International Symposium on "Scientific Incertitude and Society : Lessons from Law Court"

国際シンポジウム
「科学の不定性と社会～いま，法廷では・・」

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Introduction　はじめに

Scientific incertitude in law court: From a scientist’s viewpoint

科学の不定性と裁判：科学者の視点から

背景（background）

- 科学と社会のギクシャク

  Mistrust of science and of science policy
- 大震災以降*顕在化*

  Obvious after the disaster 3.11
- 専門家の「科学的助言」

  Expert advice
- 流行語「ただちに影響はない」no immediate (acute)effect
  - 科学と社会，科学と意思決定への社会不信
  - Further mistrust of science and of politician (government)

Scope of this symposium　シンポジウムの目的

科学と社会の「ボタンの掛け違い」を探ること

- “button up my jacket wrong” between science and society

その直し方を探ること

- How to fix it?

科学の不定性（特に多義性）（スターリング教授）

- Key:

Scientific incertitude (esp. Ambiguity)

実践例：　コンカレント・エヴィデンス（マクレラン判事）

- Promising method: Concurrent Evidence (Hon. Justice McClellan)

no immediate (acute)effect

global warming 地球温暖化

naïve scientist may say 古典的「掛け違い」

“global warming caused by greenhouse gases” is not proven

「温室効果ガスによる温暖化は科学的証明がされていない」

It is not scientific to take measures!

「対策を行うのは非科学的」 ケシカラン！

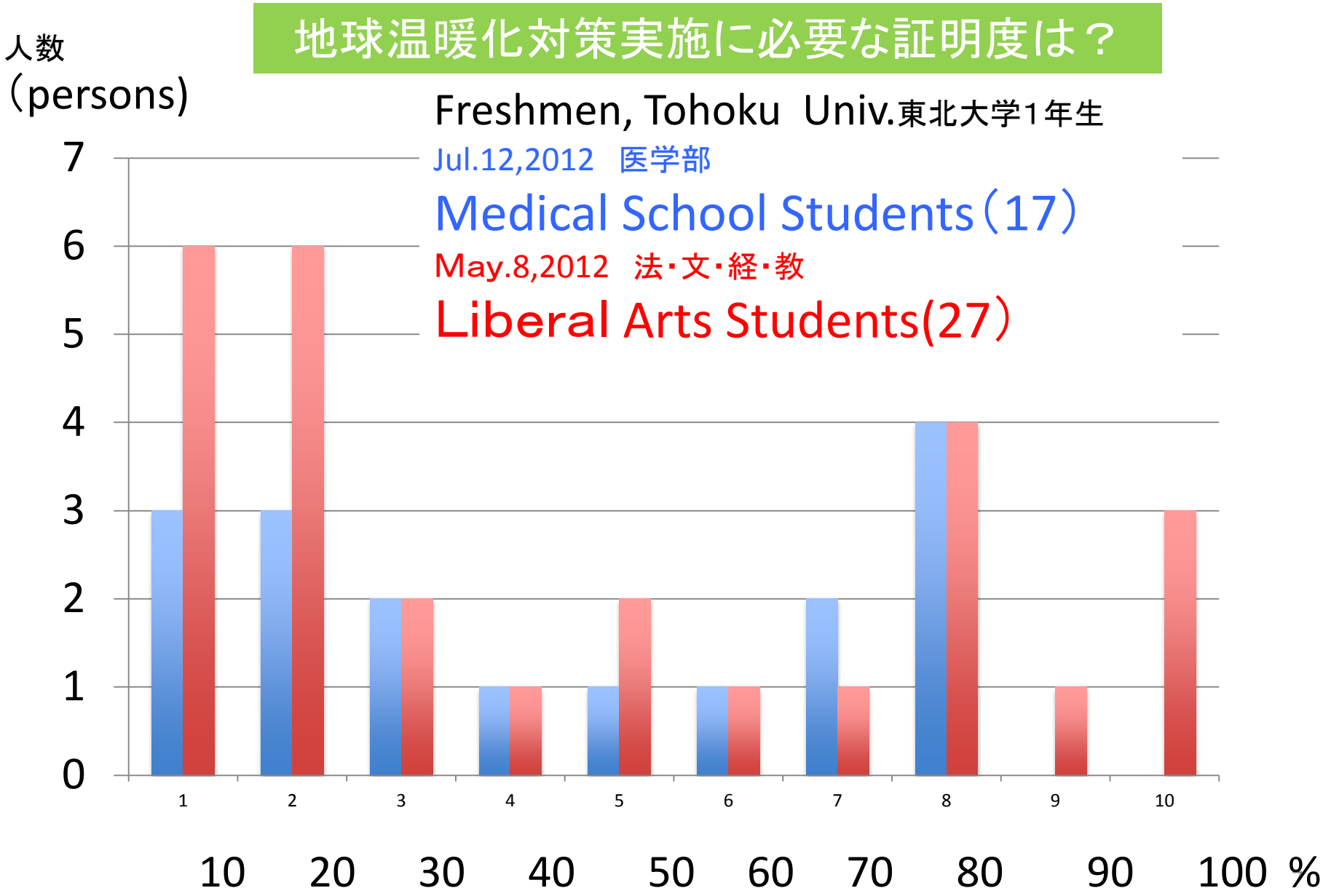
Evidence Based Decision「根拠に基づく判断」

- 仮定：対策には「科学的根拠」が必要

  Naïve Assumption: measure must be justified by “scientific evidence”

- 自然科学（技術も）Natural Science
  - 100%正しい証明：「原理的に不可能」
  - Proof without any doubt is logically impossible
    - 「地球温暖化」・・・実験不可能
    - IPCC ＞90%（100年経って99%になるか・・・?!）
      - 「証明」＝「納得のレベル」・・・科学者によって違う（相場感覚）
        - The threshold depends on scientists.

Survey among students



Russian roulette

- probability and social decision
  - 証明度（確率）と社会的判断
- probability: 17 %
  - 確率: 1/6 (17%)

- No. of persons who can accept this game is 0
  (according to my survey)
  - 社会的判断：受忍できる人：（調べた限り）0人

Mild fever of cold(without any other symptom)

38.5度で解熱剤を飲むべきか？

- Should one take an antipyretic?

エヴィデンスと判断

- Evidence & Decision

EBMを巡る誤解

Evidence Based Medicine & Decision

Ref. Muir Gray's Book "The resourceful Patient"

May “scientists” make decision for others?

何パーセントなら「科学的」ですか？

- Above which % is it “scientific”?

1%なら，ロシアンルーレットでもOKですか？

- Is it OK if the probability of Russian Roulette is less than 1%?

午後に卒業試験があっても，解熱剤飲んでダメですか？

- Is it scientifically wrong to take an antipyretic even if I have an important task this evening?

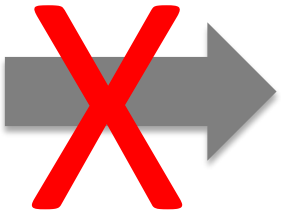
刑事事件と民事事件，判決に必要な証明度が違うのは不合理ですか？

- Is it “scientifically wrong” to make a difference in evaluating evidences, between civil and criminal case?

Science in Social Context

科学的に確たる証明

Concrete evidence



社会的判断

Social decision

社会的判断

Social decision

科学的知識

Scientific evidence

必要性の水準で
on the level needed to the decision

Typical and socially important “mise en scene”, Law court

法廷での「掛け違い」

Systematic problems appear clearly in courts

制度問題が典型的に現れる舞台

Science can always give a clear YES/NO answer to each question?

- (A) Just give me the conclusion. Is the criticism right or wrong?

  —— (W) It's not a matter of right or wrong. We are talking about science, so if I am to answer whether it is right or wrong, then I need to talk about in what sense it is right or wrong, as I mentioned in April, too.

- (A) So your answer is that you cannot answer whether it is right or wrong. Is that correct?

  ——(W) No, it's not.

Science can always give a clear YES/NO answer to each question?

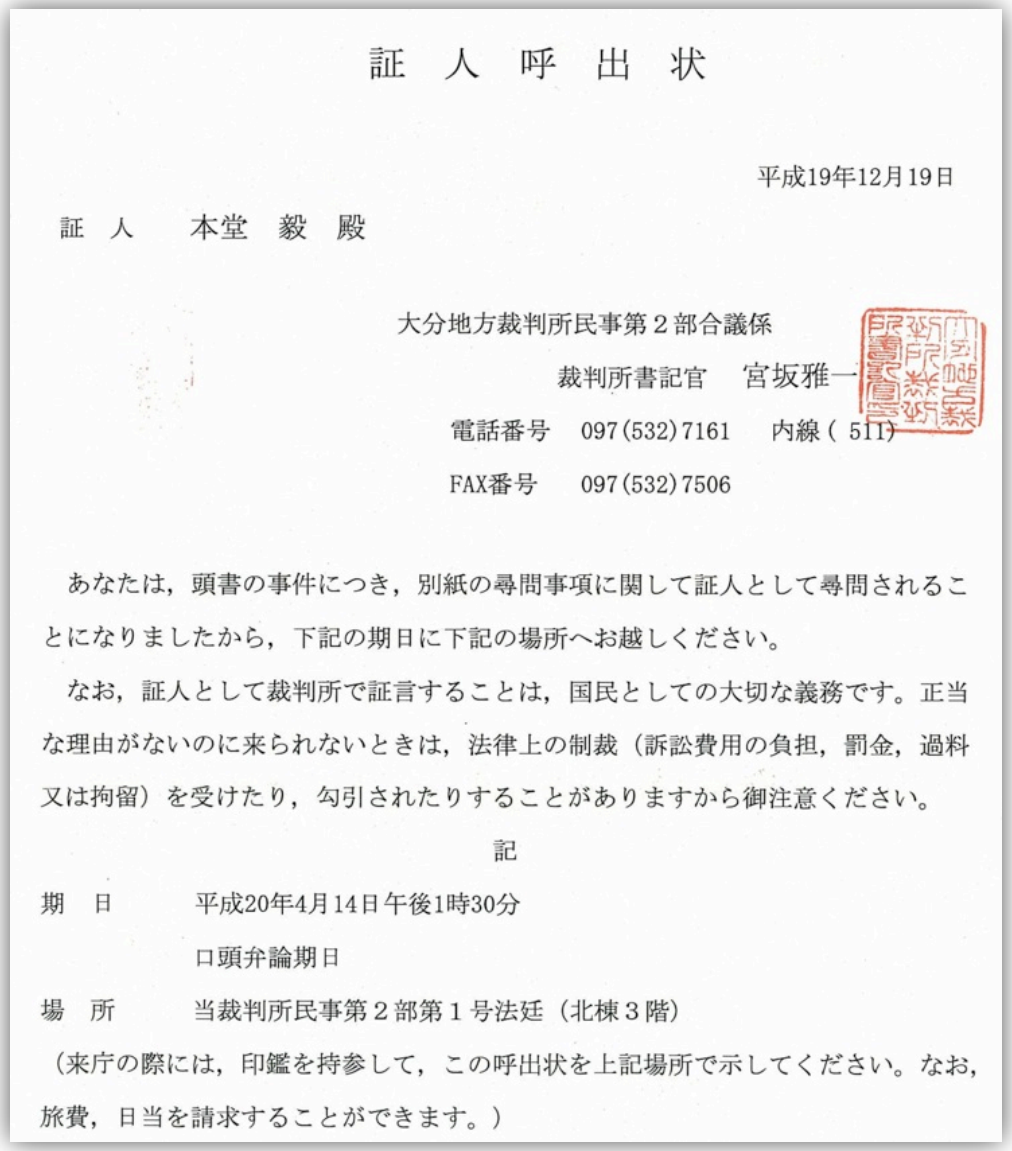
- (A) Then, which is your answer?

  ——(W) What I am saying is that I cannot give an answer without preconditions. In other words, you don't understand what I told you in the previous testimony in April, and science must have validity. And without mentioning in what conditions it is right and in what conditions it is wrong, I cannot give a correct statement. As the presiding judge told me, I will be accused of perjury if I state something wrong. Correct?

- (A) Wait a moment. Please listen to my question. Let me ask you again. Is the criticism by NRPB (National Radiological Protection Board) right or wrong? Or you cannot tell whether it is right or wrong without knowing the preconditions? Which of the three is your answer?

Summons (Oita District Court)

証人呼出状（大分地裁）



証　人　呼　出　状

平成19年12月19日

証　人　　本堂　毅　殿

大分地方裁判所民事第２部合議係

裁判所書記官　宮坂雅一

電話番号　097(532)7161　内線（ 511）

FAX番号　097(532)7506

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期　日　　平成20年4月14日午後1時30分

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場　所　　当裁判所民事第２部第１号法廷（北棟３階）

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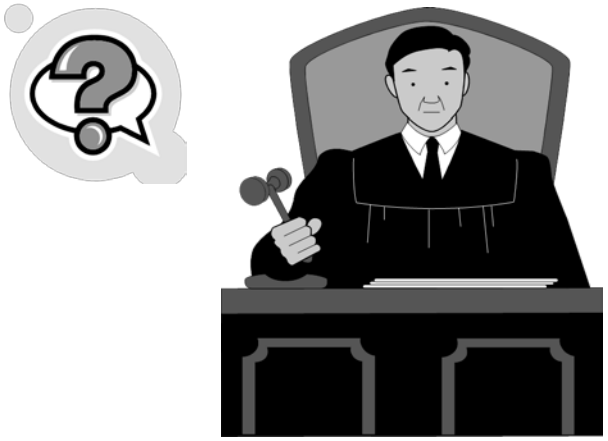
Law Court



3. 補充尋問

1.Examination in chief
主尋問

2. Cross examination
反対尋問

原告代理人
（弁護士）
Plaintiff's lawyer

科学者証人
Scientist (Expert witness)

被告代理人
（弁護士）
Defense lawyer

反対尋問 (Cross Examination)

「反対尋問――この，弁護士たる者が身につけておくべき全技能のうち，最も類い希で，最も利用価値が高く，そして最も修得困難なもの・・・・・・それは，つねに，最も確実な真実の吟味法であり，宣誓にまさる保証となると見做されてきた．」――コックス

ウェルマン「反対尋問の技術」（上） 林　勝郎訳

"The Art of Cross Examination", Francis Wellman

Golden Rules of Advocacy (K. Evans)

"The GOLDEN RULES of Advocacy", Blackstone Press 1993

In cross-examination, what attorneys are encouraged:

- 1. Search for prior inconsistent statement
  - —"do not ask him how it (the inconsistency) can be explained" (p.100)
- Stop when you get what you want
- Use leading questions
  - —"Get rid of all the ifs and buts."
  - — Never ask 'Why?' and Never ask 'How?'

Leading question (Civil Proceedings Regulations)

誘導尋問（民事訴訟規則）

第百十五条　質問は、できる限り、個別的かつ具体的にしなければならない。

- Questions must be as discrete and specific as possible

２ 当事者は、次に掲げる質問をしてはならない。ただし、第二号から第六号までに掲げる質問については、正当な理由がある場合は、この限りでない。

- Following question must be prohibited. But, the prohibition for the articles between 2 and 6 may be exempted in case with justification.

1. 証人を侮辱し、又は困惑させる質問

1.Question which abuse or confuse a witness

2. 誘導質問

2.Leading question

3. ・・・・・・・・・・・・　「敵性証人」,「弾劾」,「誤導の禁止」

Skill: How to fabricate?

Golden Rule (Evans)

- "The First Golden Rule of Examining Witnesses is:
  - THINK CONTROL.
  - Know what you want them to say.
  - Then make them say it.

- The rules be summarized:

1) Use leading questions
2) Let the witness answer with Yes or No
   (Don't let him or her explain)

Study findings are wrong if there is a criticism against them.

- (A) Is it in accordance with what you call scientific literacy to refer to the widely criticized REFLEX report in arguing as if electromagnetic waves from mobile phones affect our health?

—— (W) Mr. Yokoyama, you mentioned now that it is not proper because there is a criticism. Do you recognize the precondition as correct?

- (A) Please listen to my question.

——(W)No. What I am saying is that I cannot give a correct answer if the precondition is not proper. I mean, I cannot answer correctly under an improper precondition.

- (A) Let me state the question again. There is a lot of criticism against this REFLEX report. What I am asking is whether it is in accordance with what you call scientific literacy that you refer to the report in this trial in arguing as if electromagnetic waves from mobile phones affect our health? You can answer with Yes or No.

——(W) No, as I told you in April, the problem is the precondition ---

- (A) I think this is a question you should answer with Yes or No.

——(W) That is not proper. I am here as a scientific witness, and a scientific witness must tell facts correctly. Those who are here do not have basic scientific background, so it will be against scientific literacy, or scientists' ethics if I answer with just yes or no to the questions that cannot be answered with a single word. That is why I cannot give such an answer. I believe I already said before Mr. Yokoyama in April why I need to talk about the necessity of referring to this point .

- (A) Well, let's move on to the next question.

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How to get desired result 創作落語

都合の良い科学的結論の作り方：

How to fabricate desired result?

「ゴールデンルール」の要請：“Golden Rule” demands

1） 誘導尋問を用いる

1）Use “leading question”.

2） Yes, No で答えさせる（証人に説明させない）

2）Let witness answer, “Yes” or “No”. Don’t ask him/her “why”.

正直者の科学者が誘導尋問に素直に答える（熱力学編）

If a naïve scientist answers to leading questions …

(Thermodynamics version)

Exercise

An example of fabrication: thermodynamics case

- (Questioner) You specialize in thermodynamics. Is that correct?
- (Scientific witness) Yes.
- Here's my question. Is it a correct understanding that heat capacity is the heat quantity required to raise the temperature by one degree?
- Yes.
- What is the heat quantity required to raise the temperature of a room with a volume of 10 thousand liters from 20 to 30 degrees?
- (After calculation) XX kilocalories (kcal).
- We requested a national laboratory to make a huge piston without any air leakage and to experiment by putting 10 thousand liters of air in it. They found that the heat quantity required for the temperature increase of 20 to 30 degrees was YY kcal. Here is a written certificate. They say the finding coincided with the theory written in textbooks. Well, you just answered that XX kcal is required. Correct?
- Yes.

Attorney wins in debate!
(at some place of argument such as "summation")

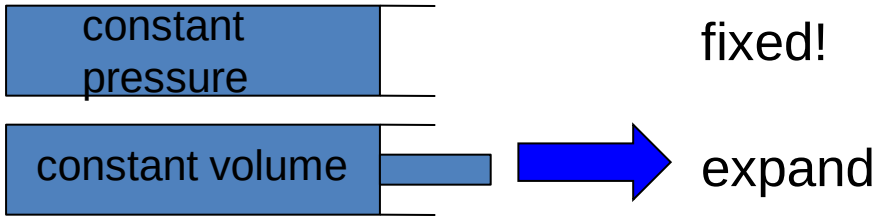
Questioner) Presiding judge! As the answer shows, the testimony by the witness contains statements that contradict even the textbook knowledge of physics. Therefore, it is proved that there is no scientific credibility in the assertion of the witness.

(q.e.d.)

Anyone found the trick?

Why fabrication available?
debate (adversary system) Who noticed?

- 1) Scientific Literacy of lawyers
  - Ignorance about condition dependence (making a switch) (cf. Jasanoff, What Judge Should Know about the Sociology of Science, 1990)
    - Heat capacities at
      - Constant volume, Cv
      - Constant pressure, Cp



- 2) Problem of legal system
  - The witness cannot make a free statement
    - Even if one sees "fabrication" in one's sight
  - Witnesses are allowed to answer only what is asked.
  - Questioner can finish his/her examination anytime
- From jurisprudence viewpoint, it may be regarded as "misleading". Attorney can claim against "misleadingness". But who can claim, especially in case of precautionary issue where there are no firm evidence for legal decision?!

Scientific misconduct

Fabrication of fact: scientific misconduct

see, “On being a scientist” by National Academy of Science

1.Scientists are requested to make personal value judgment, while professional ethics demands scientists neutrality.
2.Explanation of scientists are used for a fabrication of fact (by leading questions), while scientists have social responsibility to correctly inform the public.
Scientists are forced to act against their professional ethics.

Science in conventional adversarial system: Globally recognized problem

世界的に認知されている問題

- Hon. Justice McClellan ⇒ Concurrent Evidence

マクレラン判事　コンカレントエヴィデンスで解決

- NY Times “AMERICAN EXCEPTION, In U.S., Expert Witnesses Are Partisan” (By ADAM LIPTAK)
- Rafael Encinas de Munagorri (RDST, France)

フランス・法と科学技術ネットワーク代表, ナント大学法学部教授

科学的不定性が強い場合：致命的

In case scientific incertitude is crucial

強い不確実性：未来予測など

- Uncertainty: Future prediction, esp. new technology

殆どが「推測」：確たる証拠がないから

- As we have, logically, no firm evidence

「誤導」かどうか，分かり得ない

- Lawyers, in general, cannot discriminate whether it is “misleading”

何を知りたいか，懸念しているか（多義性）

- Anxiety about what? (Ambiguity)

Chronic exposure to substance and its effect (leading question) 1

- この物質を一回に摂取して死亡する量は，成年男子の場合，500マイクログラムで正しいですか？
- Is it true that the fatal dose for adulte male is 500 micro grammes?
  - はい(YES).
- この物質の影響として，現在科学的に厳密に証明されている影響は，これだけですね？
- It is the only established effect of the substance, isn’t it?
  - はい(YES).
- 今回の摂取量は，一日平均0.1マイクログラムで，それを１年間摂取したということですから，0.1x365，すなわち40マイクログラム以下ですね？
- As he has taken about 0.1 microgram daily for one year, the total amount of intake is less than 40 grams, isn’t it?
  - はい(YES).

Chronic exposure to substance and its effect (leading question) 2

- 40マイクログラムは，科学的に証明されている致死量500マイクログラムの10分の１以下ですね？
- It is less than 1/10 than that of established fatal dose, 500 micro-grams, isn’t it?
  - はい（YES）
- ということは，その程度の微量曝露では影響が現れる可能性について，科学的に確たる証拠はないのですね.
- Then, there is no firm evidence that such a low-level exposure can cause health effect, isn’t it?
  - はい（YES）

- 尋問を終わります.
- This ends our examination.

科学的には厳密・・・

Scientifically rigour

でも，何かおかしい

But, something wrong….

something like

「ただちに影響はない」?

Ambiguity of scientific evidence

- 対象の「選択」 Choice of object
  - 急性影響，慢性影響 Acute or chronic
  - 致死量，他の慢性疾患への影響(QOL)
  - Endpoint: death or QOL?
  - ref. シックハウス症候群（sick building syndrome）

科学的証拠の多義性

Ambiguity of scientific evidence

- 科学的議論：対象「選択」後に可能

■ Scientific discussion: available only after the choice

- 議論対象が噛み合わない ⇒ 不毛，不信

■ Object of scientific discussion, well shared?

- 対象の選択：科学では決まらない
- Choice of object: matter which is out of science
- 科学の対象でも，不確実性が高いことも
- May have uncertainty even after the choice

Condition for constructive discussion in Science

建設的議論・制度へ

- 現状：不定性（科学で決まらないこと）と科学的知見を混同，
  科学自体の議論をも阻害

Present: Lawyers attack “incertitude” resulting in fruitless debate

- 社会的規範判断の議論が置き去り
- Leaving the discussion of social norm

- 「不定性」（多義性，不確実性etc.）の正しい整理　ー可能にする制度設計

“Scientific incertitude” must be recognized and called into account systematically in Expert Evidence

Problem of institutional design

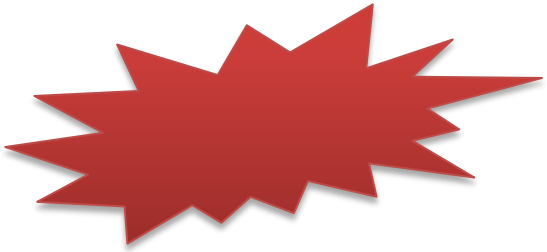
制度設計の問題

- 個々の法律家，科学者の意識ではどうにもならない

Institutional problem: which cannot be overcome by individual lawyers and scientists

- 行動規範の衝突

Conflict of code of conduct between the two fields



Conflict of “code of conduct” under current system

現制度: 2つの「行動規範」の衝突

Lawyers

- Code of conduct as lawyers asks them to “win” the case
- Thus, they should attack scientific incertitude inherent in science
- They ask witnesses to give evidence as if the scientific knowledge is firm enough, even if it not.

•Code of conduct as scientist asks us to tell the truth.
•Thus, we can seldom give evidence without uncertainty, because scientific evidence are a posteriori and depends on experimental condition.
•Dr. Leonard Welsh said, “After you come out of court, you feel like you need a shower. They’re asking you to be certain of things you can’t be certain of”
(New York Times, 2008)

Expert witness
(ex. Scientist)

Philosophy:
why court uses scientific evidence

普遍性 universality → 公共知 public knowledge

対立する紛争当事者間でも共有できる公共知

Science:

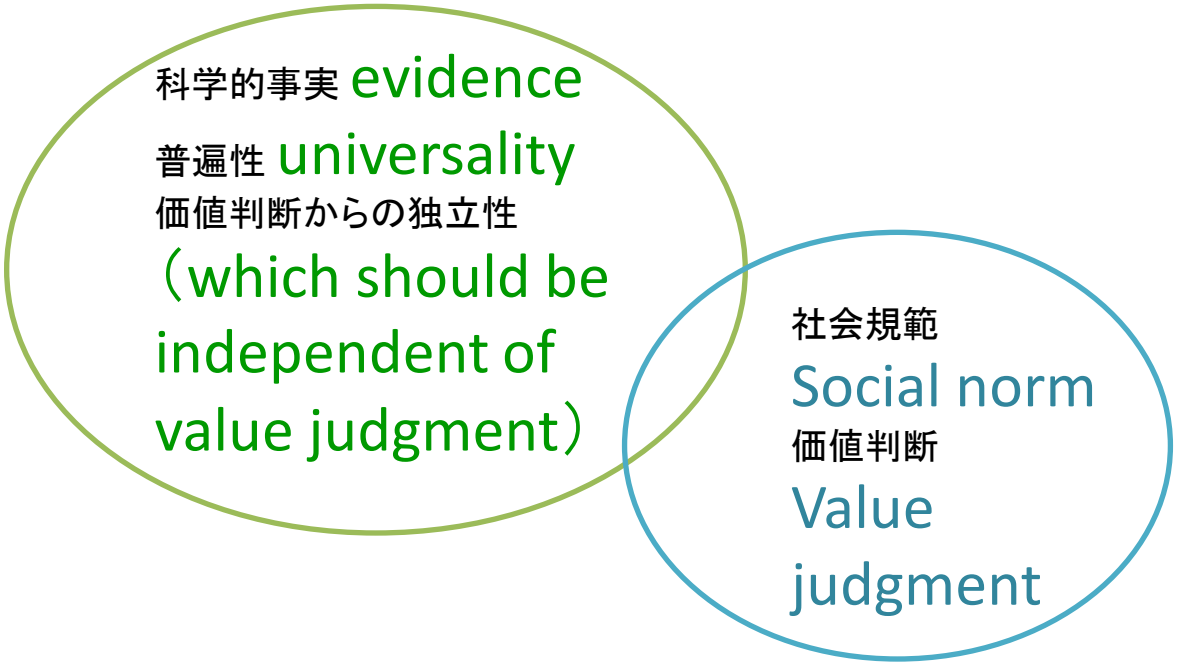
Public knowledge

that can be

shared between

parties in conflict

現状： 産湯とともに赤子を流す.



Don't throw the baby out with the bath water.

Toward “reconstruction” with consideration of “incertitude”

科学的不定性を踏まえた“再構築”へ

- 科学者への丸投げ Scientists’ decision only ×
  - 社会的文脈と不整合as often mismatched with social context
- 無秩序な攻撃（誘導尋問等）

Barbaric reconstruction as attack using leading question ×

- 科学的合理性，特に不定性と不整合
- as mismatched with scientific knowledge, esp. incertitude
- ----------

社会的文脈と科学的合理性，共存のための制度設計：コンカレント・エヴィデンスの示唆

How to design the system which makes use of scientific knowledge efficiently in social context?

Ref. Concurrent Evidence

As an organizer of the symposium:

Focus and design of this symposium
(2 slides)

シンポジウム，今日のフォーカス (Focus of this symposium)

For simplicity, “science” here is as:

- 評価するものとしての科学
  - Science as a tool for assessment
- 当事者ではなく，第三者
  - Not central party, but third party
- 事後的な問題ではなく，これからを問う問題
  - Not retrospective, but prospective issues
- 法廷：訴訟当事者でない科学者「証人」
  - Role of expert witness or expert advice

Panel Discussion

- 質問票を回収（submission of questionnaire) ～14:45
- 集計(summarizing the questionnaire)

- 個別回答(individual Q&A)
- パネリストの議論(among panelists)
- フロアからの問題解決への提案(contribution from floor)
- まとめ(summary)

- アフター・カフェ(Café juridique)