Pursuing biological advances, *safely*

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Dual-use research management

- **Dual use:** advances that lower the barriers to misuse
- **Dual use research of concern:** "Life sciences research that, based on current understanding, can be reasonably anticipated to provide knowledge, information, products, or technologies that could be directly misapplied to pose a significant threat with broad potential consequences to public health and safety, agricultural crops and other plants, animals, the environment, materiel, or national security."
- **Conundrum:** Legitimate scientific inquiry, often with medical benefits, and not everyone sees the risks and benefits in the same way.

There is strong interest in managing dual use research

- USG Moratorium on Gain-of-Function influenza research.
- Yet: Misuse by ***whom*** and to what degree?
- Dual use research of concern can be identified, but can the risks and benefits be truly quantified?
  - More likely they will be experiment-dependent, context-dependent, and time-dependent
  - Not all nations will balance the risks and benefits the same way
  - Consensus will remain difficult, particularly as experts view the threat differently

Risk of a consequential accident

- Major concern about gain-of-function influenza research– laboratory acquired infection
- Also a concern for gene drives, remediation, agriculture
- Biosafety often undervalued or underfunded, even in well-resourced laboratories.
- Good biosafety guidance and training is available

SYNOPSIS OF BIOLOGICAL SAFETY AND SECURITY ARRANGEMENTS

Summaries of key international treaties, agreements, instruments, guidelines, multilateral engagement mechanisms, and information resources intended to guide national approaches to biosafety in research, clinical, and industrial laboratories.

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Trends in Microbiology

CellPress

Science & Society

Addressing the Gap in International Norms for Biosafety

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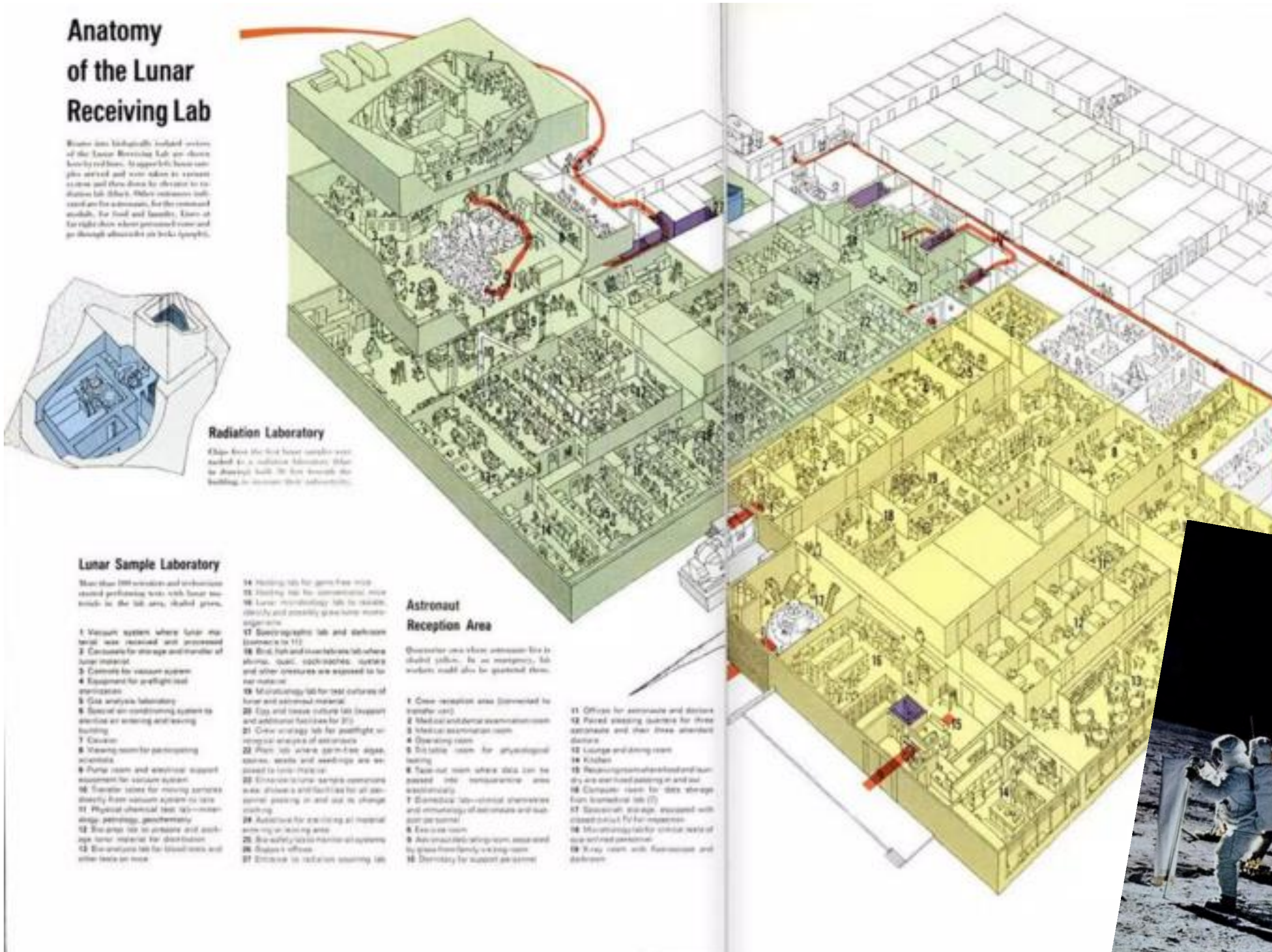
There is currently a lack of national-level norms for biosafety. Considering that a laboratory accident involving a contagious pathogen could have long-term consequences that extend beyond an individual incident into the practice of science more broadly, it is in the interests of scientists everywhere that international norms are developed.

international concern. However, laboratory-acquired infections (LAIs) with particularly transmissible pathogens, including noncirculating human influenza strains, the severe acute respiratory syndrome (SARS) coronavirus, or other contagious pathogens, could have consequences that go well beyond the laboratory. In large part, it was these biosafety concerns that fueled the decision by the US government in early 2015 to pause funding for influenza gain-of-function (GOF) research while the risks and benefits of that research are analyzed (http://www.whitehouse.gov/blog/2014/10/17/doing-diligence-assess-risks-and-benefits-life-sciences-gain-function-research). Investigators first touched off the controversy in 2011–2012 with their development of a form of the

In recognition of the fact that individual laboratory workers carry the most personal risk from LAIs, resources have been committed to boost biosafety at the local level. There is excellent guidance available for researchers, laboratories, and research institutions to adhere to high biosafety practices, and provide biosafety professional training pertaining to each individual discipline and type of work. There are also standards classifying pathogens at varying levels of biocontainment [Biosafety level-1 (BSL-1), BSL-2, BSL-3, and BSL-4] and what corresponding engineering controls should be in place to manage biorisks within a research institution, whether they pose risks to humans, livestock, or plants. The World Health Organization (WHO), the Food and Agri-


Anatomy of the Lunar Receiving Lab
Radiation Laboratory
Lunar Sample Laboratory
Astronaut Reception Area

Thank you!

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