A few remarks on the roadmap for NeuroIT

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Consciousness

- In need of a definition.

- Unconscious processes are useful:

  1. Reflexes.
  2. Dreams.
  3. Altered states of consciousness: hypnosis.
  4. Creative thinking (Poincaré discovering the Fuchsian functions).

- We need top-notch representatives of **human sciences** within Neuro-IT projects (e.g. the "conscious machines" projects).

Economy

- Blue-sky research is very nice.

- Study of the (dis)advantages of this kind of research in terms of **jobs**, **wealth** creation, **wmds**.

- Competition with genetic engineering.

Theory

- We need more sophisticated mathematics.

- Are they around or not?

  1. **Morphology**: shape optimization (Delfour, Zolesio . . .)
  2. **Morphogenesis**: singularity/catastrophe theory (Thom, Whitney . . .)
  3. **Systems**: dynamic systems analysis (Yoccoz, . . .)
  4. **Systems hierarchy**: decomposition/decentralization (J.-L. Lions, . . .)
  5. **Statistics**: spikes are important, Hawkes processes, inspiration from queing theory (modeling of the Internet).
  6. **Information Theory**: the brain must be optimizing measures of mutual information.

- We need top-notch mathematicians within Neuro-IT.

Measurements

- We need better measurements of brain activity.

- Bridge the spatio-temporal gaps between various modalities: xMRI, EEG, MEG, PET, Optical Imaging: "Meta" sensor.

- Inputs from IT: signal, image processing, computational geometry.

- Multielectrode recording is fundamental (e.g. the "Brain-probe" project).

Modeling, simulation

- Basic to understanding.

- Simulation involves engineering: mechanical-, bio-, chemical-, (hard)software-engineering.

- Complexity of software and hardware developments for Neuro-IT (e.g. the "constructed brain" project) is orders of magnitude more complex than the most complex software-engineering projects.