

The maximization of contacts seen as a general principle for the evolution of societies

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Summary

The objective of this talk is to define some general principles which should allow us to interpret in terms of networks and interaction strength different forms of social phenomena.

- Firstly, I show that if one thinks in terms of interactions there is a kind of continuum between gases (or galaxies), liquids or solids, societies of social insects, and living organisms such as bacterias or animals.

In order to give to this perspective a scientific (as opposed to a purely philosophical) underpinning, I will illustrate it by the case of a specific family of compounds, namely the alkanes, and show that the strength of interaction is indeed the key-parameter which accounts for their physical properties, i.e. their physical state as a gas, liquid or solid.

- Secondly, I indicate that the principle of maximization of contacts and interactions can be seen as a generalization of the physical principle of energy minimization. For that purpose, I analyze a simple physical process, namely the mixing of water and ethanol ($\text{C}_2\text{H}_5\text{OH}$), and show that the evolution toward a state of lower energy can also be interpreted as maximizing the global interaction between the molecules which compose the mixture. The novelty and interest of this principle comes from the fact that it can be used even for systems, such as social systems, for which no notion of energy can be defined in a clear way.

- Thirdly, I will describe several evolutionary landmarks such as the formation of stars, the formation of cities, the French or Chinese revolutions and suggest that all these transitions were permitted and marked by an increase in interaction strength. In the case of revolutions, it is the suppression of the barriers between the so-called “orders” or “estates” (such as in France the clergy, nobility and the third estate of “common” people) of the old society which led to an increase in social interaction.

What makes this argument more conjectural than similar lines of reasoning in physics or chemistry is the fact that we are not yet able to *measure* the strength of social interactions. In this respect we are in the same situation as the physicists and chemists of the 19th century: they suspected the key-role of atoms and molecules but were not able to measure inter-atomic or inter-molecular interactions.

Interaction maximization as an evolution principle for social systems

Part I: Empirical observations

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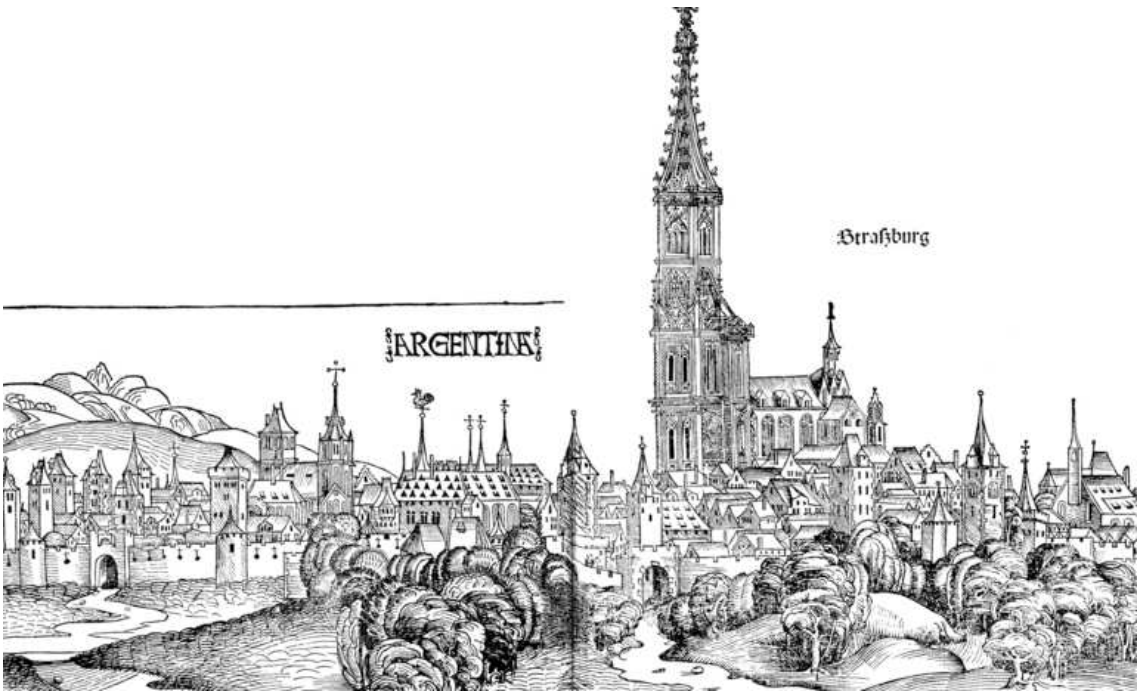
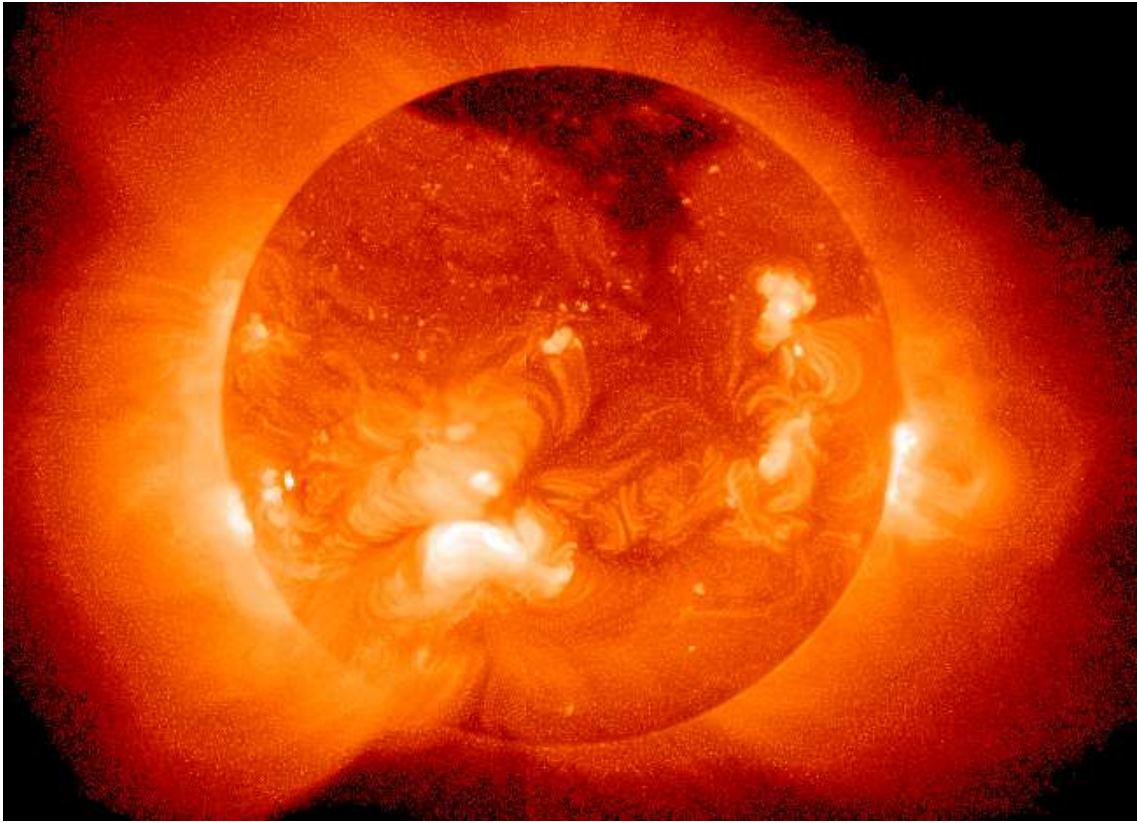
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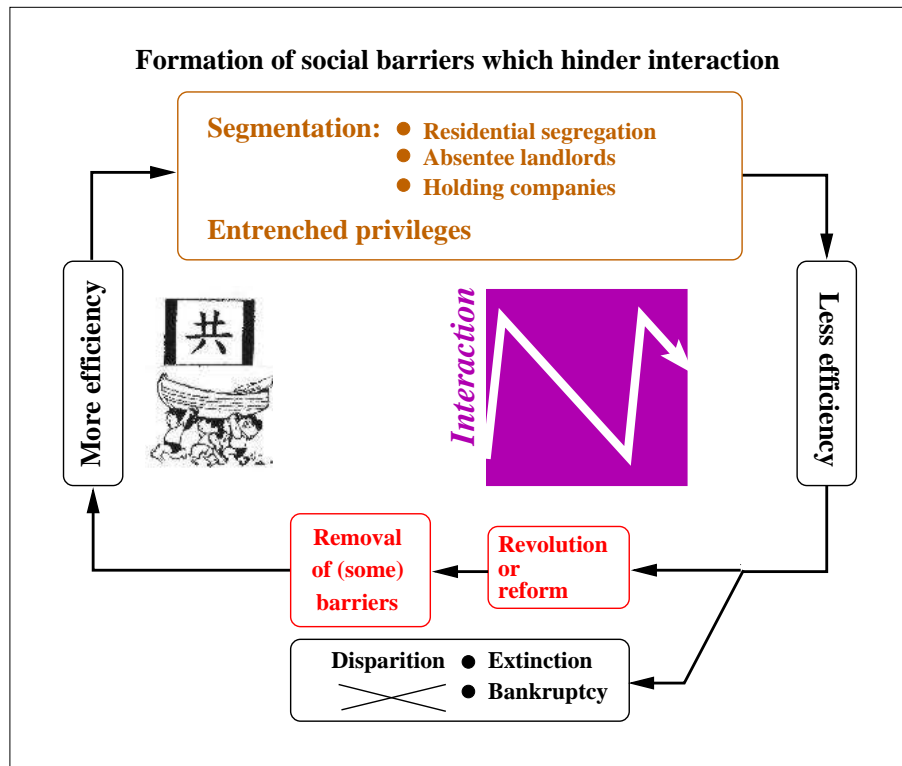
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Contents:

- Interaction is a factor which is not easy to observe
- Effects of high interaction illustrated by two cases: formation of stars and cities
- Why the segmentation of societies is an obstacle to interaction
- Social manifestations of increased interaction: meetings, demonstrations, publications, ...





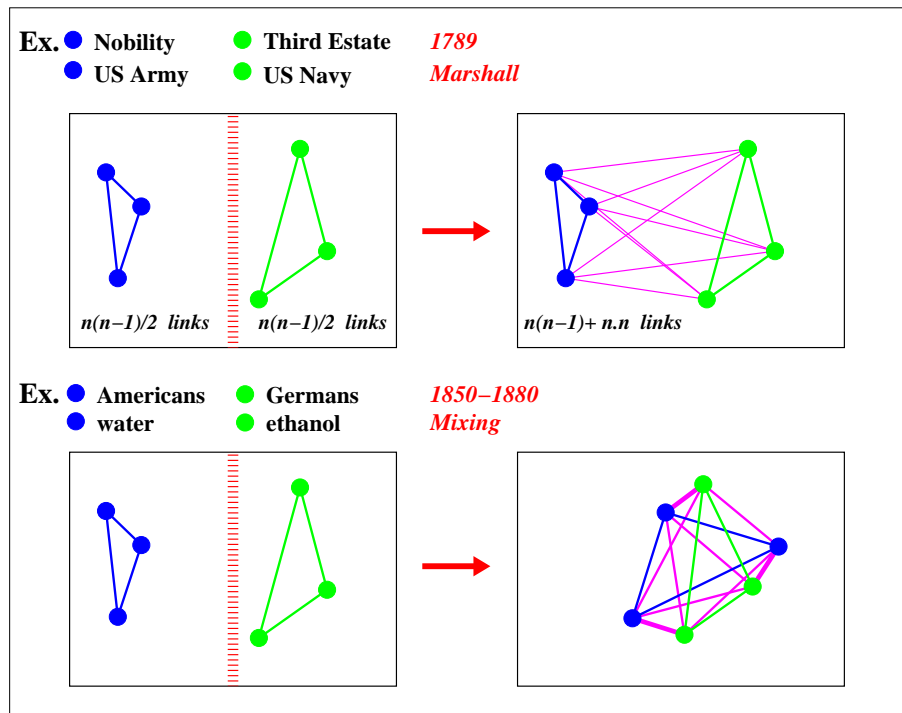
Alternance in history of periods of segmentation and periods of unification and coalescence.

This process can occur in nations, organizations or businesses.

- At nation level standard examples of revolutions are the cases of France (1789), Mexico (1911 and subsequent years), China (1949). Standard examples of transformation through reform are Russia (Peter the Great), Turkey (Mustapha Kemal), Japan (Meiji). Examples of disparitions are provided by the Indian kingdoms which were segmented into hundreds of independent states and were overwhelmed by British colonization.

- For organizations, standard examples of revolutions are the Cistercian explosion (11th century), the Protestant Reformation (Luther, Calvin).

- For businesses examples of disparitions are provided by the American railroad companies which were segmented in dozens of companies of various sizes.



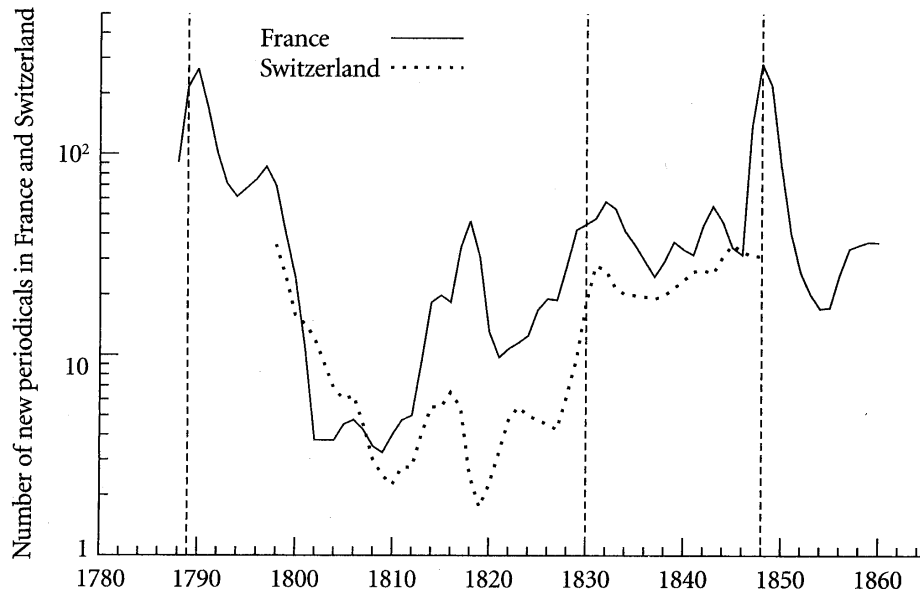
How the removal of social barriers increases interaction.

The increase in interaction may happen in two ways: (i) Removal of the social barrier between unchanged blue and green populations (diagrams in first line); for instance before the Revolution only persons belonging to the nobility could become officers in the French army.

(ii) Removal of social barriers and in addition relocation of the blue and green populations in a way which brings them closer to one another; an illustration is provided by the arrival of German immigrants in the United States after they have crossed the Atlantic. The (partial) removal of social barriers consists in the fact that the immigrants learn English and get used to American customs.

The example of the US Army versus US Navy refers to the fact that prior to World War II they were largely independent. Then suddenly, they had to learn to work closely together. As chief military adviser to President Franklin D. Roosevelt (and Chief of Staff of the US Army) General George Marshall played an important role in this process. In this example, the suppression of the barrier was brought about by the necessity of war and the requirement of efficiency and success.

Revolutions are preceded by an increase in social interaction



The role of an increase in social interaction in the outbreak of revolutions. Social interaction has many facets; many of them, unfortunately, cannot be assessed quantitatively. The diffusion of newspapers certainly reflected the state of ferment that seized a country (here France and Switzerland) prior to a revolution. The graph shows that the number of new periodicals began to increase at least two or three years before the outset of a revolution. This can be observed in 1789, 1830, and 1848. In France there is another peak in 1818 that does not seem to correspond to any large-scale movement. In June 1817, however, there had been several revolutionary disturbances in Sens, Nogent, and Lyon (*Quid* 1997).
Source: Hatin (1965 [1860]); *Nouvelle histoire de la Suisse et des Suisses* (1983).

Excerpt from: *Pattern and Repertoire in History* (Harvard UP 2002)