



CENTRE  
INTERNATIONAL  
DE RECHERCHE  
SUR L'ENVIRONNEMENT  
ET LE DÉVELOPPEMENT



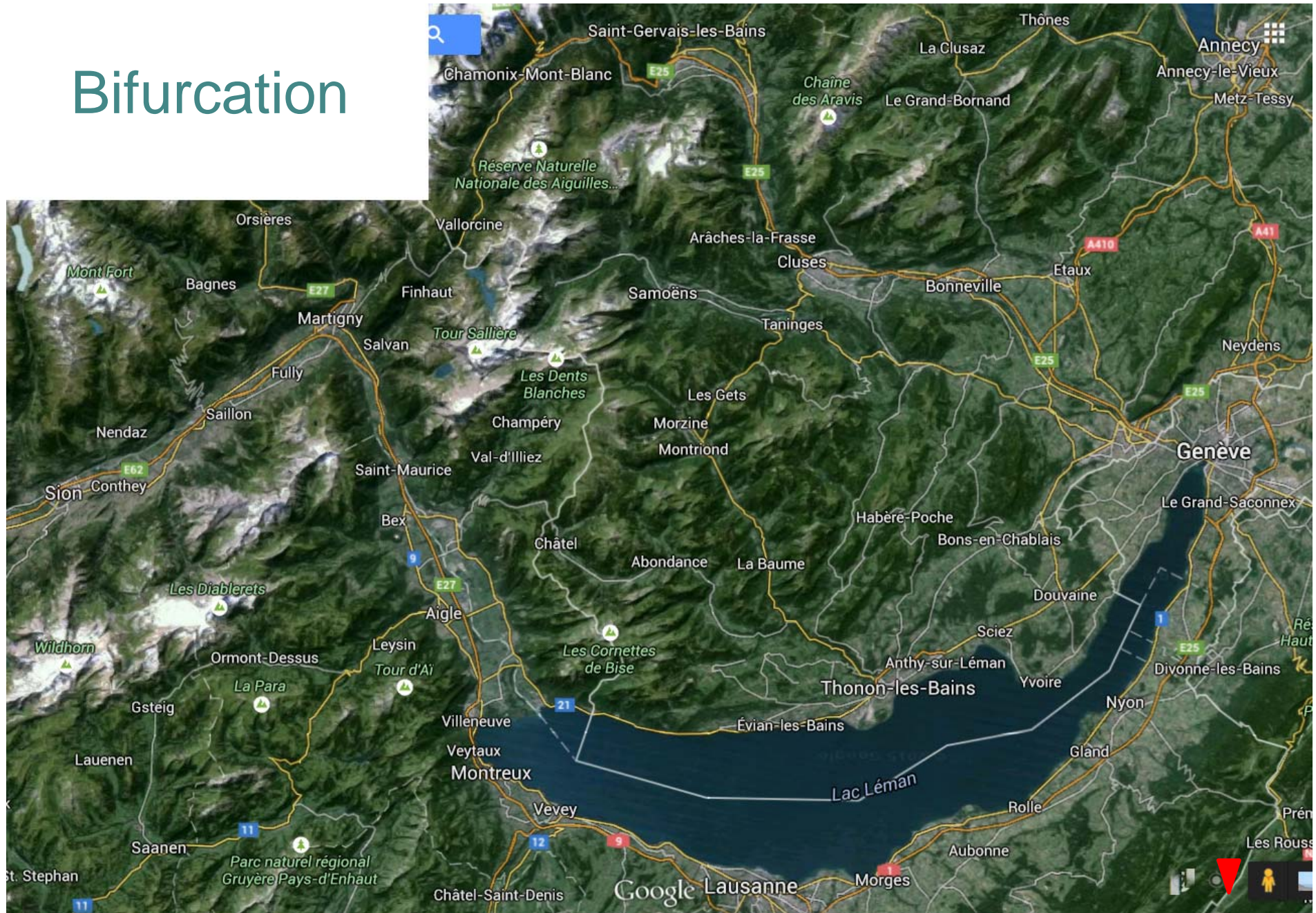
# Bifurcations, path dependency and lock-ins: Concepts and implications for climate mitigation

**Franck Lecocq, CIRED**

LCS-Rnet 2015  
Paris, 16 June 2015

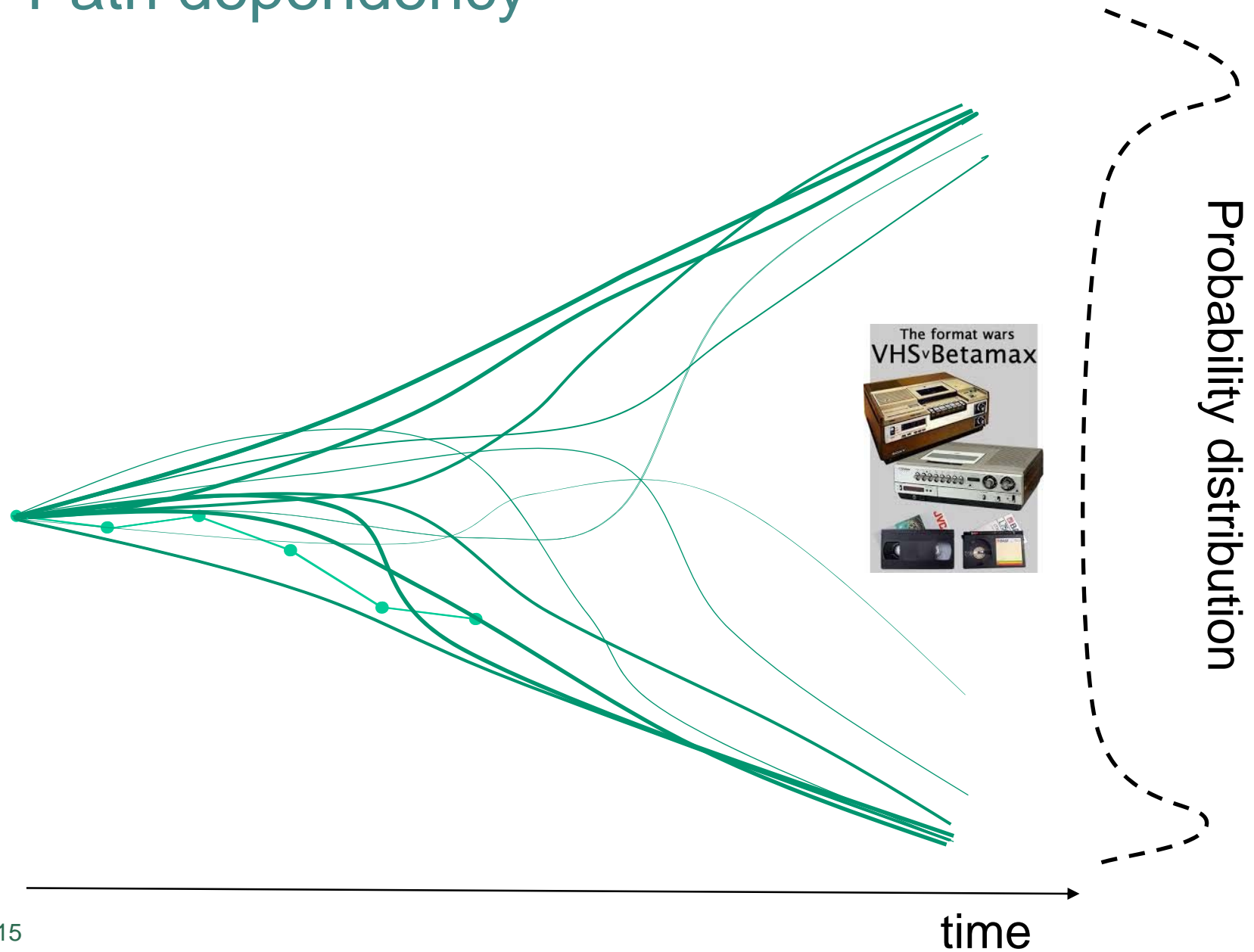


# Bifurcation



16 June 2015

# Path dependency



# Lock-in

---



FIGURE 3  
Map showing the routes of major expeditions of exploration between 1835 and 1850



FIGURE 1  
1947 US interstate highway plan

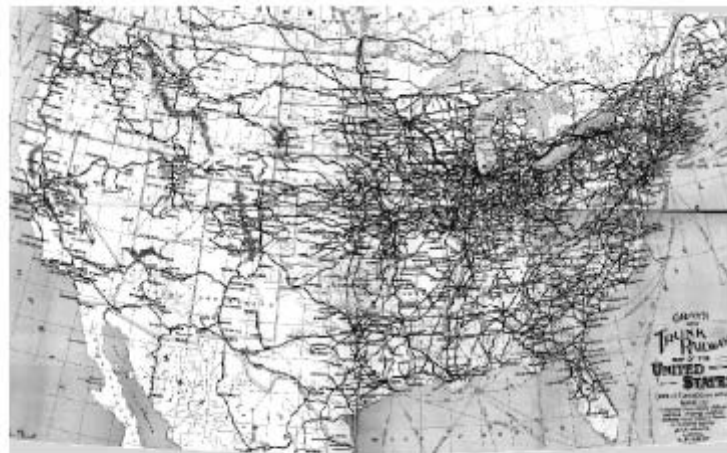


FIGURE 2  
Gray's map of 1898 railroads

Duranton and  
Turner 2012

## Path dependency and economic inefficiency: Liebowitz and Margolis (1995) typology

---

- 1. Past decisions affect future decisions.** There can be multiple equilibria, e.g., driving on the right hand or the left-hand of the road (Arthur, 1983), but no sub-optimality.
- 2. The chosen path proves to be inferior, but only ex-post,** against a contrafactual. No inefficiency, e.g., power source for motor cars? (Foray, 1997)
- 3. The chosen path can be demonstrated to be inferior and avoidable ex ante,** with information available at the time the initial decisions are made: economic inefficiency , e.g., QWERTY keyboard (David 1986).

# Path dependency may not be factored in decision-making because of...

---

- Uncertainties about cumulative mechanisms
- Information / incentive asymmetry across agents
  - Agents with right information to make the correct choice fail to take advantage of the implied profit opportunities, while other agents know only payoff going to next adopter (Foray 1997)
- Local vs. global optimization
  - The entity that finances a project does not necessarily include in its profitability/financial cost-benefit analysis the effects of that particular project on the remainder of society.
- Public intervention to internalize the externalities is then necessary

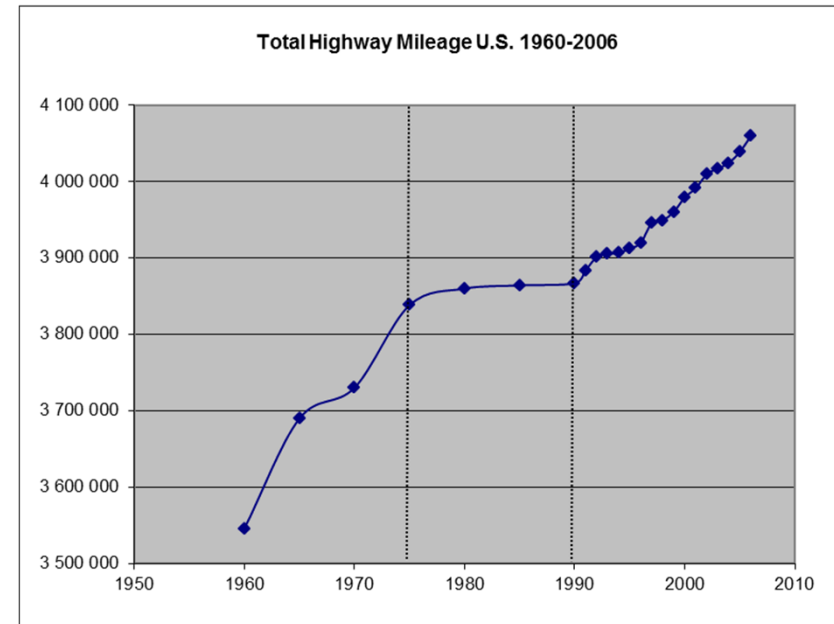
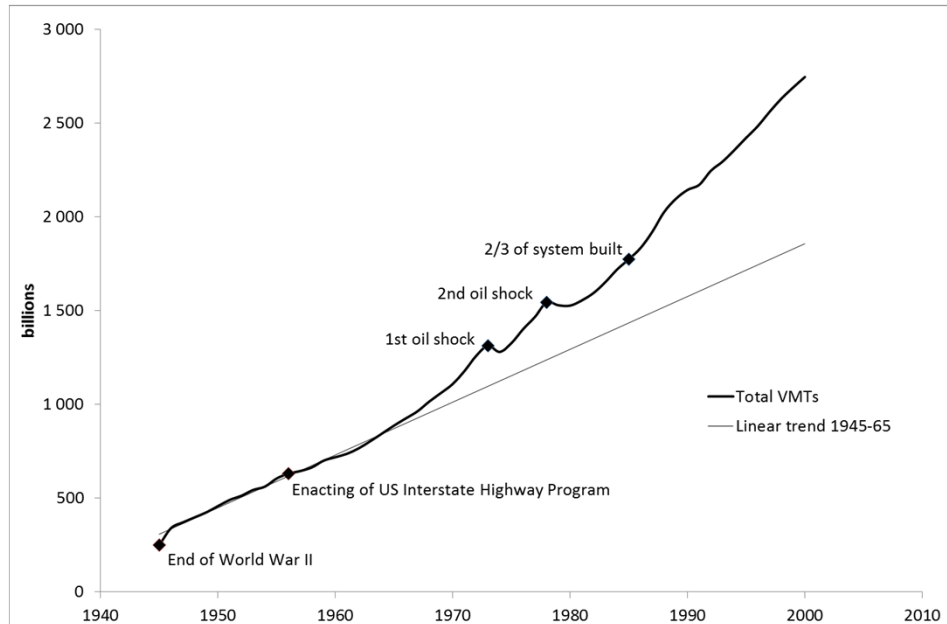
# Path dependency in climate mitigation

---

- Decisions towards high/low emissions paths
  - E.g., choice of energy supply technologies
  - Cumulative mechanisms captured in models through ITC coefficients (e.g., Gritsevskii and Nakicenovic 2000)
- Decisions that condition abatement costs down the road
  - E.g., structural policies (urban forms, transportation policy, etc.) : Baseline vs. policy scenarios
  - Potentially very important for mitigation ... and for many other dimensions of development (e.g., Shalizi and Lecocq, 2014)
    - Structural policies as criteria for assessing implementation of INDCs?
  - Various but less documented cumulative mechanisms, ill-captured in numerical exercises

# Two issues for research:

## I. Documenting cumulative mechanisms

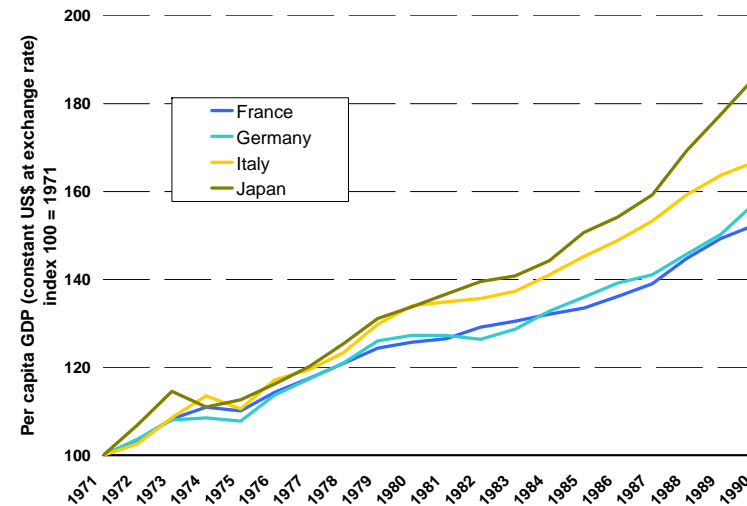
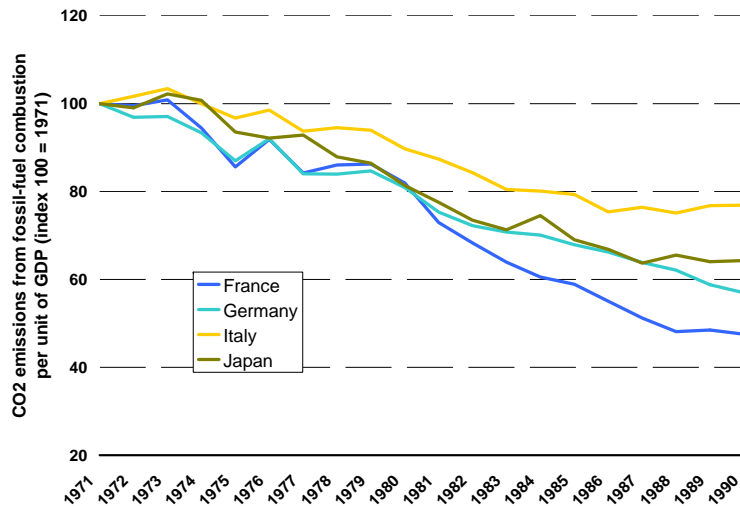


- Uncertainty about cumulative mechanisms remains important
- Documenting past examples of bifurcations
- Modeling cumulative mechanisms in the future
- So as to inform 'intuitions' behind, notably, investment in structural policies



# Two issues for research:

## II. Comparing very different futures



- With cumulative mechanisms, different futures might be difficult to rank (e.g., Hourcade and Kostopoulou 1994, Gritsevskii and Nakicenovic 2000)
- In the long run, welfare comparison of worlds that are not 'at the margin' of each other problematic



CENTRE  
INTERNATIONAL  
DE RECHERCHE  
SUR L'ENVIRONNEMENT  
ET LE DÉVELOPPEMENT



# Thank you

[www.centre-cired.fr](http://www.centre-cired.fr)

