



The potential for life sciences misuse, the Biological Weapons Convention, and the art of science diplomacy

CONDENsE | Yprès, Belgium
29-30 August 2019

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The world is overarmed and peace is underfunded

OpEd by United Nations Secretary-General Ban Ki-Moon
27 August 2012 | [Eurasia Review](#)



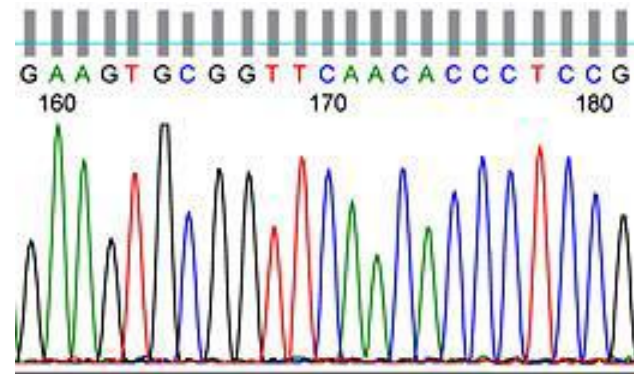
For More Information on Military Expenditures
[The Stockholm International Peace Research Institute \(SIPRI\)](#)
[The United Nations Report on Military Spending](#)
[Disarmament - A Basic Guide \(see chapter 2 on Global Military Expenditures\)](#)



New technologies and how they related to the Biological Weapons Convention: positive use and potential for misuse



What Is DNA?



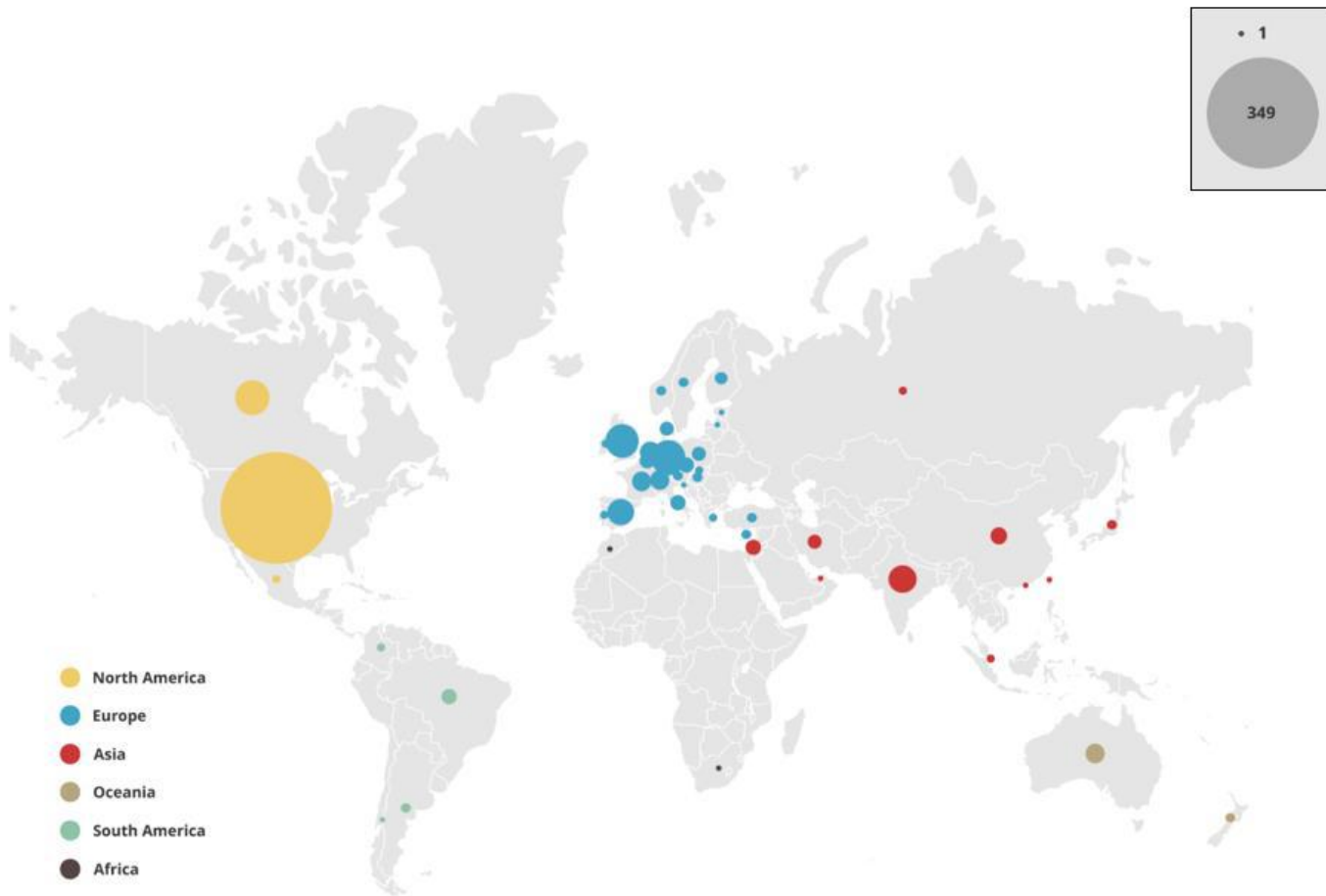


Figure 1: World map of genomic companies and research institutes (year 2018).

- By 2022, the genomics business is expected: **24 billion USD**
- Academia & research are main businesses (health)
- New targets: **Start ups, small companies and the general public.**
- Why? Low prices for DNA sequencing: **technology and instruments**



1. Companies offering Gene Therapy (editing)

**CRISPR
THERAPEUTICS**

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PROGRAMS
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Patients
Investors
Careers

Gene-based medicines

Transforming the lives of patients
with serious diseases

Learn More

Download CRISPR Therapeutics Corporate Presentation

CRISPR Therapeutics

www.crisprtx.com/our-programs/our-therapeutic-approach.php ✓

We are focused on the treatment of somatic (non-germline) cells, analogous to the approach taken by more traditional and established gene therapy methods.

1. (not only) companies offering Gene Therapy (editing)

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The CRISPR-baby scandal: what's next for human gene-editing

As concerns surge after a bombshell revelation, here are four questions about this fast-moving field.

David Cyranoski



He Jiankui presented a slide at a Hong Kong, China, genome-editing summit that showed DNA sequences from the edited CCR5 genes in the twin girls. NATIONAL ACADEMIES/FLICKR (CC BY-NC-SA 2.0)

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NEWS • 10 JUNE 2019

Russian biologist plans more CRISPR-edited babies

The proposal follows a Chinese scientist who claimed to have created twins from edited embryos last year.

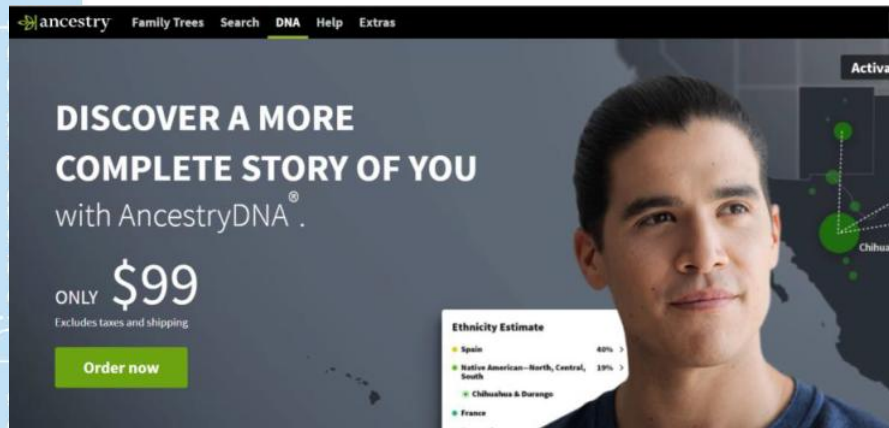
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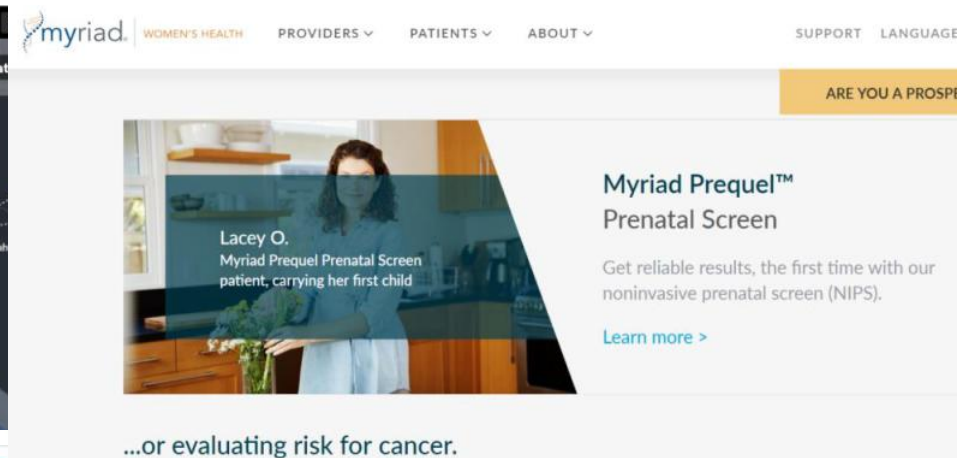
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Ethnicity Estimate

- Spain 48%
- Native American—North, Central, South 19%
- Chilote/Mapuche & Druwaga
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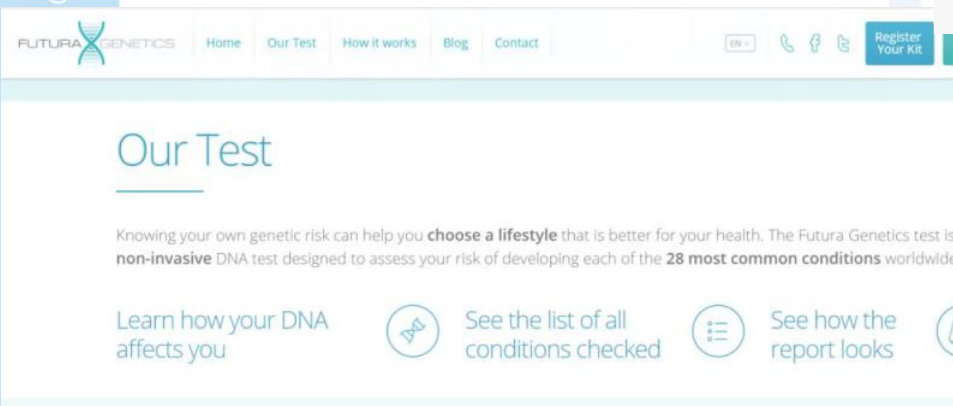
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Myriad Prequel Prenatal Screen patient, carrying her first child

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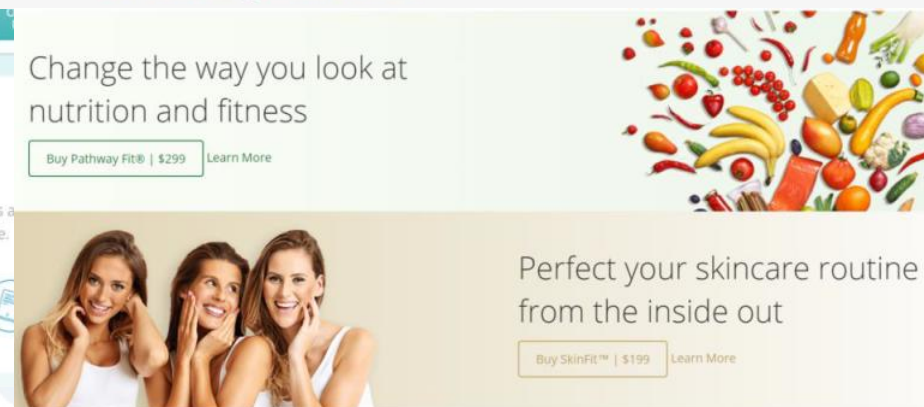
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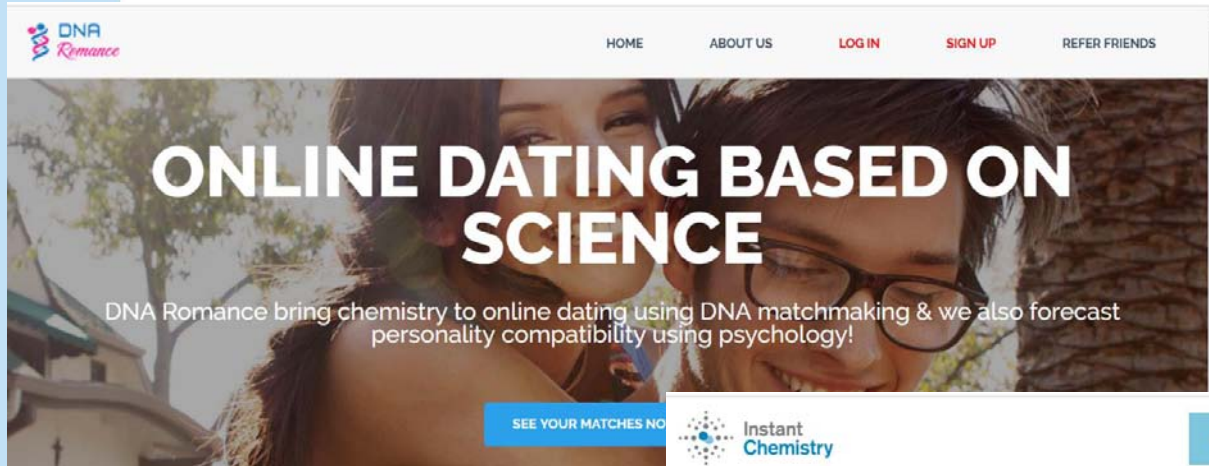
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2. Companies that offer direct to consumer genetic testing



Relationship Compatibility

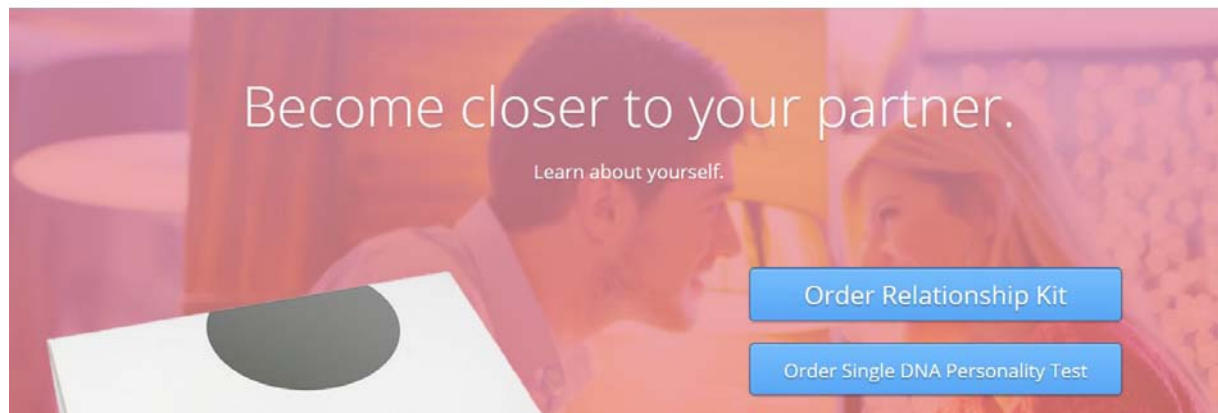
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3. Companies that sell D0-It-Yourself Biology



At Amino Labs, our goal is to make teaching genetic engineering accessible, fun and affordable.




3. Companies that sell DO-It-Yourself Biology

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4. Companies that buy/sell genetic data

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 **Matthew Herper** Forbes Staff
Pharma & Healthcare
I covered science and medicine, and believe this is biology's century.

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23andMe's Pharma Deals Have Been the Plan All Along

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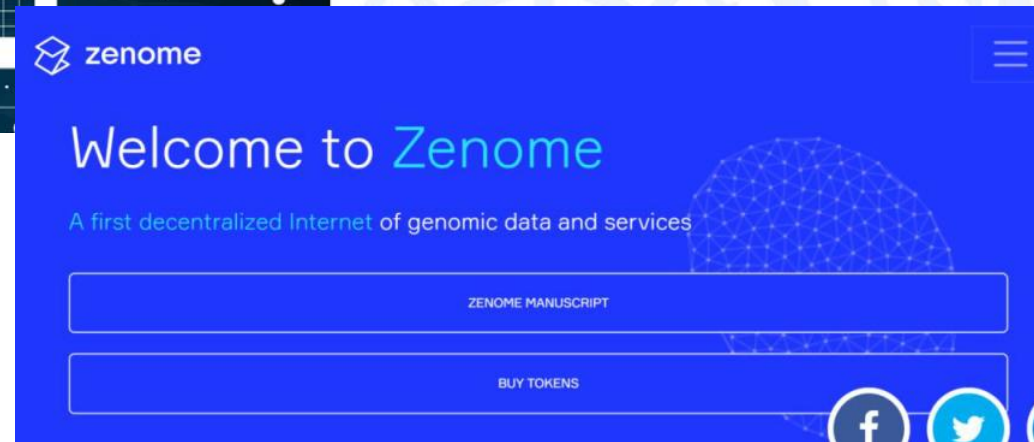
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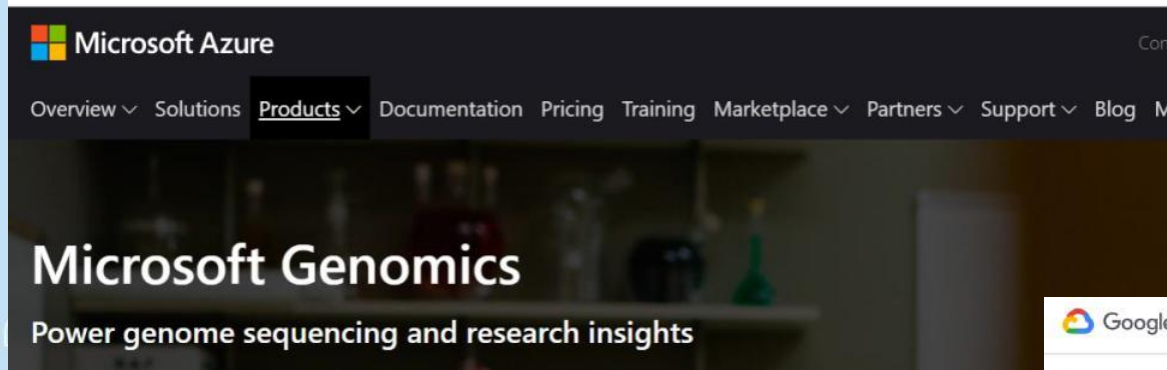
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5. Companies that use blockchain and cryptocurrency



6. Companies that store genetic data



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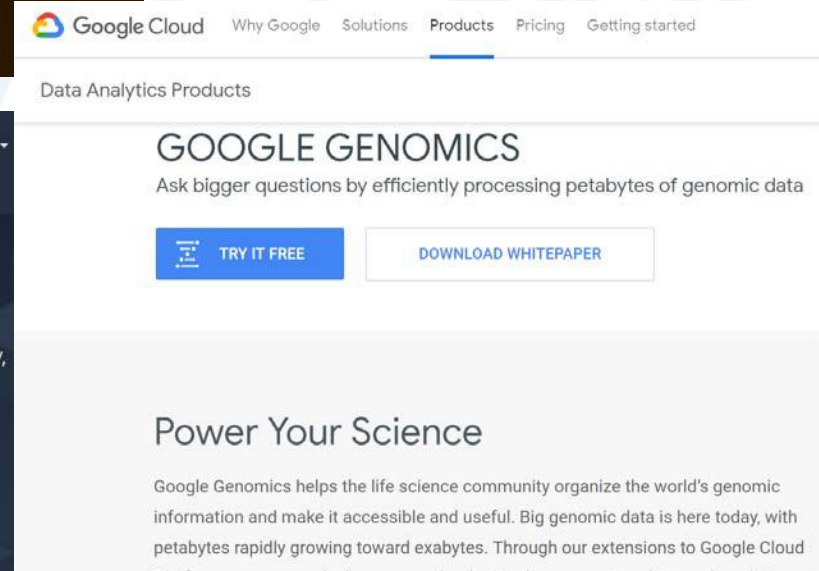
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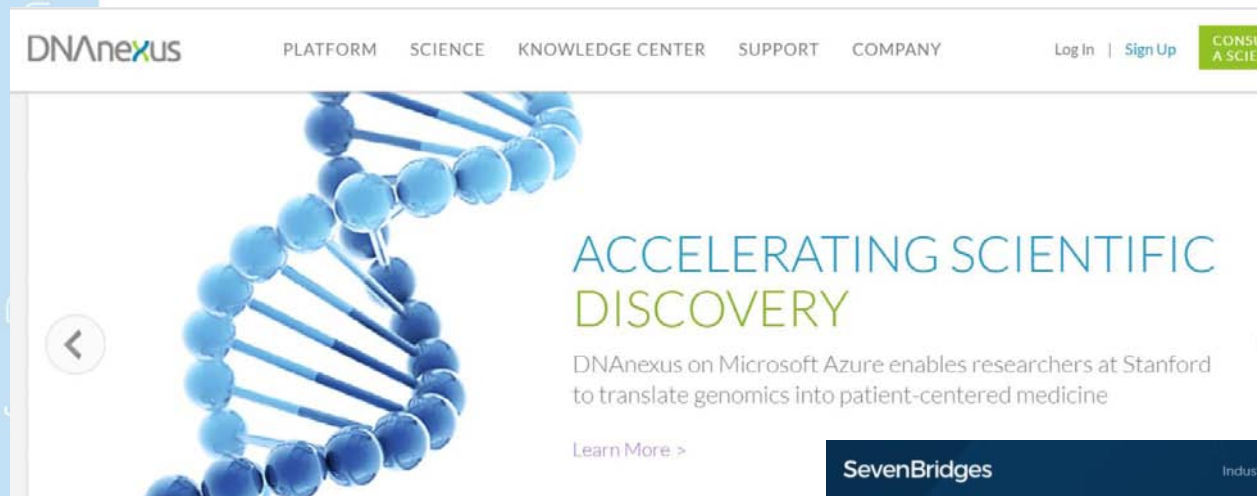
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Google Genomics helps the life science community organize the world's genomic information and make it accessible and useful. Big genomic data is here today, with petabytes rapidly growing toward exabytes. Through our extensions to Google Cloud

6. Companies that store genetic data




The screenshot shows the DNAnexus website. The header includes the DNAnexus logo, navigation links for PLATFORM, SCIENCE, KNOWLEDGE CENTER, SUPPORT, and COMPANY, and links for Log In and Sign Up. A green button labeled 'CONSULT A SCIENTIST' is also present. The main content area features a large blue DNA double helix graphic on the left. To its right, the text 'ACCELERATING SCIENTIFIC DISCOVERY' is displayed, with 'DISCOVERY' in green. Below this, a paragraph states: 'DNAnexus on Microsoft Azure enables researchers at Stanford to translate genomics into patient-centered medicine'. A 'Learn More >' link is at the bottom of the text block.

United Nations Office for Human Rights




The screenshot shows the SevenBridges website. The header includes the SevenBridges logo and navigation links for Industries, Products, Case Studies, Resources, Company, Contact, and Login. The main content area has a dark blue background with a hexagonal pattern. The text 'Actionable informatics for biomedical research' is prominently displayed in white. Below this, a paragraph states: 'Accelerate scientific discovery with fast, secure, and collaborative genomic and healthcare data analytics.' A 'SCHEDULE A DEMO' button is located at the bottom of the text block.

7. Companies that provide deep analysis using AI




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AI-Powered Discovery Platform

The future of medicine will rely on artificial intelligence, because biology is too complex for humans to understand




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IBM Watson for Drug Discovery

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8. Companies doing Synthetic Biology

- ❑ Synthetic biology applies **engineering, design, and computer science** principles to biology, usually at the DNA level.
- ❑ In 2018, 98 companies raised **3.8 billion USD**. Govs invested 50 million on them.

synthorx



Better medicine is in our
(synthetic) DNA

A path to better medicines

With our novel DNA base pair, we are designing and building protein therapeutics to create an entirely new generation of tailored medicines to improve how we treat disease.

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8. Companies doing Synthetic Biology

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About us

Autolus is a biopharmaceutical company developing next-generation, programmed T cell therapies for the treatment of cancer.

Technology

We are applying our broad array of T cell programming technologies and capabilities to engineer precisely targeted controlled and highly active T cell therapies that are designed to better recognise cancer cells, break down their defence mechanisms and attack and kill these cells.

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We Make DNA

At Twist Bioscience, we work in service of customers who are **changing the world for the better**. In fields such as medicine, agriculture, industrial chemicals and data storage, by using our synthetic DNA tools, our customers are developing ways to better lives and improve the sustainability of the planet.

Accelerating customer success

The faster our customers succeed, the better for all of us, and Twist Bioscience is uniquely positioned to help accelerate their efforts.

We have created a revolutionary **silicon-based DNA synthesis platform**, that offers **precision at a scale** otherwise unavailable to our customers.

- Innovative silicon-based DNA Synthesis Platform enables production of high-



Do you think that any of these technologies **can be used as a channel for creating a bio weapon?**

What is the Biological Weapons Convention all about?

Prohibits **development, production, stockpiling, acquisition, retention or transfer of BWs**

- Opened for signature on 10 April 1972
- Entered into force on 26 March 1975
- First multilateral disarmament treaty banning an entire category of WMD
- No verification mechanism





The Regional Science and Technology Workshops

In the framework of European Union Council Decision 2016/51, the predecessor of the current Decision, also in support of the BWC, UNODA organized five regional workshops to discuss the implications of science and technology on the BWC over the course of 2017-2018. The outcomes were revealing...



Science and Technology Workshop for Central Asia and Eastern Europe

Kiev, Ukraine/21-22 September 2018





Science and Technology Workshop for Latin America and the Caribbean

Mexico City, Mexico/16-17 April 2018





Science and Technology Workshop for the Middle East and North Africa

Amman, Jordan/11-12 July 2018





Science and Technology Workshop for sub-Saharan Africa

Pretoria, South Africa/25-26 July 2018



Science and Technology Workshop for Asia

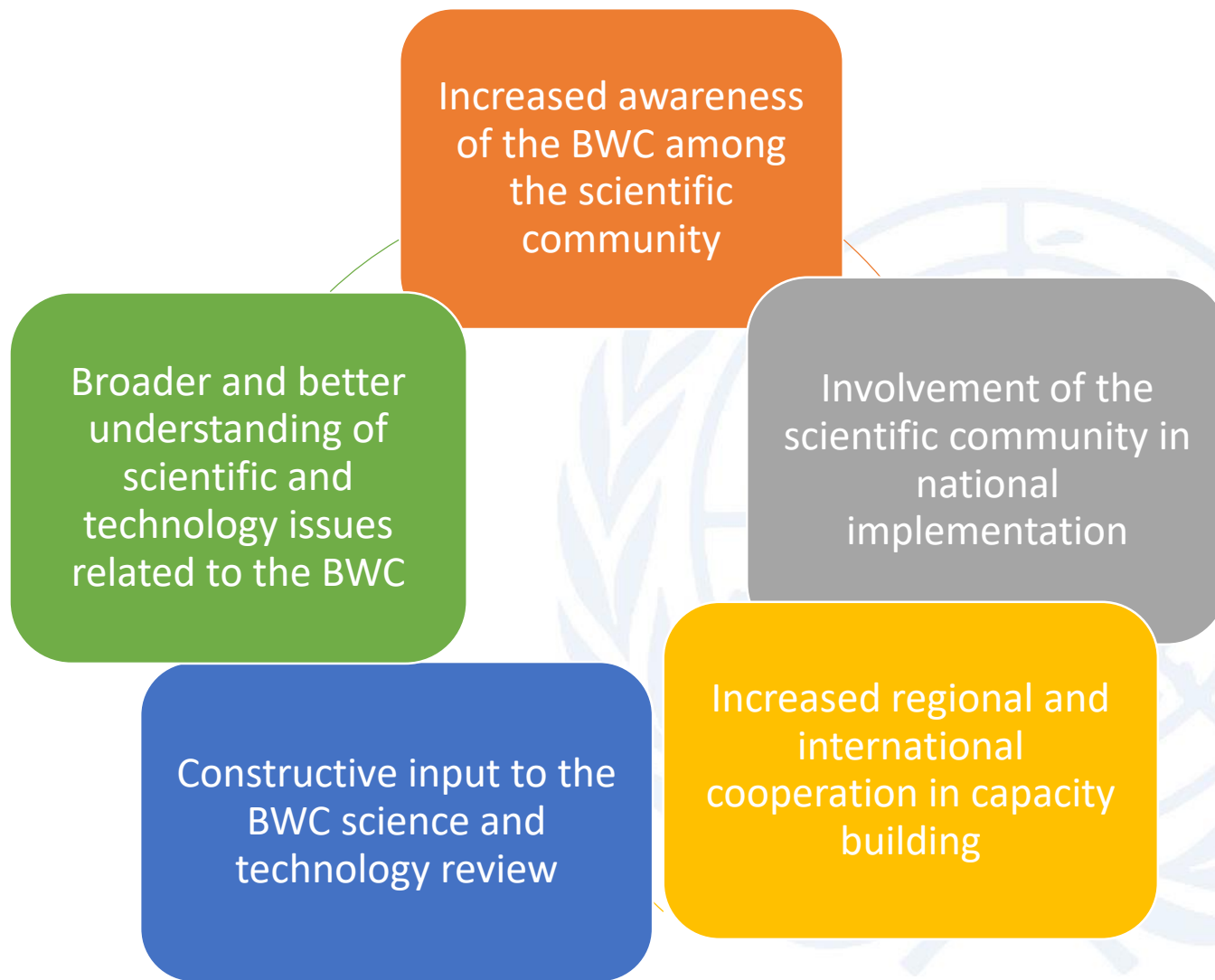
Manila, Philippines/21-22 November 2018



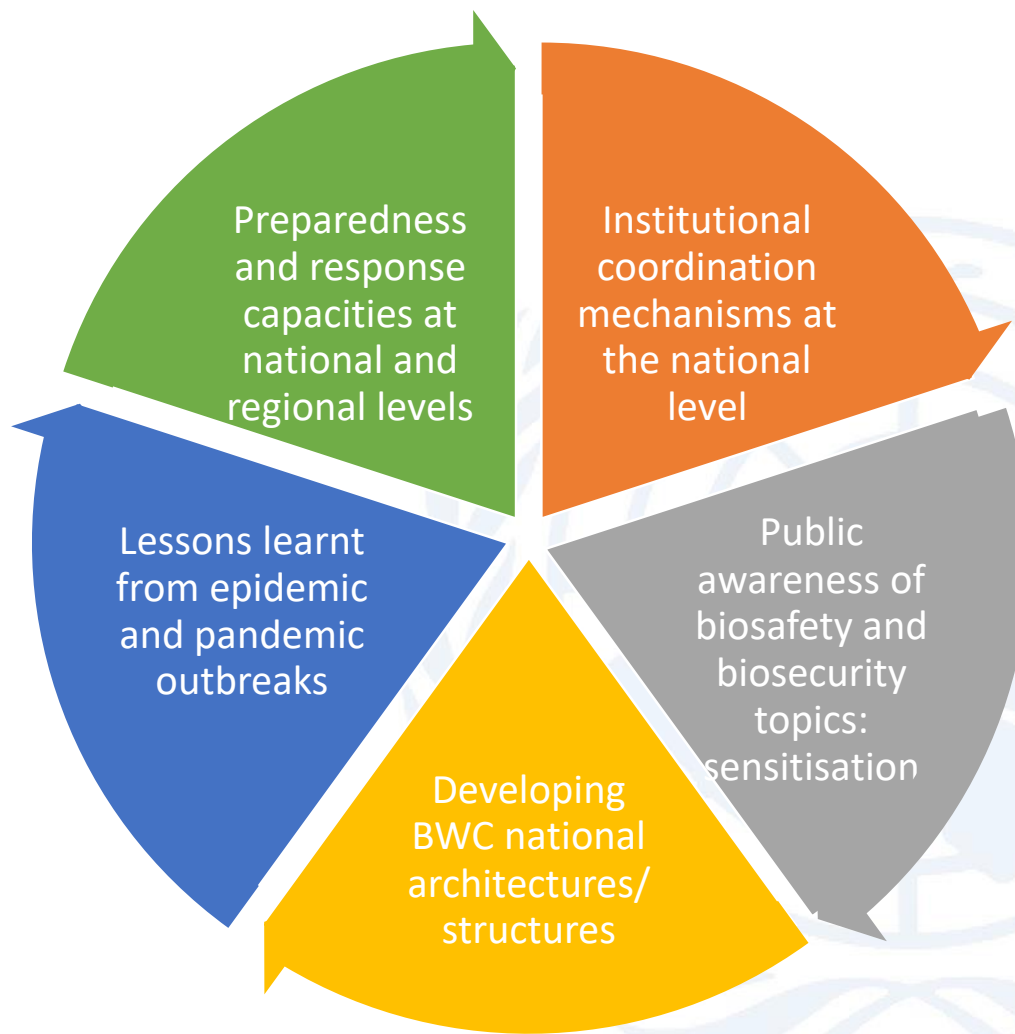


Project 2: S&T Workshops

- expected results -



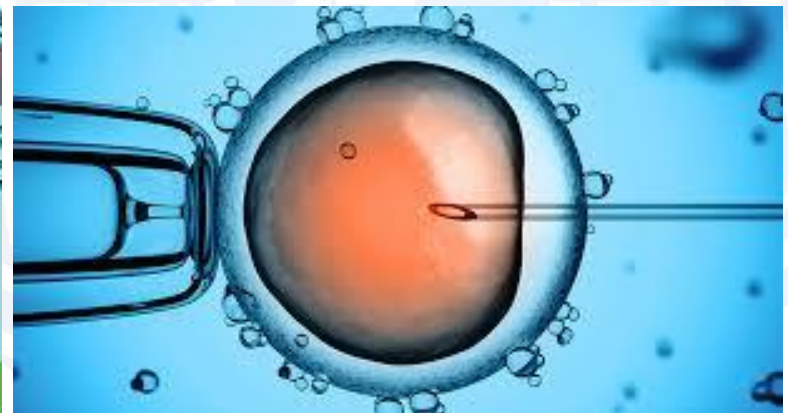
Main S&T topics of discussion under EU Council Decision 2016/51





General S&T takeaways

- ❑ Advances in S&T have moved at an unprecedented pace in the last decade. Science developments that were unthinkable just years ago, such as gene editing and biotechnology advances, are now underway and could have a very significant impact on the BWC





General S&T takeaways



While the BWC as a Convention remains relevant to this date, ways of operating within the framework of the Convention must be re-thought by States Parties and old paradigms must be updated. The foundational article of the Convention is robust but there are important gaps in some other articles that must be addressed and updated



More S&T conclusions from regional workshops

- Watershed events, such as the development of technologies as CRISPR makes the production of bioweapons more accessible. **It is not clear to scientists whether the international community fully understands the risks** associated with these advances.
- **Regulated Safety VS Managed Safety** = to what extent is it advisable to impose rules on scientific research? When does this hinder positive developments?



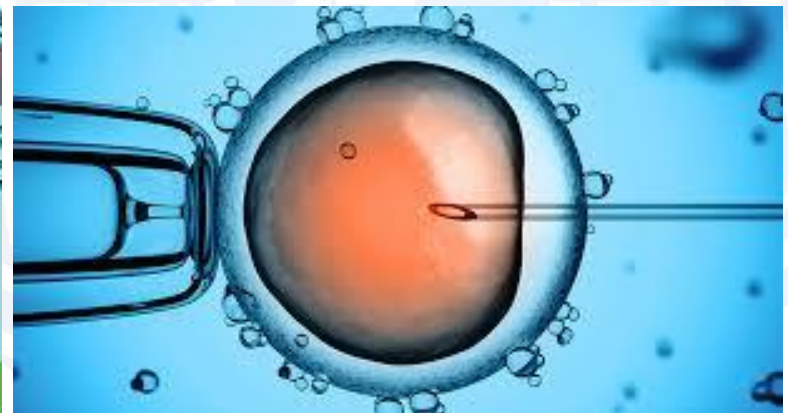
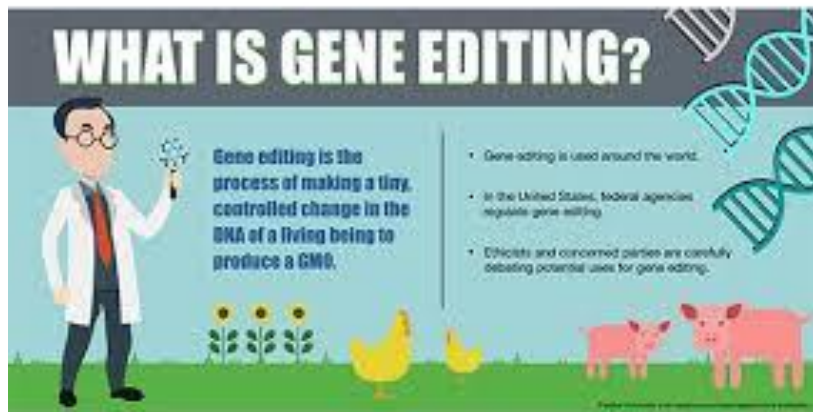
More S&T conclusions from regional workshops

- **Continued education and outreach** on S&T is imperative, as well as awareness-raising at the community level and in local languages on topics such as dual-use research, biosafety and biosecurity.
- **South-South cooperation** is important to work on similar issues of concern in the biosafety and biosecurity areas.
- **Preparedness is the best way towards prevention** for potential biorisks, ability to handle outbreaks of infectious diseases and the emergence of epidemics.



Key Takeaway

Biosecurity is a shared **[collective]** responsibility: at the international, regional and national levels... but there is much more!





The Art of Science Diplomacy

- **What scientists say**



The Art of Science Diplomacy

- What diplomats hear



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Building the bridge: communicating science for decision-making





For more information...

www.unog.ch/bwc

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