

# ELSI and Emerging Technology

—ELSI in Large-scale Research Programs —

## ELSIと新興技術

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## Technology Assessment (TA) in Japan

2013-2017: Senior Specialist at the **National Diet Library (NDL), Research Bureau**

国立国会図書館調査及び立法考査局専門調査員を務める

cf. the Congressional Research Service at the Library of Congress, US

米国議会図書館議会調査局に相当する組織

2016: NDL was recognized as an **associate member of EPTA\***.

EPTAの準会員となる

\*The European Parliamentary Technology Assessment network

cf. Science, Technology Assessment, and Analytics team (STAA) of the Government

Accountability Office (GAO) at the Congress, US

米国では、議会会計検査院科学技術アセスメント分析チームが準会員

TA: Advice on Science, Technology and Innovation to Congress/Parliament/Diet

# My Personal History and ELSI -2-

個人的経験から

## **Hiroshima and the ELSI:** Prehistory of the ELSI -1-

My present position is the professor of **Hiroshima University**. 広島大学所属  
The university was/is located in the city damaged by the A-bomb. 被爆地の大学  
The Research Institute for Radiation Biology and Medicine is affiliated to the  
University. 附置研究所として原爆放射線医科学研究所の存在  
The A-bomb and its survivors are our reality as well as our memory.  
原爆と被爆者は、我々にとって記憶であると同時に現実

**Today's ELSI is due to the existence of A-bomb survivors in Hiroshima and Nagasaki.**

今日ELSIは広島、長崎の被爆者に負う。

## **Hiroshima and the ELSI:** Prehistory of the ELSI -2-

After the A-Bomb, ABCC (Atomic Bomb Casualty Commission) was established in 1946, which was substantially a research institute of AEC (Atomic Energy Commission) to investigate the physical and genetic effects of radiation among the A-bomb survivors in Hiroshima and Nagasaki.

原爆傷害調査委員会が、原爆被爆者の調査研究機関として、原子力委員会の下に設立され、放射線の身体的影響、遺伝的影響を調査。

**ABCC→Radiation Effects Research Foundation (RERF)**

現・（公財）放射線影響研究所へ 広島大学原爆放射線医科学研究所とも協力

**AEC →US DOE (Department of Energy)** 現・米国エネルギー省へ

## Hiroshima and the ELSI: Prehistory of the ELSI -3-

DOE's tradition of research on the effects of radiation on heredity; chromosome abnormality, gene abnormality, and so on.

DOEの放射線影響研究（放射線被曝による染色体、ゲノムへの影響）の伝統



The end of the Cold War 冷戦終結の前夜



Based on DOE's experience of Human Genome Research

DOEのヒトゲノム研究の経験

1986: DOE announces Human Genome Initiative. Pilot projects begin at DOE national laboratories. ヒトゲノム研究の提唱とパイロット研究の開始

1987: NIH (National Institutes of Health) begins funding of genome projects. NIH国立衛生研究所もゲノム研究に資金提供開始

## **Hiroshima and the ELSI: Prehistory of the ELSI -4-**



1988: DOE and NIH agreed on cooperation on genome research.

ゲノム研究を共同で実施することに合意

1989: DOE and NIH established Joint ELSI Working Group.

This is the **origin of the ELSI.**

ELSIワーキンググループを創設 = ELSIの起源

1990: Human Genome Project launched to determine the DNA sequence of the human genome.

ヒトゲノム・プロジェクトの開始

**ELSI is due to the existence of A-bomb survivors in Hiroshima and Nagasaki.**

ELSIは広島、長崎の被爆者の存在に負う、という歴史的事実。

## Nanotech ELSI -1-

Risk debate on Nano Material ナノ物質の化学的リスク



Nano Machine and “Gray Goo” ナノマシン、グレイ・グー

Drexler, K. Eric, 1986, “Engines of Creation : The Coming Era of Nanotechnology”

ドレクスラー 『創造する機械—ナノテクノロジー』

Self-propagating Nano machine 自己増殖型ナノマシン



Runaway self-propagating Nano machines, “Gray Goo” covers the earth. Just SF!

ナノマシンの自己増殖の暴走の結果、“Gray Goo”が地球を覆うというSF的議論

## Nanotech ELSI -2-

New Idea to acquire public budget: ナノテクイニシアティブの予算獲得のために  
**Converging Technologies** (Nanotechnology, Biotechnology, Information Technology and  
Cognitive Science: **NBIC**) for Improving Human Performance



**“Human Enhancement” ← NBIC**



**Important deals were made Backstage at ELSI debates.**



## Nanotech ELSI -3-

US, NSF and UK, Royal Society, etc. made high level ELSI talks in 2003 or so.

米英は2003年頃、主要人物の間でELSI対話を開始した。

**At the same time, they were discussing Nonotech Research Strategies.**

**ELSI is important not only for the sake of ELSI but Research Policy and Research Strategies.**

ELSI対話は研究戦略を議論する場でもある！

Most of Japanese scientists didn't understand what ELSI is, and What ELSI drives.  
Japanese scientist could not join high level talks in its early stage.

# My Personal History and ELSI -4-

個人的経験から

## Gordon Research Conference -1-

2008 The Gordon Research Conference, August 17 - 22, 2008

Science and Technology Policy - Governing Emerging Technologies

科学技術政策：新興技術を統制する

Targets: Nanotechnologies and Synthetic Biology

対象：ナノテクと合成生物学

similar to this session 本セッションとよく似た会議

Multi-disciplinary, long, and frank discussion among one hundred diversified participants including humanities, social sciences, natural sciences, young and senior researchers with frontrunners in Nanotech and Synthetic Biology

## Gordon Research Conference -2-

What sorts of topics were discussed?

<only information, but examples of Issues which we should discuss in Japan>

### Governing Emerging Technologies

Emerging Nanotechnologies

Emerging Synthetic Biology

### Integrations: Social Sciences, Humanities and Emerging Technologies

Vision, Risk, and Circumstance: Synthesizing the History of Synthetic Biology

Science Fiction and the Moral Imagination of Nano Scientists

Integration of policy analysis and ethics in for-profit and not-for-profit settings

Integrating Ethics with Neural Implant Research

### Emerging Enterprises

Responsible Nanotechnology

Emerging Neuro Enterprises

Bio-Enterprise and Security

## Gordon Research Conference -3-

### Engagements: Publics and Emerging technologies

The National Citizens' Technology Forum on NBIC Technologies

Nano-Scale Informal Science Education

Making emerging technologies public in the Netherlands: The case of synthetic biology

The terms of public engagement in neuroscience: European observations

### Equity, Development, and Emerging Technologies

Nanotechnologies in Latin America

The Impact of Emerging Technologies on the Governance of Abilities and Able-ism

Emerging Technologies and an Emerging Democracy

### Anticipation: Futures of Emerging Technologies

History and the Future of Emerging Technologies

Scenarios and Emerging Technologies

Scanning for Emerging Technologies: Best Practices from Industry

The Future of Neurotechnologies

## Gordon Research Conference -4-

Implementation of Governance Activities 1: **Dual Use and Military Issues**

**Preventive Arms Control** and Nanotechnologies

Protecting Yourself in an Open World: Assessing the Security Significance of Emerging/  
Dual-Use Technologies

**Dual-use and Emerging Technologies**: Exploring Analytic Frameworks for Assessment and  
Governance

Implementation of Governance Activities 2: Civilian Issues

The Role of **Standards** in Emerging Technologies

International Governance of Nano-Risk

How to Go Slow with Emerging Technologies

The Coming **Regulation** of Nanotechnology: National and International Prospects

Prospects for Governing Emerging Technologies: Comments

# My Points on ELSI for Emerging Technology -1-

- Consider differences in issues by technology type and stage
  - 技術の種類、開発ステージによる課題の違い
- **Information Technologies 情報技術**
  - Inherent tendency of social experiment 本質的に社会実験の性格
  - Difficult to discuss ELSI in the development stage... “Dual-use” should be discussed...  
開発段階でのELSIは困難、デュアルユースなど議論すべき問題もあるが
  - Uncover issues that need to be resolved and discussed before social implementation  
社会実装の前に議論が起きる、論点が露見することも
- **Bio Technologies バイオテクノロジー**
  - Early stage discussion on ELSI 早い段階でELSI議論が発生しがち
  - Tend to discuss regulating research, including research guidelines  
研究の規制が話題になりがち、研究ガイドラインを含む
  - Difficult balancing between risk and benefit リスクとベネフィットのバランスを取りにくい

# My Points on ELSI for Emerging Technology -2-

## Legal issues -1-

### 1. Variety of Legal Issues 法制度的課題の多様性

examples:

- Responsibility for accidents during autonomous driving 自動運転時の事故の責任
- Medical imaging technology with AI: Responsibility to use, not to use  
AI医療画像診断技術を使う責任、使わない責任

- Administrative Procedure Law and AI 行政手続法とAI

If the government decides to permit or deny, it must indicate the reason. Therefore, when applying AI to administrative procedures, “Explainable AI” is required.

行政が許可・不許可を決定する場合は、その理由を提示しなければならない。

To change the legal rules or to change the AI?

ルールを変えるか、技術を変えるか（→説明可能AI）

# My Points on ELSI for Emerging Technology -2-

## Legal issues -2-

2. Legal system defines the direction of technology development and social implementation. 法制度等は、技術の発展、社会実装の方向性を決める
3. Ultimate Issues 大きい課題
  - Applying AI to Public Policy 公共政策分野へのAIの適用
    - Should we choice what AI has decided or what has decided by democratic procedure? 人工知能が決定したことと民主主義の関係は？
  - Could AI replace humanities, social sciences and natural sciences?  
AIは人文学、社会科学、自然科学を不要にするのか？



# My Points on ELSI for Emerging Technology -3-

## Barriers of ELSI

1. Consider ELSI in broader sense. ELSIを狭く捉えるべきではない
2. **Naïve Image of Science and Technology, or Innocence**
  - Almighty S&T vs. Useless S&T ・ ・ extreme ideas!
  - Both came from the belief that S&T always gives complete answers.
3. **Gap between ordinary people's time sense and researchers' one**  
一般人の時間感覚と研究者の時間感覚のズレ

# My Points on ELSI for Emerging Technology -4-

## My Final points to be considered

### 1. ELSI inside / with Large-scale Research Projects

- Emerging Technologyの中でやるか、伴走するか

### 2. Open place to be discussed ELSI among unbiased participants, where the topic is not limited.

- ELSIについて議論する場の必要性 不偏性、オープン

Thank you very much.