



Developing Biosecurity Education for Life Science Researchers: Measures at Tianjin University under the Tianjin Biosecurity Guidelines

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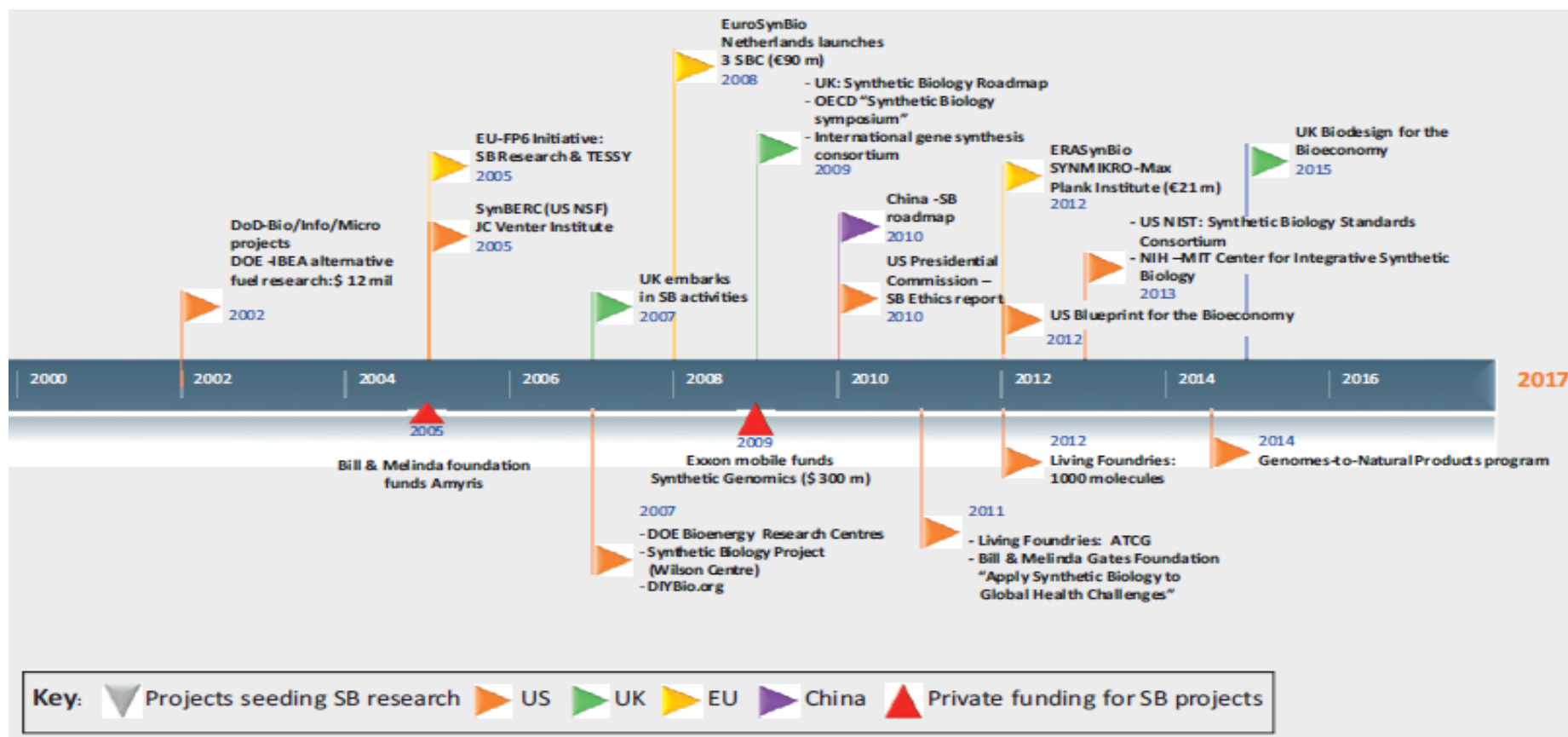
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2023.12.13




Major initiatives in Synthetic Biology





Bueso and Tangney. *Trends in Biotechnology* 35.5 (2017): 373-378.

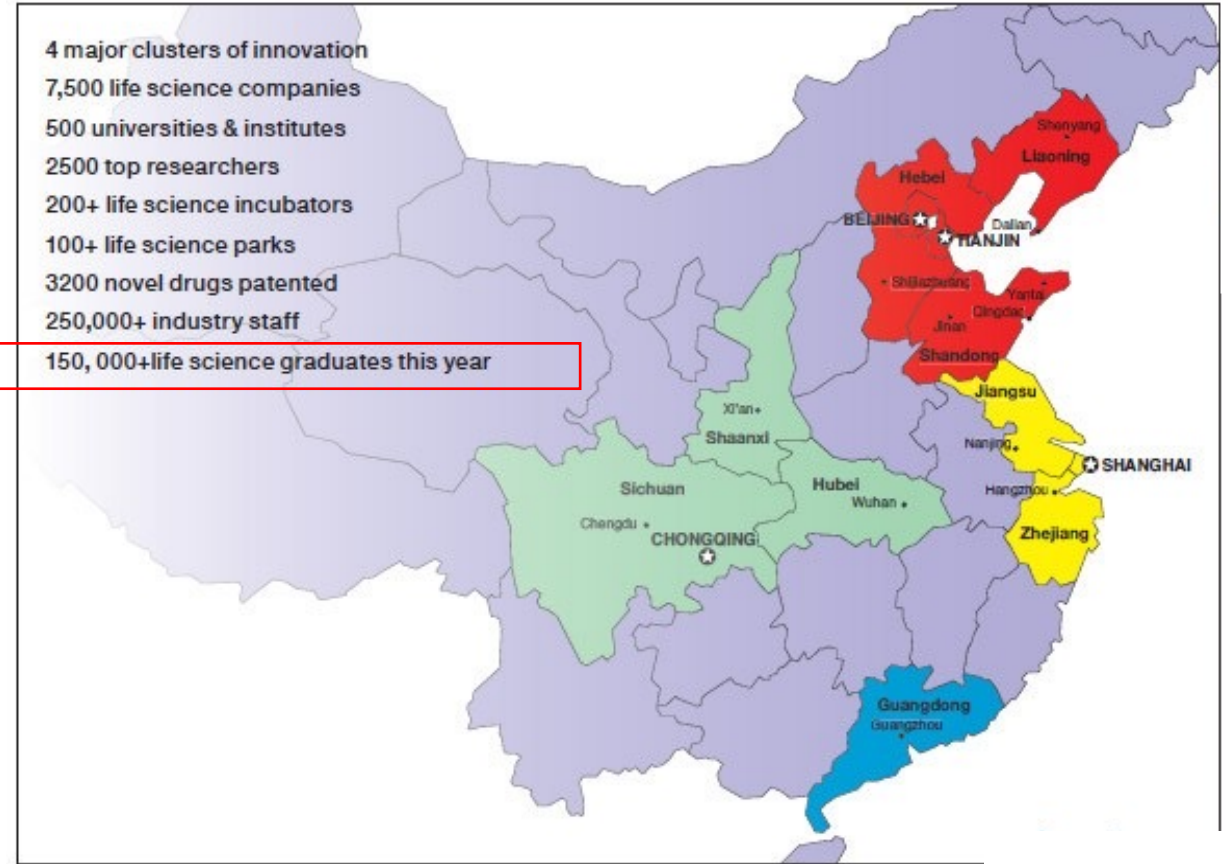
1. Since 2005, **~1 billion** dollars invested in synthetic biology research in **USA**.
2. From 2004 to 2013, **~450 million euro** was invested into synthetic biology field in **EU**.
3. Since 2007, over **300 million pounds** have been invested into synthetic biology in **UK**.
4. Since 2011, **~200 million** invested in Synthetic Biology Research (2011-2015), and **1 billion** planned for 2019-2023 in **China**.



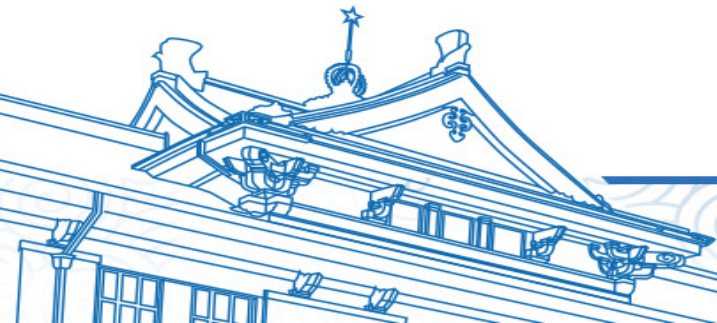
 *The concept of biosecurity education is multilayered and complex.*

 *Life scientists still lack awareness of the risks of their research.*

 *The lack of empirical evidence.*



Fast growth of new biotechnology research and industry in China





The Tianjin Biosecurity Guidelines for Codes of Conduct for Scientists

Advances in the biological sciences bring about wellbeing for humanity, but the same advances could be misused, particularly for the development and proliferation of biological weapons. To promote a culture of responsibility and guard against such misuse, all scientists, research institutions, and governments are encouraged to incorporate elements from the **Tianjin Biosecurity Guidelines for Codes of Conduct for Scientists** in their national and institutional practices, protocols, and regulations. The ultimate aim is to prevent misuse of bioscience research without hindering beneficial outcomes, in accordance with the articles and norms of the Biological and Toxin Weapons Convention (BTC), and in advancement of progress towards achieving the UN Sustainable Development Goals.

1. Ethical Standards

Scientists* should respect human life and relevant social ethics. They have a special responsibility to use biosciences for peaceful purposes that benefit humankind, to promote a culture of responsible conduct in biosciences and to guard against the misuse of science for malicious purposes, including harm to the environment.

2. Laws and Norms

Scientists should be aware of and observe applicable domestic laws and regulations, international legal instruments, and norms relating to biological research, including those on the prohibition of biological weapons. Scientists and their professional bodies are encouraged to contribute to the establishment and further development and strengthening of relevant legislation.

3. Responsible Conduct of Research

Scientists should promote scientific integrity and strive to prevent misconduct in research. They should be aware of the multiple applications of biological sciences, including their potential use for developing biological weapons. Measures should be taken to prevent the misuse and negative impacts of biological products, data, expertise, or equipment.

* For purposes of this document, "scientists" are practitioners engaged in work that includes biological science, including those involved in funding, education, and training; research and development (in the public and private sectors); project planning, management, dissemination, and oversight.



Background

The responsible practice of chemistry improves the quality of life of humankind and the environment. Through their many peaceful uses, such as in research and industry, chemicals play an essential role in this improvement. However, some chemicals can also be used as chemical weapons or to create them, and these weapons are among the most horrific in the world.

The 1993 Chemical Weapons Convention (CWC) embodies the powerful international norm against chemical weapons, requiring its States Parties "never under any circumstances: (a) To develop, produce, otherwise acquire, stockpile or retain chemical weapons, or transfer, directly or indirectly, chemical weapons to anyone; (b) To use chemical weapons; (c) To engage in any military preparations to use chemical weapons; (d) To assist, encourage or induce, in any way, anyone to engage in any activity prohibited to a State Party under this Convention." The task of destroying the world's declared stockpiles of chemical weapons is close to completion, but the threats that the use of chemicals a weapons pose to global security have not yet been eliminated.

As destruction of the remaining chemical weapons continues, a concerted effort is needed to prevent their re-emergence. This includes training and raising awareness among chemistry practitioners, defined as anyone trained in chemistry as well as others dealing with or handling chemicals. Their support is needed so that production and use of chemicals is accompanied by recognition of the responsibility to ensure that they are applied solely for peaceful and beneficial purposes. Fortunately, ethical standards established by the global chemistry community already provide a foundation. Building on that foundation, a group of experts from 24 countries from all regions of the world convened to define and harmonize key elements of ethical guidelines as they relate to chemical weapons based on existing codes.¹

Such codes are primary ways through which the community's ethical standards are addressed. The key elements presented in this text should be incorporated into new and existing codes in order to align with the provisions of the CWC. A code need not mention chemical weapons or the CWC to support its basic goals, and provisions may need to be tailored for particular sectors or circumstances, while still reflecting the fundamental values. Taken together, "The Hague Ethical Guidelines" provide the key elements that should be applied universally.

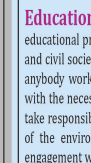
¹Code is used as a general term and includes the full range of such documents, from aspirational statements such as the Hippocratic Oath to codes that are enforceable, for example as part of a practitioner's terms of employment.

The Key Elements

Core element. Achievements in the field of chemistry should be used to benefit humankind and protect the environment.



Sustainability. Chemistry practitioners have a special responsibility for promoting and achieving the UN Sustainable Development Goals of meeting the needs of the present without compromising the ability of future generations to meet their own needs.



Education. Formal and informal educational providers, enterprise, industry and civil society should cooperate to equip anybody working in chemistry and others with the necessary knowledge and tools to take responsibility for the benefit of humankind, the protection of the environment and to ensure relevant and meaningful engagement with the general public.



Awareness and engagement. Teachers, chemistry practitioners, and policymakers should be aware of the multiple uses of chemicals, specifically their use as chemical weapons or their precursors. They should promote the peaceful applications of chemicals and work to prevent any misuse of chemicals, scientific knowledge, tools and technologies, and any harmful or unethical developments in research and innovation. They should disseminate relevant information about national and international laws, regulations, policies and practices.



Ethics. To adequately respond to societal challenges, education, research and innovation must respect fundamental rights and apply the highest ethical standards. Ethics should be perceived as a way of ensuring high quality results in science.



Safety and Security. Chemistry practitioners should promote the beneficial applications, uses, and development of science and technology while encouraging and maintaining a strong culture of safety, health, and security.

Accountability. Chemistry practitioners have a responsibility to ensure that chemicals, equipment and facilities are protected against theft and diversion and are not used for illegal, harmful or destructive purposes. These persons should be aware of applicable laws and regulations governing the manufacture and use of chemicals, and they should report any misuse of chemicals, scientific knowledge, equipment and facilities to the relevant authorities.



Oversight. Chemistry practitioners who supervise others have the additional responsibility to ensure that chemicals, equipment and facilities are not used by those persons for illegal, harmful or destructive purposes.

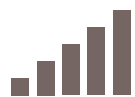
Exchange of information. Chemistry practitioners should promote the exchange of scientific and technical information relating to the development and application of chemistry for peaceful purposes.



The Participants of the Second Workshop on Ethical Guidelines for the Practice of Chemistry under the Norms of the Chemical Weapons Convention (CWC).

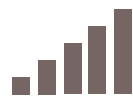
More information is available at <https://www.opcw.org/special-sections/science-technology/the-hague-ethical-guidelines/>





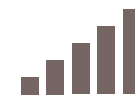
Global Public Goods

Both are aimed at promoting a culture of responsible behaviour in research and preventing the misuse of chemical or biological technologies



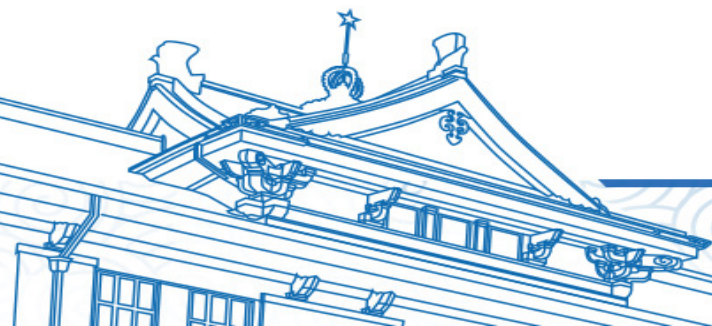
International Soft Law

Defined as standards, principles and guidelines that are not legally binding but have a significant impact on how nations behave



Effective Multilateralism

A positive impact on resolving the current fragmentation of international organizations in global biosecurity governance





Ideas: the community of human destiny and the globalist value of security without borders



*Principles I: balance the innovation and risk;
Principles II: human orientation ;*



Path Formation: based on the BTWC framework, with the biosecurity think tanks as the main suppliers



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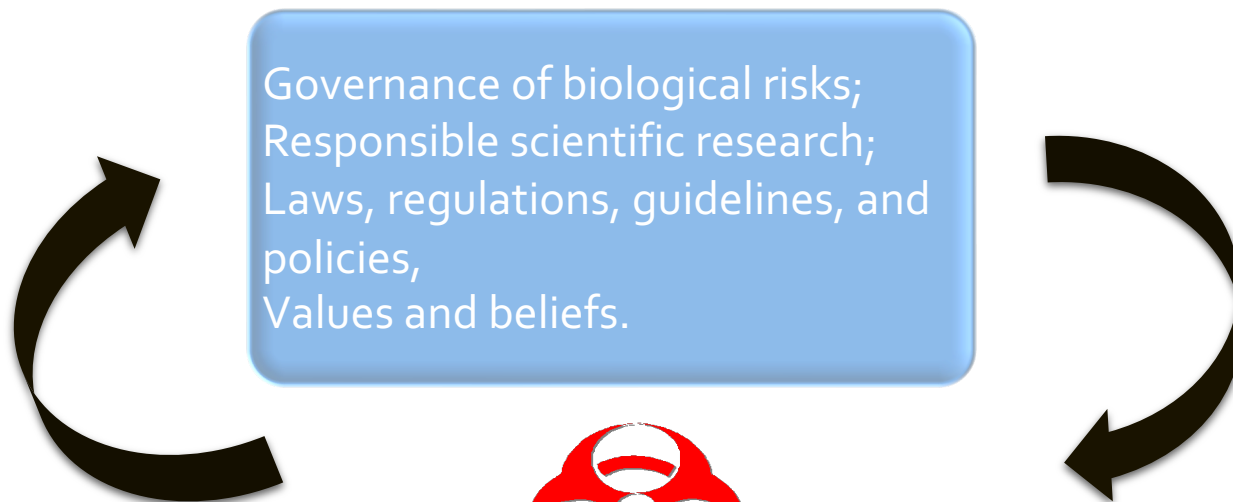
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Ensure faculty and staff are well-educated and trained.

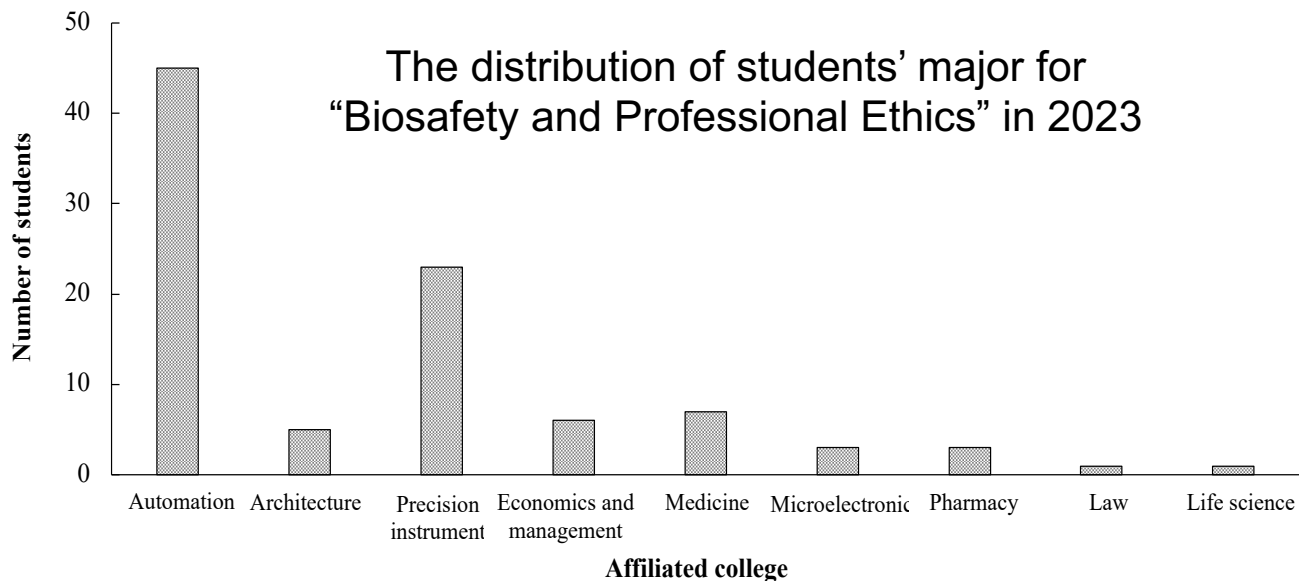


Provide biosecurity advice on their concerns.



Provide information on whom scientists should consult.





We offered “*Biosafety and Professional Ethics*” and “*Advances and Perspectives in Biosafety and Biosecurity Legislation*” for **1200** students, which is the first time such courses offered in technic universities in China.

Students who chose courses involved a variety of majors.





Biosecurity Education
We have addressed various organizational affiliations to numerous areas of interest using the Tianjin Guideline as the foundation for teaching, and objective standards like honesty and integrity.





“Young Scientists from the Global South of the Biosecurity Diplomacy Workshop” held by UNODA on 22 January 2021, bringing together 29 talented young scientists from 17 countries from the Global South for a series of virtual sessions on topics related to the BWC.



“The Training Program for Lancang-Mekong Cooperation Future Diplomats 2022”. Over 60 young officials and practitioners in public health, and medical students from Asia and Africa, participated the training.





“International Workshop on Biosafety Laboratory Management and Technologies”

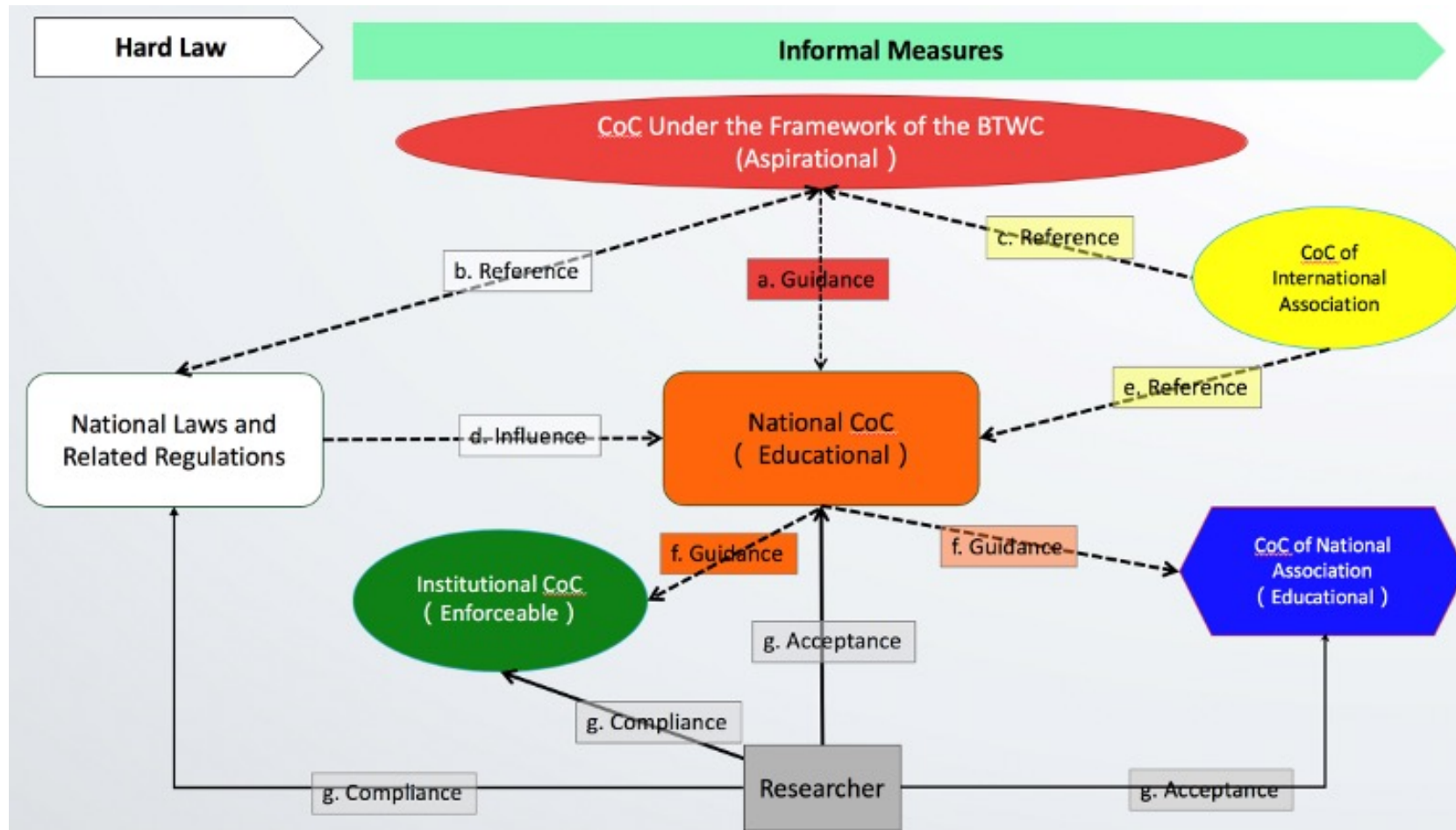
Wuhan, China. 2018-2023 (Organized by CAS and MFA of China)



124 scientists and lab managers

48 countries (*Bangladesh, Brazil, Bulgaria, Cambodia, Cameroon, Croatia, Congo, Egypt, Ethiopia, Hungary, Laos, Latvia, Malaysia, Mauritius, Myanmar, Nepal, Nigeria, Pakistan, Poland, Sri Lanka, Tanzania, Uzbekistan...*)





- *All of these entities should serve as an educational audience for biosecurity and may require an organized “systematic educational network”.*
- *“Community laboratories” and “biohackers”, who practice outside of conventional biological research settings pose a new educational challenge.*

Implementation system of an ethical code of conduct for biological scientists



天津大学生物安全战略研究中心

Tianjin University Center for Biosafety Research and Strategy (CBRS)

Thanks!

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