Intelligence in the areas of Ecology and Materials Science, will highlight the strategic importance of science, technology and innovation as key drivers of youth entrepreneurship and leadership.

Note: see the Annexure (Pg4) for detailed explanations of targeted thematic areas.

The 5th BRICS YSF programme will also include the following activities:

- 1) BRICS Young Innovator Prize
- 2) Science Communication Program (youth science networking and activities)

3. Eligibility

This call is open to early career researchers/ scientists/ engineers/ technologists/ innovators up to the age of 40 years who are based in South Africa. Applicants should meet the following criteria to participate:

- South Africa citizen
- Be under the age of 40
- Must be a Doctoral student or Post-Doctoral Fellow or a young faculty member who has completed a masters or a PhD degree in one of the above-mentioned thematic areas
- Have research interests in the conference themes
- Commit to be present and active for the duration of the conference
- Submit an abstract that will be the basis for a presentation at the conference

Note: In addition to the abstract, applicants should submit a short motivation (1 page at most). The chosen presenters are asked to not simply focus on their research but should engage with the theme(s) and answer its requirements. Presentations that address challenges pertaining to BRICS countries and provide possible recommendations are preferable. The conference format is a Forum, which is a discussion group, where ideas related to a subject under discussion can be raised and evaluated on a (more-or-less) equal and informal basis.

Applicants who have already participated in previous editions of the BRICS Young Scientist Conclaves are NOT eligible to apply.

4. Forum Participation and Application

The Department of Science and Innovation (DSI) and the Academy of Science of South Africa (ASSAf) invite online submissions of abstracts for oral presentations on the themes indicated above. Further information about the forum will be circulated to successful applicants.

Access the online application at: <https://forms.gle/stnLWqysKvsbBbKS6>

Funding support

International air travel related expenses (airfare, medical insurance etc¹.) shall be met by the DSI whereas local hospitality i.e. food, accommodation and local transport in Russia will be supported by the host country for the duration of the conference. We request those applying to be in possession of a Passport (or apply for one soonest) for ease of logistics. This will be obtained at own cost but does not mean automatic selection.

5. Call for Abstracts

Abstract Format and Submission

Abstracts should follow the following format:

- Must not be more than 300 words (excluding Title, Author and Institution) in the online application form
- Must be written in English
- The title must be in boldface, capital letters (lowercase) and centred
- The font must be in font size 11

Must include the following information:

- Title, Author(s), Institution(s)
- Name of first author should be underlined (Please do not underline co-authors)
- Institutional affiliations for all authors
- The superscript numbering must be in front of each initial and surname of each author

Where appropriate, the text may be structured using the following headings:

- Introduction or Objectives
- Discussion
- Recommendations
- Conclusion

General Conference Information

Important Note: The meeting organisers take cognisance of the current Covid-19 pandemic and due considerations will be taken into account and updated information given in the event of any changes to be made.

For any further information on the forum please contact:

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Application Deadline: Friday, 26 June 2020

¹ SA citizens visiting Russia are exempt from visa requirements for a period not exceeding cumulatively 90 days for holiday and business visits

I. ECOLOGY

Ecology – is a chemical and biological engineering science, that:

- studies the structure and functioning of systems of the supraorganism level (population, community, ecosystem) in time and space in human-modified conditions and in the natural environment;
- determines what impacts of anthropogenic and non-anthropogenic origin affect the environmental situation, including the spread of bacterial and viral diseases;
- develops engineering (including genetic engineering) methods for diminishing negative impact on the biosphere.

Modern environmental science is an interdisciplinary science that studies the problems of interaction between man and the biosphere, namely, the role of man in nature and changes in nature under the influence of anthropogenic factors. Regarding the world-wide growing industry, the negative impact on nature, the planet and mankind itself is constantly increasing. Industrial enterprises contribute heavily to air pollution that negatively affects respiratory systems of the human body, leading to a number of chronic and fatal diseases; the pollution is present on crops, it enters the soil, groundwater and the human body. Wastewater pollutes rivers and water bodies, making them unsuitable for organisms and thus disrupting the functioning of entire ecosystems. An important problem is the emission of greenhouse gases from cars when burning fuel. All of these are examples of the negative impact of anthropogenic activities. In addition, there are non-anthropogenic impacts, primarily associated with volcanic activity, earthquakes and solar activity. If the situation continues to develop in this direction, the humanity is under a threat of a global environmental disaster. In this regard, the issue of Green Industry, of reducing negative impact on nature, the planet and man is a matter of utmost urgency.

Relevant topics

- 1) Clean air: condition monitoring, sensors, measurements of pollution in atmospheric air and emissions, modeling and predicting the state of atmospheric air using digital twins, air quality control;
- 2) Pure water: development of the best available water purification technologies, technological rehabilitation of water bodies, hybrid technologies for transferring industrial and agricultural enterprises to a closed water cycle;
- 3) An integrated solid waste management system: developing the best available technologies for processing solid industrial waste, designing finished products based on the life cycle, taking into account the subsequent collection and disposal, technology of biodegradable materials to reduce the overall load on the ecosystem;
- 4) Natural resources management, including the development of algorithms for the rational use of planetary resources, energy and resource-saving technologies, production and microchipping of organic products for use by a traceability system;
- 5) Bioecology: the study of the relationships of living organisms with their environment, study of the influence of certain groups of animals, insects, microorganisms on environmental changes, developing ways of reducing the risks of human intoxication with mycotoxins of plant materials; autecology: the study of the individual relationships of individual species of organisms on the environment; the study of biological methods of controlling plant pests (the study of the ecological mechanisms

of the influence of the locust family on the fauna and environmental situation of the regions; the influence of the river beaver population on the change in the physical, geographical and environmental characteristics of their habitats, etc.);

- 6) Virus and pathogen ecology; the impact of viruses and bacteria on the planet, in particular, the impact of the COVID-19 pandemic on the environmental situation in the world; issues of the emergence, spread, and possible mechanisms for stopping disease outbreaks. Emergency preparedness and response;
- 7) Human ecology, including the development of technical and methodological systems for improving the physical and psychological state of a person in the short and long term, as well as the development of environmentally friendly materials and design solutions for creating environmentally friendly housing, including eco-settlements;
- 8) Environmental compliance: the ability of an organization, city, region to comply with environmental norms and rules, both external and internal, including assessment, management and control systems associated with the risks of non-compliance with regulatory documents, rules and standards of supervisory authorities, legislation requirements.

II. MATERIALS SCIENCE

Materials science is an interdisciplinary branch of science that studies the methods of production, structure and properties of materials, the relationship between their composition, structure and properties (mechanical, thermal, chemical, electro-physical, magnetic, optical) and the behavior of materials depending on various factors.

In the modern world, materials science is one of the most promising areas of natural science and a locomotive of technological progress. Advances in space exploration, new means of communication, computers, smartphones, artificial implants (in medicine) and the widespread use of laser technology - these and other achievements would not have been possible without previous achievements in materials science. Knowledge of the structure and properties of materials allows you to create fundamentally new products, as well as new industries. At the same time, the knowledge gained by scientists in the field of materials science is in demand by traditional industries and is widely used to improve safety and economic efficiency of production, expand the product range, develop technological innovations and solve existing production problems. Without new research in the field of materials science, further development of electronics, metallurgy, mechanical engineering, aircraft manufacturing, building materials industry, chemical and textile industries, the industry of new carbon and polymer structural and composite\ nano materials, as well as of other industries is impossible.

Relevant topics

- 1) New metallic materials, as well as the new generation metal-matrix composite materials (both construction and functional); the development of methods for designing automotive, aerospace, and construction products using aforementioned materials;
- 2) Materials for additive manufacturing, including gas-dynamic spraying and laser surfacing; nano and microadditives in alloys, prediction of the properties of metals

and alloys with additives, technology for the production of innovative steels and products from them;

- 3) New functional materials, including nanomaterials, whose operational characteristics (magnetic, electrophysical and optical properties, catalytic activity) can be changed using quantitative control;
- 4) Materials resistant to extreme conditions, including new polymers and nanomaterials, for energy sector (including nuclear energy, as well as actively developing sectors of alternative energy) and for space sector;
- 5) Nature-like medical materials (including hybrid and nanostructured), in particular, innovative polymers and the creation of artificial organs based on them;
- 6) New composite materials resistant to extreme conditions (including Arctic conditions), for use in the construction industry;
- 7) New functional and construction materials, including nanomaterials containing carbon, namely: fullerenes, carbon nanotubes, graphene, glassy carbon, etc.;
- 8) Nature-like materials for use in modern electro-chemical energy sector: magnetic, ferroelectric, luminescent and ion-conducting mineral-like functional materials, including new mineral-like piezoelectric and optical materials;
- 9) Minerals and mineral-like compounds as components of heat-resistant ceramics and matrix-immobilizers of toxic and radioactive elements.

III. ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is one of the current breakthrough scientific directions. The AI research is conducted in all developed countries of the world. The AI can be described as a set of solutions that allows to simulate the human mental functions (including learning and self-training, as well as finding a solution without a given algorithm) and based on this to obtain results comparable to the results of human intellectual activity. The AI research results are actively implemented into all spheres of life. In medicine, systems are developed and implemented for automatic processing of test results, diagnostic data and monitoring of treatment methods. In industry, it is now possible to track equipment wear, fulfillment of production plans and other activities that are usually done manually. In agriculture, the use of artificial intelligence allows for proper control over the condition of plants, the level of moisture, the availability of nutrients in the soil and for well-timed care of plantings that are automatically weeded, watered and harvested. The AI can be used in road traffic management for analyzing data from traffic lights and collecting information on traffic congestion, unforeseen accidents, negative weather conditions and other factors affecting traffic. By analyzing the data, AI can adjust the operation of the road system. In everyday life, AI is best represented in the form of the Smart Home system, which optimizes energy consumption, level of heating and ventilation, and control over the operation of household appliances.

Relevant topics

- 1) Development and application of artificial intelligence methods for solving the digital industry challenges (sensorics of industrial facilities, creation of digital twins, energy saving, information security of industrial facilities);
- 2) Creation of a multibiometric information system using artificial intelligence methods, surpassing in its capabilities all known biometric systems in the world;

- 3) The use of artificial intelligence to solve the environmental problems of large industrial agglomerations;
- 4) Creation of advanced computer vision systems for solving a wide range of tasks (control of production processes, medical diagnostics, adaptive traffic control, safety and counter-terrorism, production of autonomous robotic devices);
- 5) Development of methodology and algorithms for the classification and formation of forecasts based on the analysis of Big Data;
- 6) Machine learning methods for solving combinatorial optimization challenges (application of combinatorial optimization: to develop the optimal air traffic network; to develop the best way to deliver goods; in applied sociology; in business research – to predict the behavior and preferences of consumers, competitors and markets, etc.);
- 7) Development of algorithms for creating synthetic images based on the architecture of generative-competitive neural networks (creation of technology for improving Deep HD images based on generative-competitive neural networks);
- 8) Development of a unified payment system based on cryptocurrency; improvement of national payment systems and their continuous implementation as an element of economic cooperation between the BRICS countries in the face of growing market risks of the global payment infrastructure.



BRICS