

# The Science of Expert Opinion

DIMACS Workshop held under the auspices  
of the *Special Focus on Algorithmic Decision  
Theory* and the Army Research Office

Rutgers University

October 24-25, 2011

# Workshop Agenda

**Monday, October 24, 2011**

- 8:30 - 9:00**      **Breakfast and Registration**
- 9:00 - 9:15      Opening Remarks  
Fred Roberts, DIMACS Director Emeritus
- 9:15 - 9:30      Introduction  
Cliff Behrens, Telcordia Technologies
- 9:30 - 10:45      Keynote Talk: *Eating the Pudding*  
Roger M. Cooke, Resources for the Future
- 10:45 - 11:00**      **Coffee Break**
- 11:00 - 11:45      *Training to Improve Judgmental Expertise by Using Decompositions of Judgment Accuracy Measures*  
Eric Stone, Wake Forest University
- 11:45 - 12:30      *Use of Expert Judgment in Risk Assessments Involving Complex State Spaces*  
Thomas A. Mazzuchi, The George Washington University
- 12:30 - 1:45**      **Lunch Break**
- 1:45 - 2:30      *Cultural Consensus Theory: Detecting Experts and their Shared Knowledge*  
William Batchelder, University of California, Irvine
- 2:30 - 3:15      *Overlapping Expert Information: Learning about Dependencies in Expert Judgment*  
Jason R. W. Merrick, Virginia Commonwealth University
- 3:15 - 3:30**      **Coffee Break**
- 3:30 - 4:15      *Consensus Building Using E-DEL+I: Lessons Learned*  
Carolyn Wong, The RAND Corporation
- 4:15 - 5:00      *Combining Multiple Expert Systems using Combinatorial Fusion Analysis*  
D. Frank Hsu, Christiana Schweikert and Roger Tsai, Fordham University
- 5:15**              **Dinner**

# Workshop Agenda (cont.)

**Tuesday, October 25, 2011**

**8:30 - 9:00**      **Breakfast and Registration**

9:00 - 9:45      *Explanations as Indicators of Expertise*

Winston R. Sieck, Global Cognition

9:45 - 10:30      *Justified Opinions are Better than Simple Ones: The Use of Argumentation  
in Forming Collective Opinions*

Alexis Tsoukiàs, Université Paris Dauphine

**10:30 - 10:45**      **Coffee Break**

10:45 - 11:30      *The Wisdom of Competitive Crowds*

Casey Lichtendahl, University of Virginia

11:30 - 12:15      *Expert Judgement and Societal Decision Making in a Web-connected World*

Simon French, University of Warwick

**12:15 - 1:30**      **Lunch Break**

1:30 - 2:15      *Uncertainty, Expert Judgment, and the Regulatory Process: Challenges and Issues*

Bob Hetes, Environmental Protection Agency

2:15 - 3:00      *Roles for Elicitation in Physics Information Integration: An Expert's Perspective*

James Langenbrunner and Jane Booker, Los Alamos National Laboratory

Tim Ross, University of New Mexico

**3:00 - 3:15**      **Coffee Break**

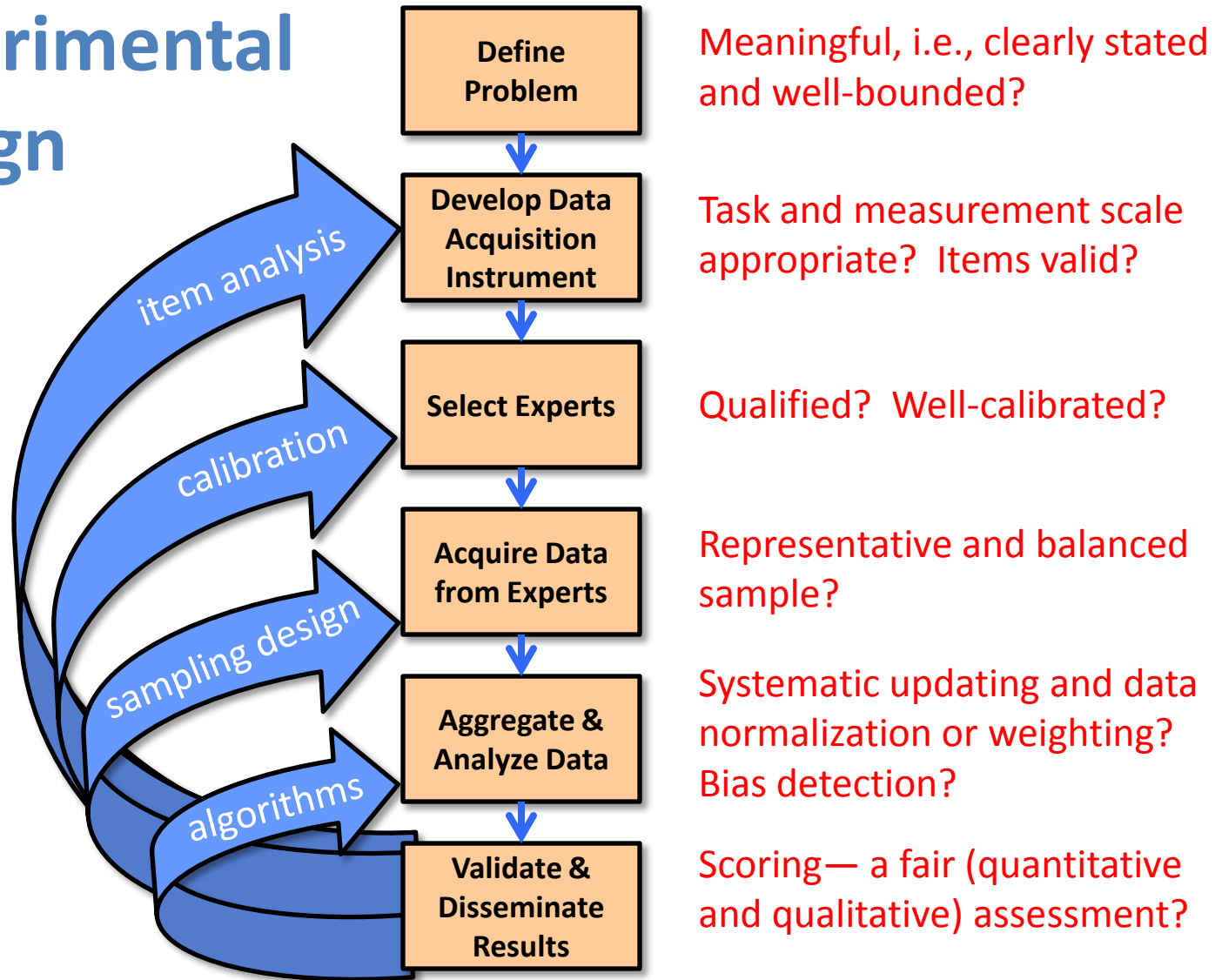
3:15 - 4:15      General Discussion

4:15 - 4:30      Closing Remarks

Cliff Behrens, Telcordia Technologies

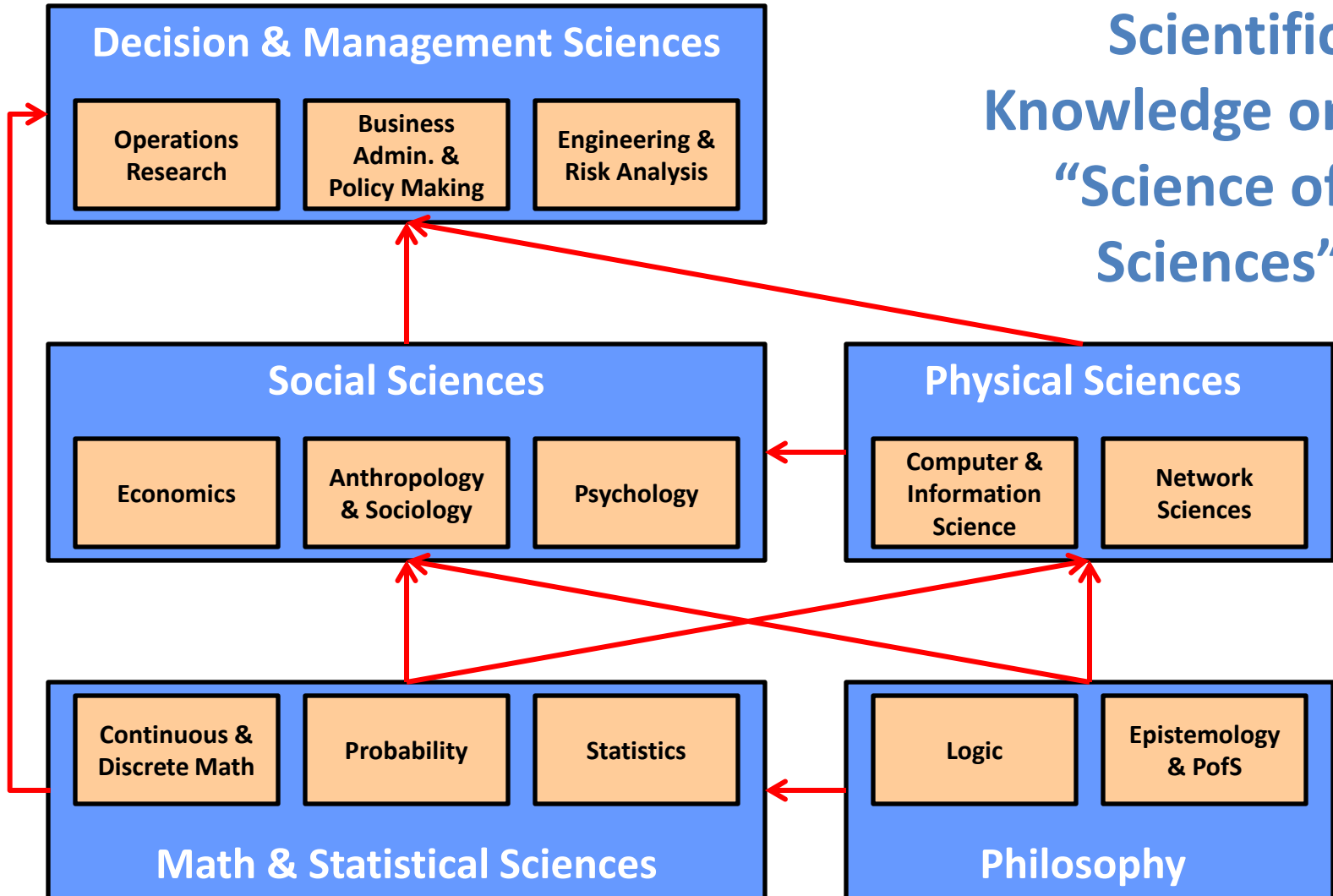
# Where's the Science in EE?

## Experimental Design



# Where's the Science in EE?

Cumulative  
Scientific  
Knowledge or  
"Science of  
Sciences"



# Who Are We?

<b>Researcher</b>	<b>Discipline</b>	<b>Affiliation</b>
William Batchelder	Psychology & Cognitive Sciences	U. California - Irvine
Cliff Behrens	Mathematical Anthropology	Telcordia Technologies
Roger Cooke	Philosophy & Mathematics	Resources for the Future
Simon French	Information & Decision Sciences	U. of Manchester
Robert Hetes	Environmental Sciences	EPA
Frank Hsu	Discrete Mathematics & Computer Science	Fordham U.
James Langenbrunner	Nuclear Physics	Los Alamos National Lab
Casey Lichtendahl	Business & Decision Sciences	UVA
Tom Mazzuchi	Mathematics/OR	The George Washington U.
Jason Merrick	Mathematics/OR	Virginia Commonwealth U.
Winston Sieck	Cognitive Psychology & Statistics	Global Cognition
Eric Stone	Cognitive Psychology	Wake Forest U.
Alexis Tsoukiàs	Computer Science & Systems Engineering	Université Paris Dauphine
Carolyn Wong	EE, Management & Mathematics	RAND

# Why Are We Here?

- Address recent criticism of expert elicitation (EE) methods
  - Tetlock, Philip. 2005. *Expert Political Judgment: How Good Is It? How Can We Know?*
    - “When we pit experts against minimalist performance benchmarks — dilettantes, dart-throwing chimps, and assorted extrapolation algorithms — we find few signs that expertise translates into greater ability to make either ‘well-calibrated’ or ‘discriminating’ forecasts.”
  - Gardner, Dan. 2011. *Future Babble: Why Expert Predictions Are Next to Worthless, and You Can Do Better*
    - “They’re wrong a lot, those experts. History is littered with their failed predictions. Whole books can be filled with them. Many have been.”
- Examine the current state-of-the-art in EE methods & applications
- Share lessons learned, and from multidisciplinary perspective
- Expose areas where improvements and new research are most needed

# EE is a HARD PROBLEM!

- What's the probability of a person walking across the Atlantic Ocean?
- Assemble a panel of experts including:
  - psychologist(s), human physiologist(s) and kinesiologist(s), meteorologist(s) and atmospheric scientist(s), marine biologist(s) and ichthyologist(s), engineer(s) that have won the U. of San Diego "Walk on Water" competition
- Develop alternative scenarios and decompose them into their constituent event sequences
- Apply formal methodology, i.e., EE, aggregation using Delphi or Classical Model ...?
- Someone from the "crowd" cries out, "Wait...doesn't anybody remember Rémy Bricka?"



# FRENCHMAN FULFILLS LONGTIME DREAM OF MANKIND BY 'WALKING' ACROSS ATLANTIC OCEAN IN 61 DAYS

Published in *Deseret News*, June 5, 1988

Fulfilling one of man's oldest dreams to walk on water, a 39-year-old Frenchman has managed to walk across the Atlantic Ocean, it was reported Saturday. Reme Bricka, with polyester floats strapped to his feet, reached the Caribbean island of Trinidad after a 61-day, 3,540-mile transatlantic trek from a beach in Tenerife in Spain's Canary Islands, newspaper reports said. A Japanese freighter picked him up about 45 miles off the coast of Trinidad Tuesday and took him to a hospital, the reports said.



Bricka used a double-bladed oar and towed a rubber raft to rest in during the journey and survived on vitamin pills, fish he caught and distilled water. The Canary Island newspaper *Diario de Avisos* said Bricka lost 44 pounds, suffered extreme hunger and vision problems but that his condition was otherwise satisfactory.

Bricka, an entertainer, said he had spent three years preparing his Atlantic crossing. "I am not crazy. I want to fulfill one of man's oldest dreams, which is to walk on water," he said before setting out April 1 from Tenerife's Los Cristianos beach despite a ban by Navy officials. Bricka said he had crossed the English Channel and "walked" from Cannes on the French Mediterranean to the island of Corsica to test his floating shoes.

# What Makes EE So Hard?

- Elicitation issues
  - bounding the problem, e.g., space, time, culture
  - measurement, e.g., verbal or numerical values of uncertainty
  - coaching probability
- Bias issues, e.g.,
  - Availability
    - How does this new knowledge change our assessment now that it is “available?”
    - What is the probability that a person could walk across the Pacific Ocean?
  - Representativeness
    - Probability of Rémy Bricka walking across the Atlantic is “1”...he’s already done it. But is he representative of the larger population from which we might draw our hypothetical argonaut?
  - Hindsight
    - Well...after all, this IS what I really meant by “extremely unlikely.”
  - (Dis)confirmation
    - Heh...you didn’t tell us that this argonaut could wear floats on his feet, otherwise I would have gotten it right.
  - Narrative
    - Most religious might base assessment on belief that no mere mortal could ever walk on water, at least not without divine intervention.

# What Makes EE So Hard?

- Aggregation issues
  - calibration of experts and dearth of suitable calibration variables
  - weighting of experts
  - correlations among experts
  - aggregate judgments before or after propagating them through model scenario?
- Hope to address these issues and others over the next two days

# Rémy Bricka: Stalking the 7 Seas

*Outside Magazine*, June 2004

RÉMY BRICKA FIRST CROSSED the Atlantic Ocean in 1972, sailing luxury-class aboard *France*, a 1,035-foot passenger steamer. For his second trip, he decided to walk.

The French-born Bricka, then 38, left the Canary Islands on April 2, 1988, with his feet lashed to a pair of 14-foot fiberglass pontoons. Behind him, he towed a raft outfitted with a coffin-size sleeping compartment and carrying fishing tackle, compass, sextant, and three portable water desalinators. Walking 50 miles a day with a precarious upright rowing technique that made him look like a drunk nordic skier, Bricka aimed for the Caribbean island of Guadeloupe, subsisting on fish and plankton he scooped up from drifting schools.

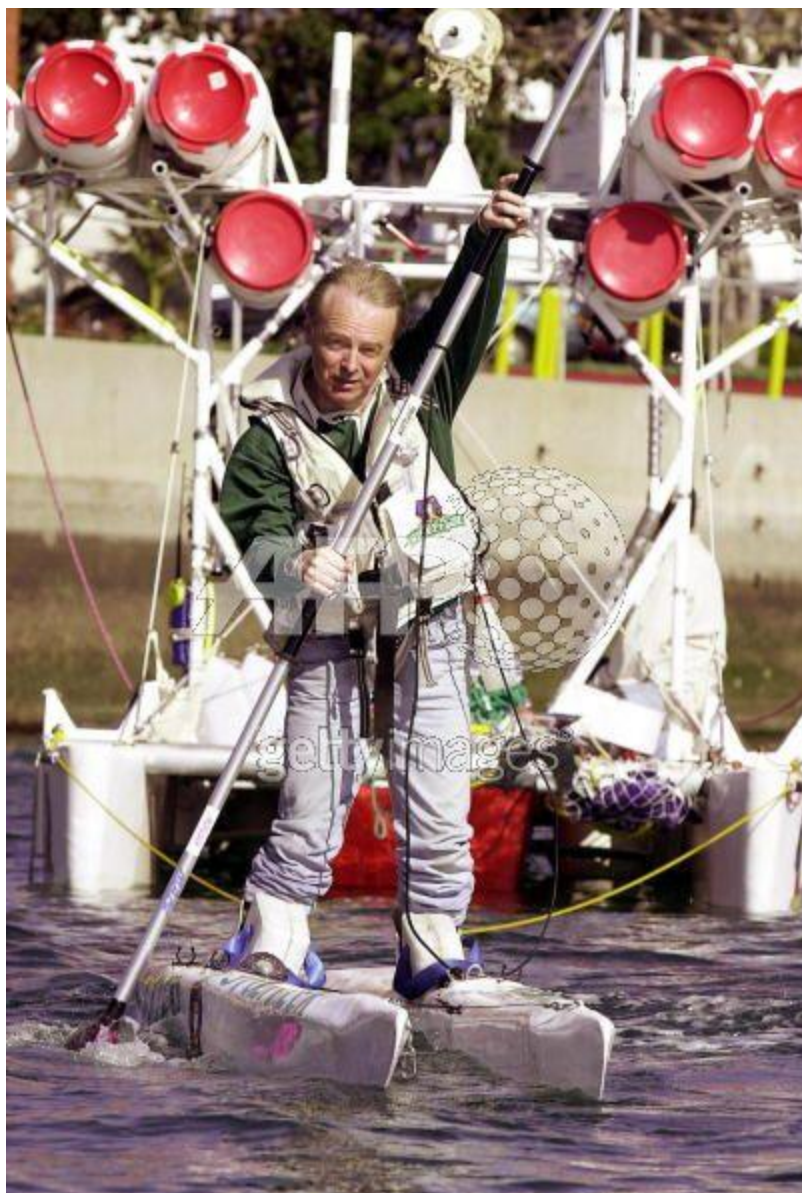
Strange as it seems, given these foolproof preparations, there were problems. Two of Bricka's desalinators bonked halfway through his stroll, so he supplemented his hydration with a daily quart of seawater. Two months in, a Japanese trawler plucked him from the Caribbean near Trinidad. Emaciated and hallucinating ("I saw trolls attack my legs!" he recalls), he'd dwindled from 160 pounds to 110.

The feat—a 3,502-mile hike over open ocean—earned Bricka a Guinness world record but grabbed few headlines in France, where he's famous for another form of performance art. Clad entirely in white, Bricka tours the country with two dozen instruments strapped to his body and a pet dove and rabbit riding shotgun on his shoulders. He's known to one and all as L'homme Orchestre, or the One-Man Band.

So far, the only person to challenge Bricka's water-walking record is Bricka himself. In April 2000, he left Los Angeles, planning to walk the Pacific and arrive in Sydney in time to crash the Summer Olympics. Stoeffler, a French deli-foods company, donated an 11-pound tub of sauerkraut and put up \$100,000 for equipment, including freeze-dried meals, an Iridium satellite phone, and a GPS unit.

En route, Bricka ran out of food and his Iridium service shut down. A cyclone packing 50-foot swells thrashed his raft. Using a handheld messaging device, he e-mailed a plea to his wife, in Paris: "Come pick me up now or I'll have to hitchhike."

Ten days later, an American tuna boat found Bricka 500 miles south of Hawaii. He'd failed, but it was a grand failure: The oompah man of the sea had covered 4,847 miles in 153 days.



# Discussion Topics

1. In 2008, 18 authors including four Nobel laureates, wrote an article in Science titled "The Promise of Prediction Markets." However, the promise of prediction markets, as a way to aggregate expert opinion, has not exactly come to pass. Several firms, such as Eli Lilly, General Electric, Google, France Telecom, Hewlett-Packard, IBM, Intel, Microsoft, Siemens, and Yahoo, have conducted large-scale experiments with them. But the reviews appear to be mixed. In 2008, Barry Ritholtz, the blogger at The Big Picture web site, wrote about the failure of prediction markets: "They are thin, trading volumes are anemic, the dollar amounts at risk are pitifully small. Thus, these markets are subject to failure at times." Dan Gross wrote in Slate that "these are less futures markets than immediate-past markets." On the academic side, a recent article in Management Science by Healy et al 2010 presents empirical evidence that in complex environments with few traders, the Delphi method outperforms the prediction market's double auction mechanism. **What does this group think about the future role of prediction markets in aggregating expert opinion?**

# Discussion Topics (cont.)

2. What is the right balance between Relativist vs. Positivist perspectives, i.e., does world view or culture so shape the way humans gather and process information that objective “scientific” assessments of human opinions are meaningless?
3. What is good practice in reporting expert judgment?
4. How might we perform a 'meta-analysis' of several similar, but 'independent,' expert judgment studies?
5. How aware are experts of the inferences they make in everyday practice, and their associated uncertainties?
6. What new EE research is needed most?
7. Are the failures of EE forecasting related more to insufficient methods or to the delusion that one can predict the future?
8. Which is more effective, combining experts' distributions before or after propagating them through the model?
9. “Groups do not decide: individuals do. Beliefs, values, intentions all reside in individuals, not groups. Groups are better viewed as social processes which translate the individual decisions of the group members—their ‘votes’—into a course of action,” cf., French 2011.