Can sociophysics becomes a predictive social tool ?

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What is SOCIOPHYSICS ?

It is the use of concepts and techniques from Statistical Physics to describe some social and political behaviors

It does not aim at an exact description of the reality but at singling out some of its basic mechanics which may in turn appear be rather counter intuitive

Founding papers:

S. Galam, “Entropie, désordre et liberté individuelle”, Fundamenta Scientiae 3, 209-213 (1982)

S. Galam, Y. Gefen and Y. Shapir, “Sociophysics: A mean behavior model for the process of strike”, Journal of Mathematical Sociology 9, 1-13 (1982)

S. Galam, “Physicists as a revolutionary catalyst”, Fundamenta Scientiae 1, 351-353 (1980)

S. Galam, “About imperialism of physics", Fundamenta Scientiae 3, 125 (1982)

When sociophysics started in the early eighties all physicists dismissed it strongly as nonsense

No physical journal would accept a related paper

Such a conference would be totally unconceivable

Outside physics, the rejection was total including social scientists, politicians and journalists

Indeed to evoke the hypothesis "human could behave, even in part, as atoms" was look upon as an evident absurdity

An unsual review:

S. Galam, "Sociophysics: a personal testimony", Physica A 336, 49-55 (2004)

Today, sociophysics is a well flourishing field of statistical physics with an increasing number of physicists joining the field and all physical journals now accepting related papers

Every year several conferences include sociophysics topics. Our conference and our action contribute a good deal to the growing of this new field of research

Few social scientists are starting to get interested but yet with some doubt and caution

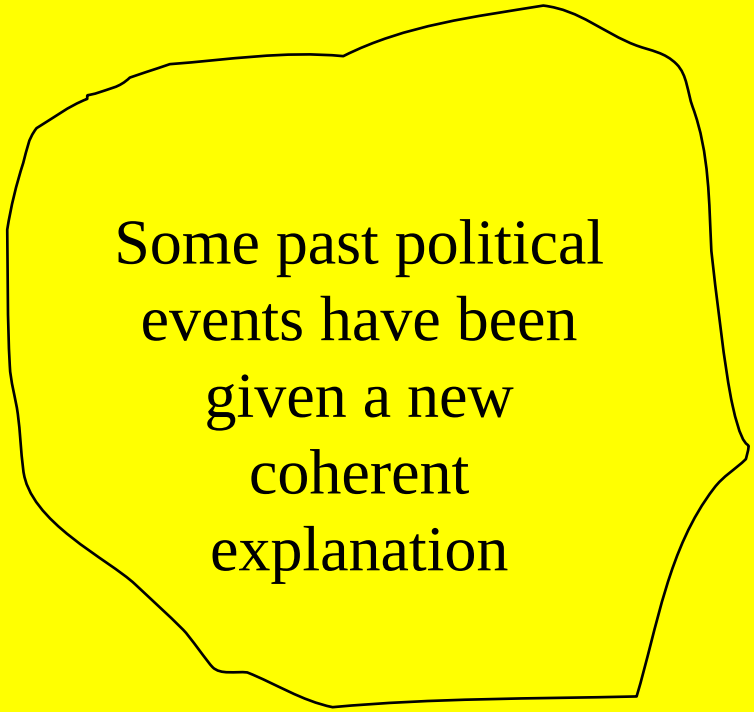
Journalists are excited but still often reluctant to publish associated view points

S. Galam and S. Moscovici, “Towards a theory of collective phenomena: Consensus and attitude changes in groups”, Euro. J. of Social Psy. 21, 49-74 (1991)

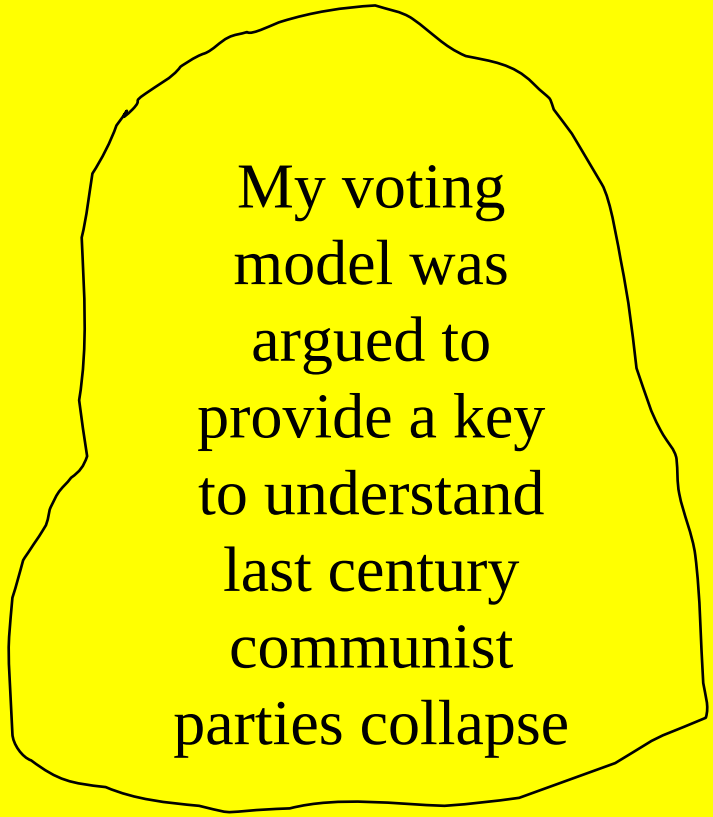
What did sociophysics accomplish so far ?

Several models have been elaborated together with new concepts and some numerical simulations

Some general qualitative features and new properties of social systems have been given enlightening explanations



For instance



Journal of Mathematical Psychology 30, 426-434 (1986)

Journal of Statistical Physics 61, 943-951 (1990)

Physica A 274, 132-139 (1999)

My contrarian model was advocated to explain the fifty-fifty 2000 American and 2002 German elections

Physica A 333, 453-460 (2004)

The Sznajd model was used to explain 1998 Brazilian elections

K. Sznajd-Weron and J. Sznajd, *Int. J. Mod. Phys. C* 11, 1157-1165 (2000)

F. Slanina and H. Lavicka Eur. *Phys. J. B* 35 279-288 (2003)

My social percolation model proposed some global framework to terrorism events like September 11

S. Galam, Eur. Phys. J. B 26, Rapid Note, 269-272 (2002)

S. Galam and A. Mauger, Physica A 323, 695-704 (2003)

To come up with an explanation to a past event is nice but not really convincing moreover when a different model is used for each event

One step further was accomplished by predicting some events to occur in the near future but without mentioning a date

For instance

Using my voting model, a scenario for a voting power taking in France by the extreme right party Front National was elaborated

No one believed it

Le Monde 1997 “Le dangereux seuil critique du FN”

Libération 1998 “Crier, mais pourquoi?”

In addition

Using my contrarian model fifty-fifty elections were predicted to occur again and to become a common feature of western democracies

cond-mat 2004

Yet no-one would believes fifty-fifty elections could happen again, and for sure not in the US, Germany or Italy where political issues at stake were so much apart

Worthwhile digression

The paper first submitted to PRL was withheld by the editor arguing it was too political

Physica A editor M. Ausloos showed a much more opened mind:

Physica A 333, 453-460 (2004)

And what was predicted did happen

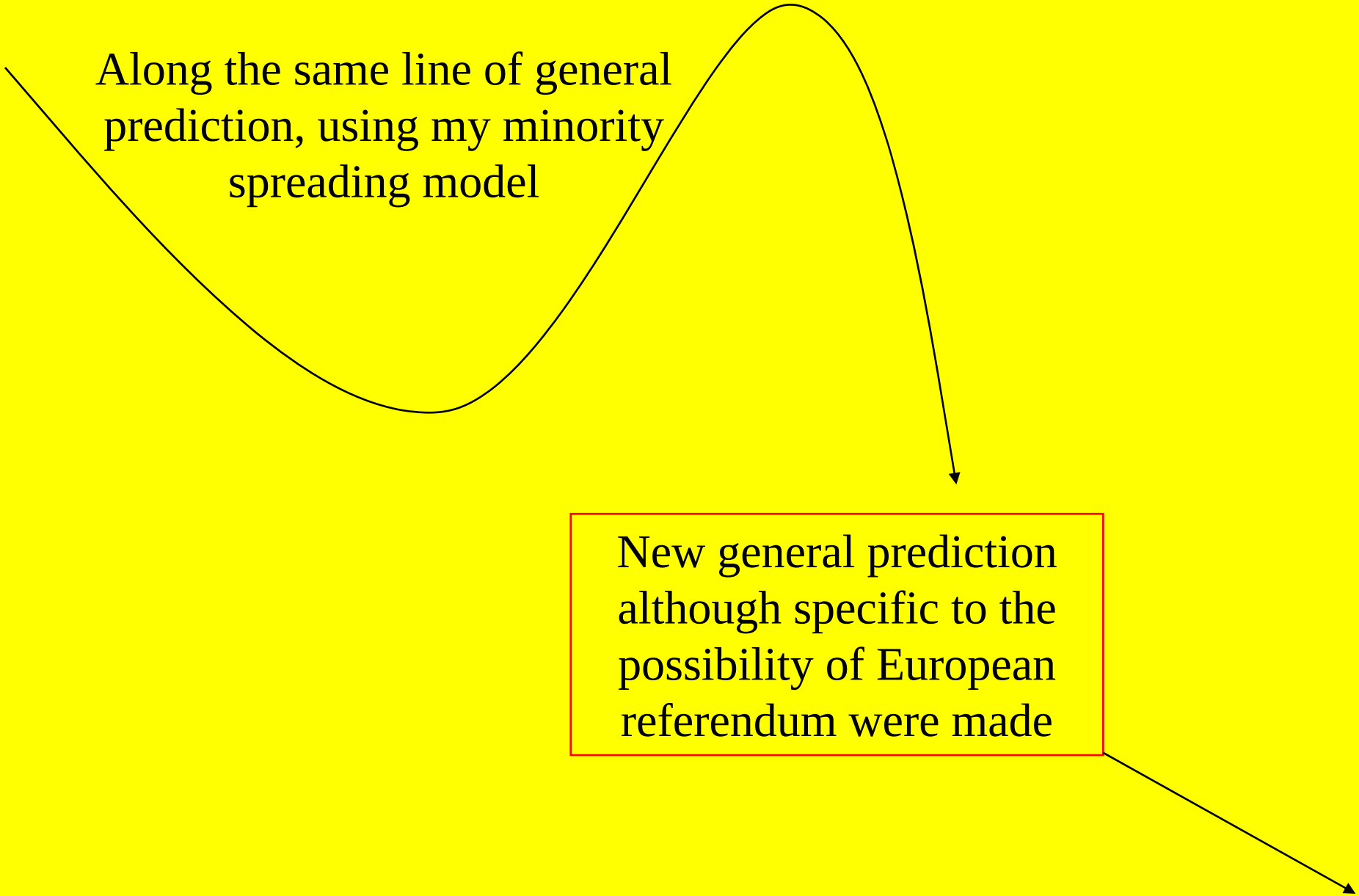
The Front National scenario did occur in part in 2000 with its leader running at the second run for president, at the total surprise of everyone including the FN itself

Fifty-fifty elections did occurred again in 2005 German and 2006 Italian elections against all polls and analyst predictions

It is somehow better BUT yet not really convincing in particular towards skeptic people

No one gave a serious tip to these predictions too busy trying to recover from the psychological and political collapse which resulted from these totally unexpected events

And, even if it sounds nice it is still not quite convincing since neither a date nor a precise location were given


Along the same line of general prediction, using my minority spreading model
New general prediction although specific to the possibility of European referendum were made

To give some real life illustrations of our model, we can cite events related to the European Union which all came as a surprise. From the beginning of its construction there have been never a large public debate in most of the involved countries. The whole process came trough government decisions tough most people always have seemed to agree on this construction. At the same time European opponents have been systematically urging for public debates. Such a demand sounds like absurd knowing a majority of people favor the European union. But anyhow most European governments have been reluctant to held referendum on the issue.

At odd, several years ago French president Mitterand decides to run a referendum to accept the Maastricht agreement [11]. While a large success of the Yes was given for granted it indeed made it just a bit beyond the required fifty percent. The more people were discussing, the less support there was for the proposal. It is even possible to conjuncture that an additional two weeks extension of the public debate would have make the No to win.

Eur. Phys. J. B **25**, 403-406 (2002)

Applying our results to the European Union leads to the conclusion that it would be rather misleading to initiate large public debates in most of the involved countries. Indeed, even starting from a huge initial majority of people in favor of the European Union, an open and free debate would lead to the creation of huge majority hostile to the European Union. This provides a strong ground to legitimize the on-going reluctance of most European governments to hold referendum on associated issues.

Physica A 336, 56 – 62 (2004)

When these statements were made no referendum was planned

The model in short

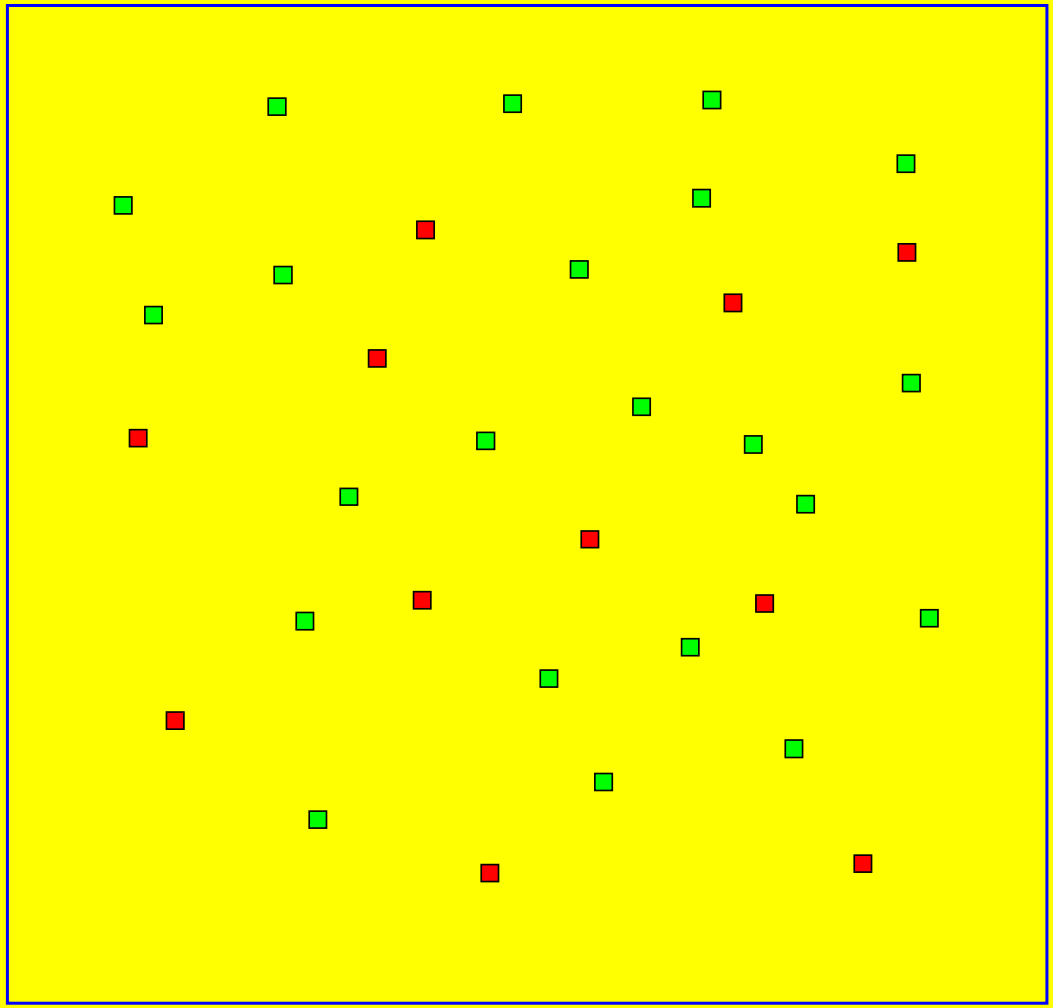
A simple illustration to implement the dynamics and show how the model works

Indeed the mechanisms involved are universal and apply to all public issues

A population of 33 persons with 22 ▫ in favor of the reform and 11 ▪ against it

Day “1” morning

People on their own

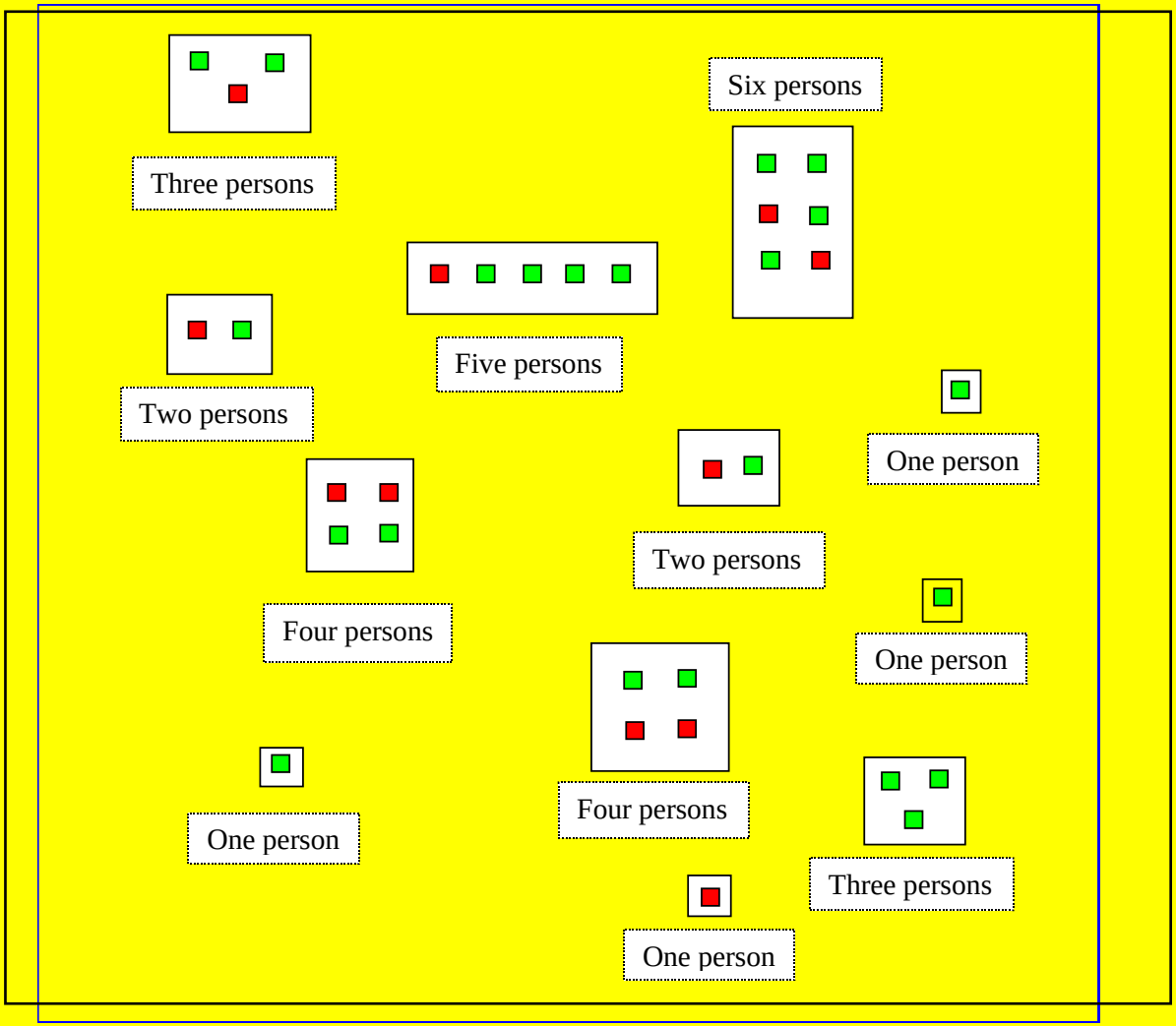


The same people at lunch

22 ▪ in favor and 11 ▪ against

Day “1” lunch

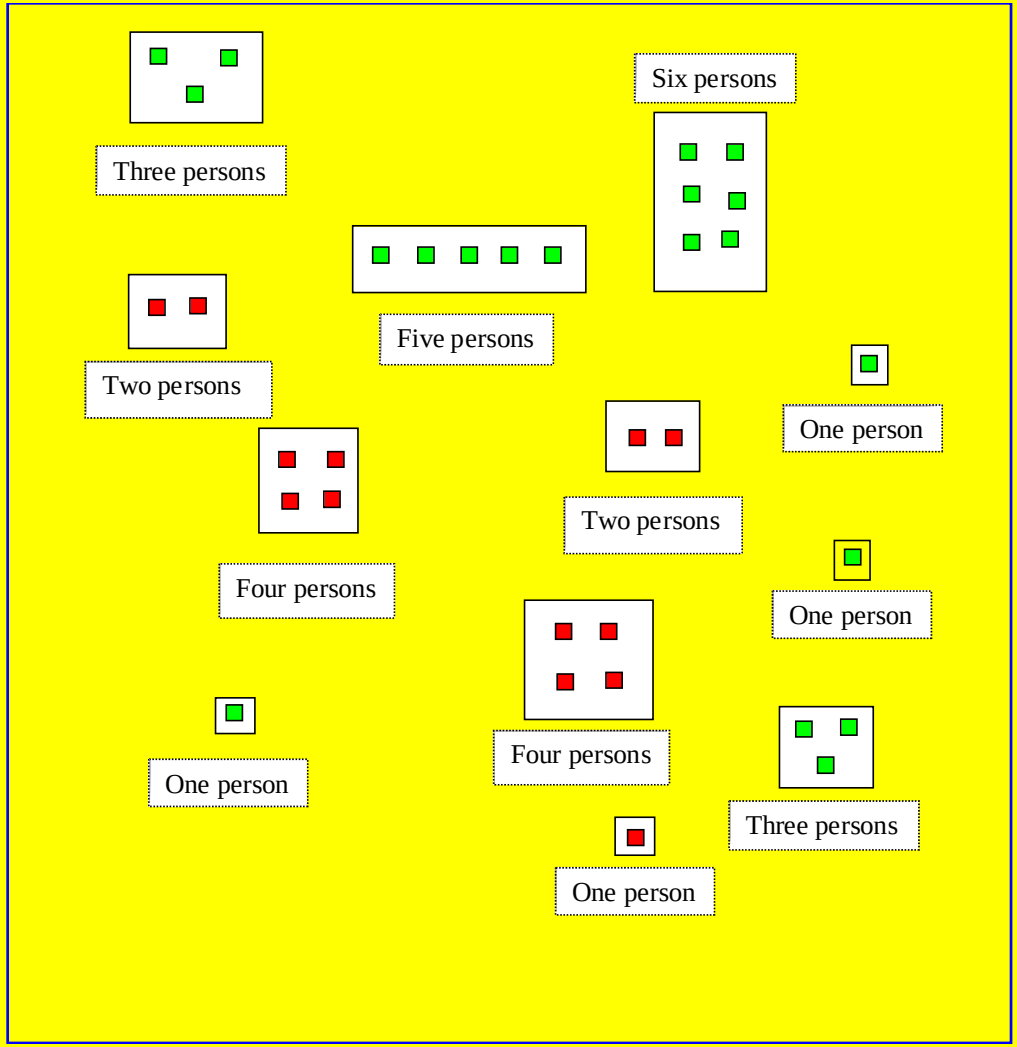
They are discussing



Lunch is over

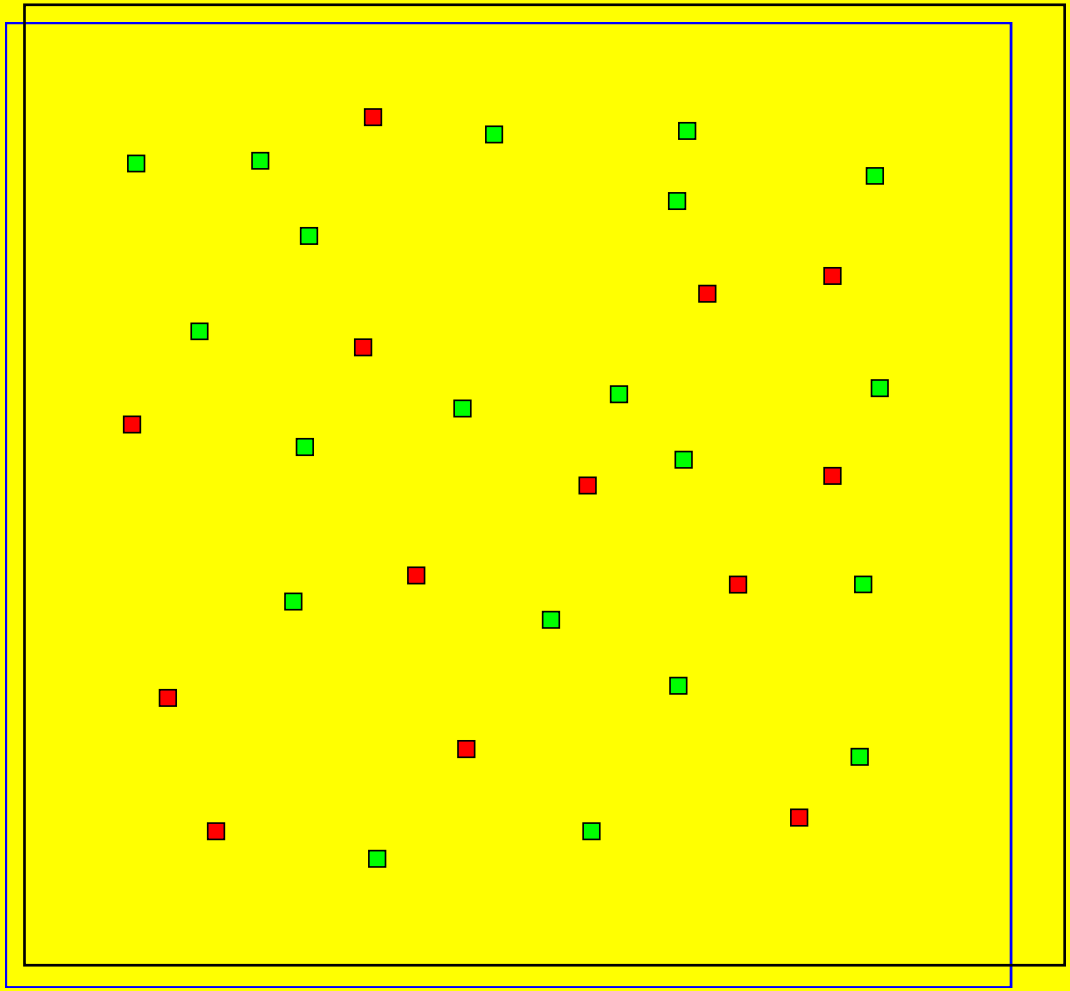
20 in favor and 13 against

Day “1” end of lunch



Day “1” afternoon

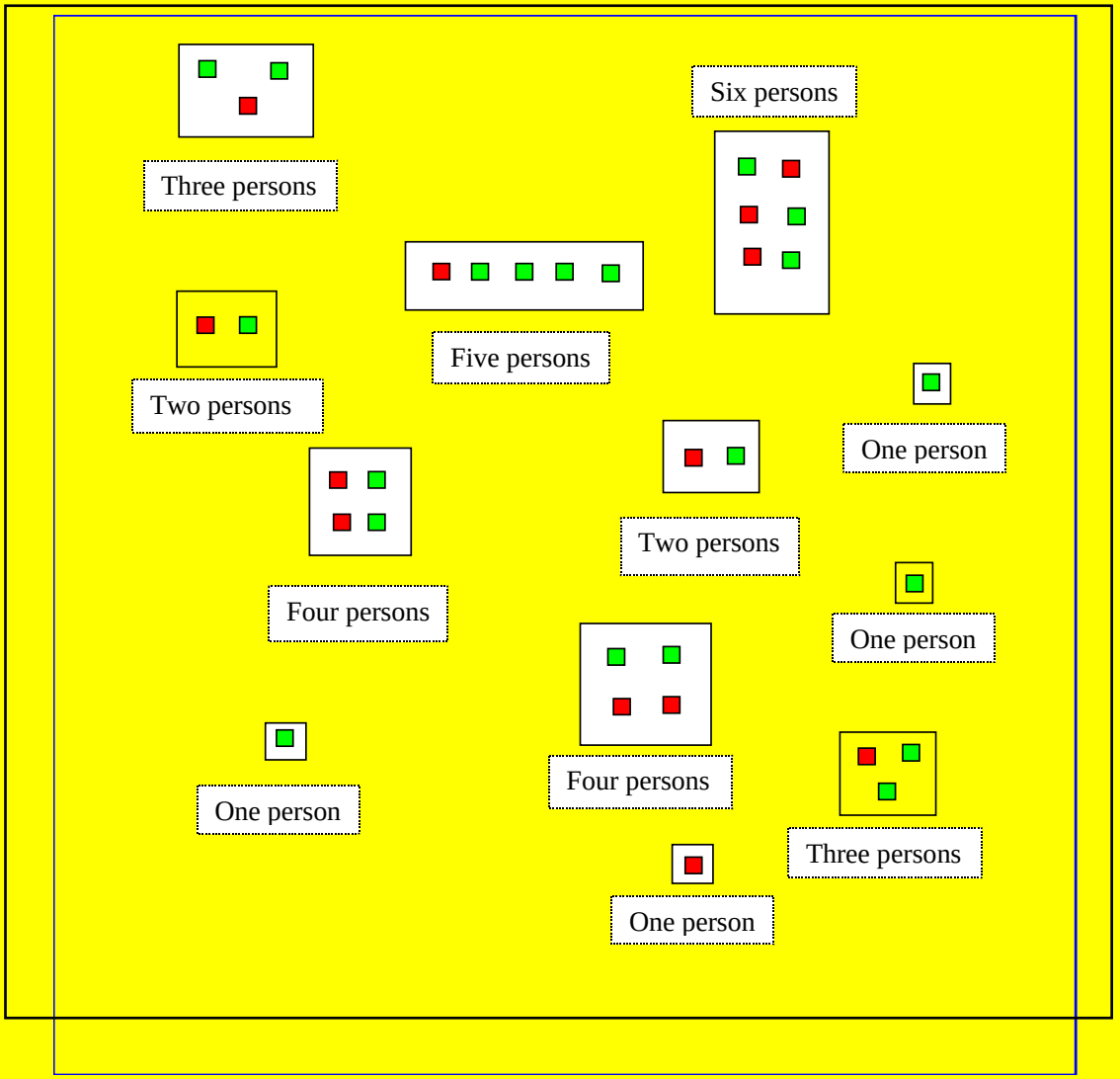
People on their own



Dinner time

20 ▫ in favor and 13 ▪ against

Day “1” dinner



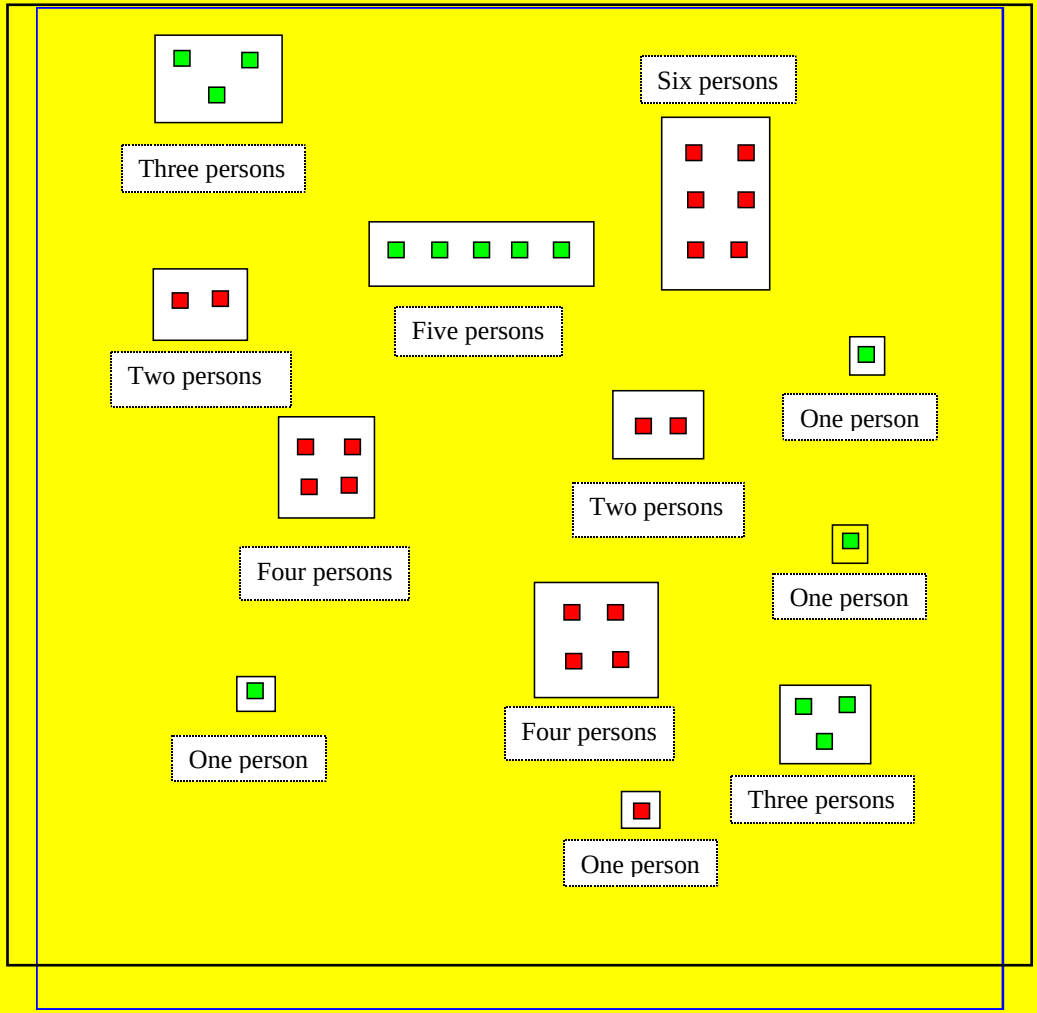
They are discussing

Usually group compositions are different

Dinner is over

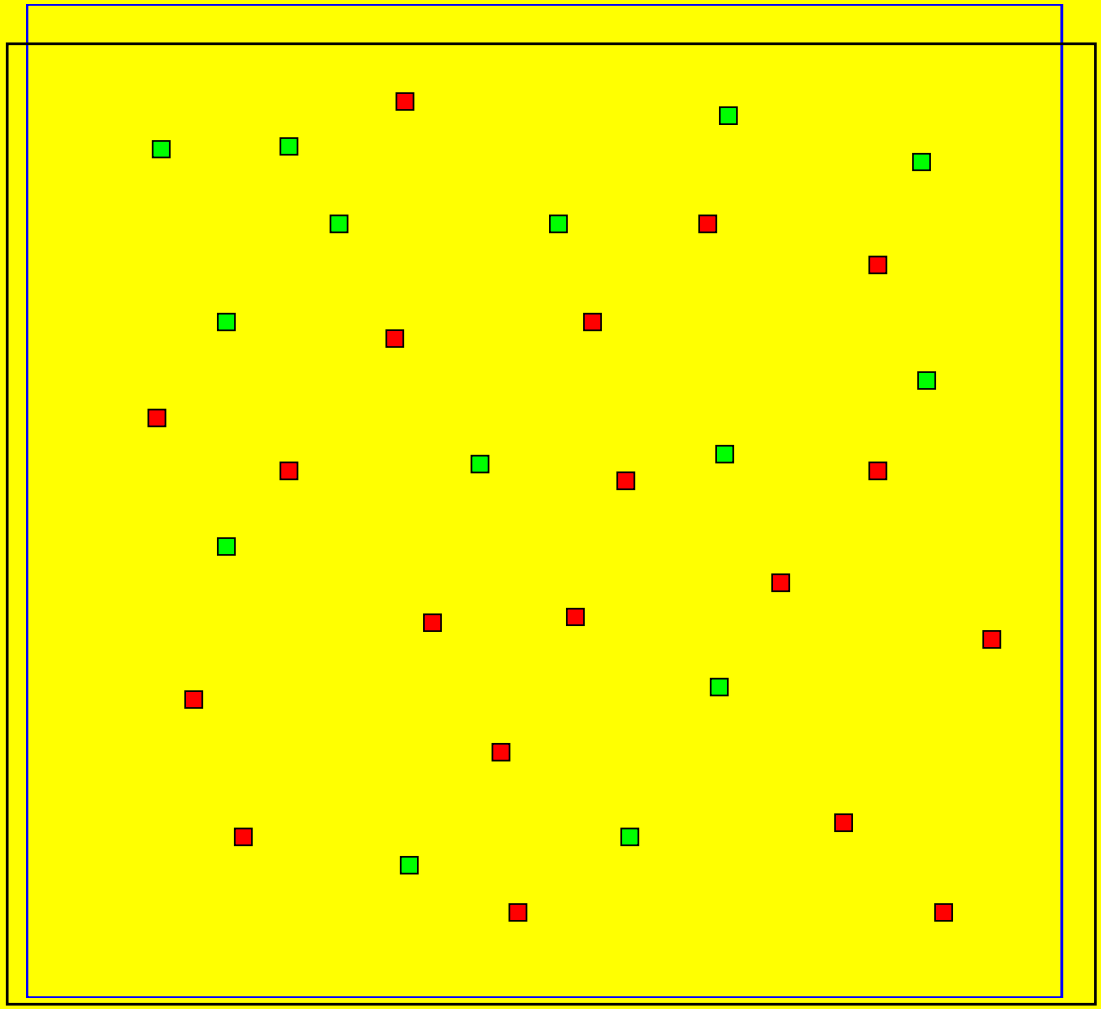
14 in favor and 19 against

Day “1”end of dinner



One day latter

Day “2” morning

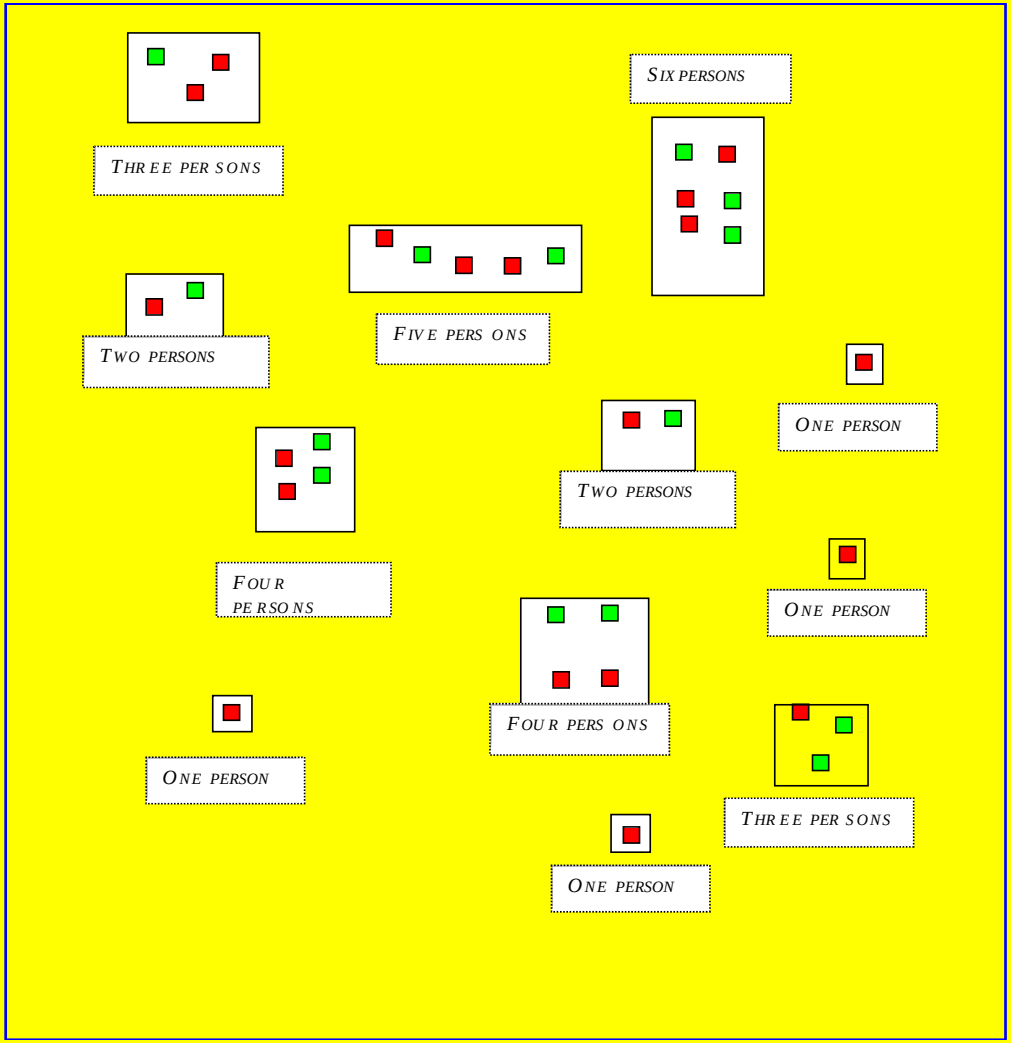


People on their own

Lunch time

14 in favor and 19 against

Day “2” lunch



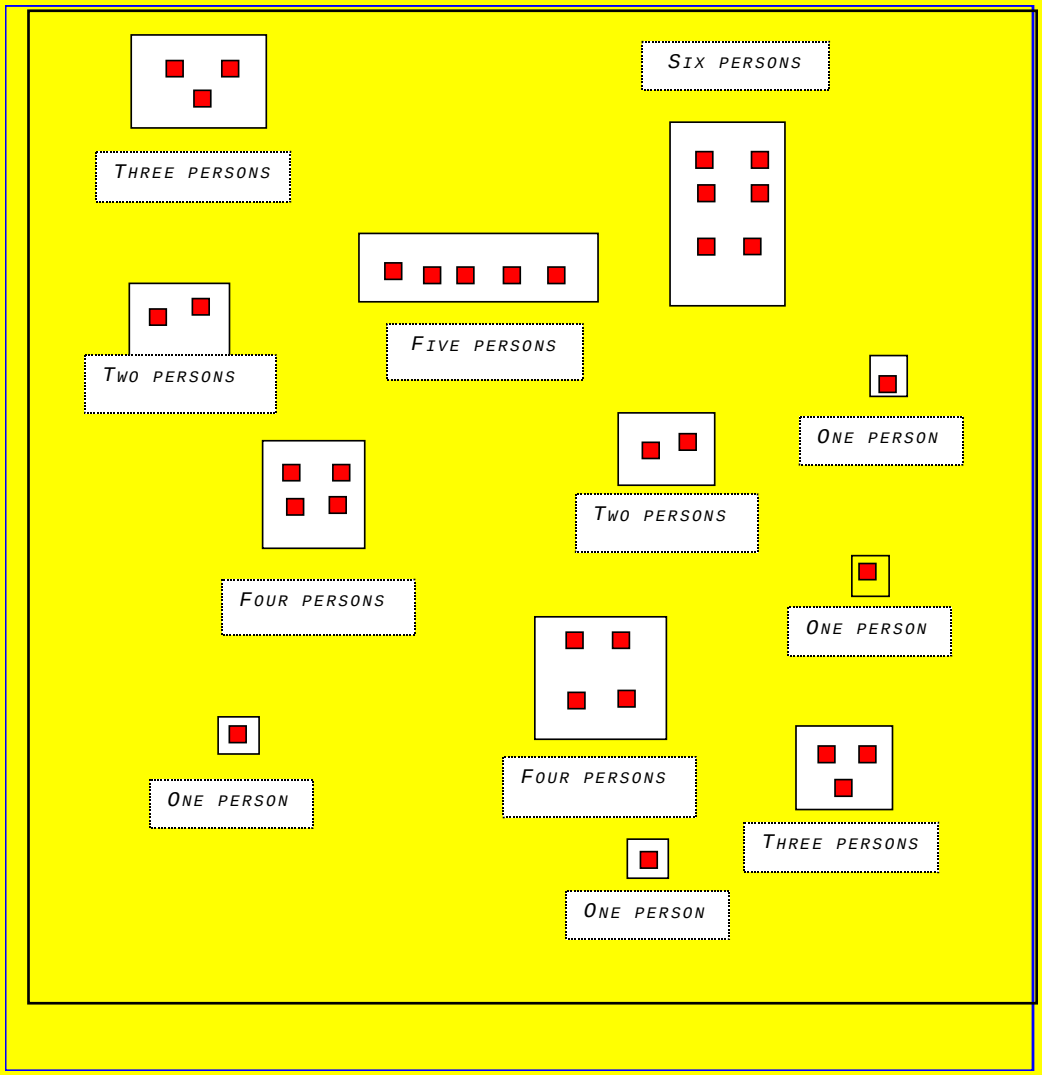
They are discussing

Usually group compositions are not too different

Lunch is over

0 in favor and 33 against

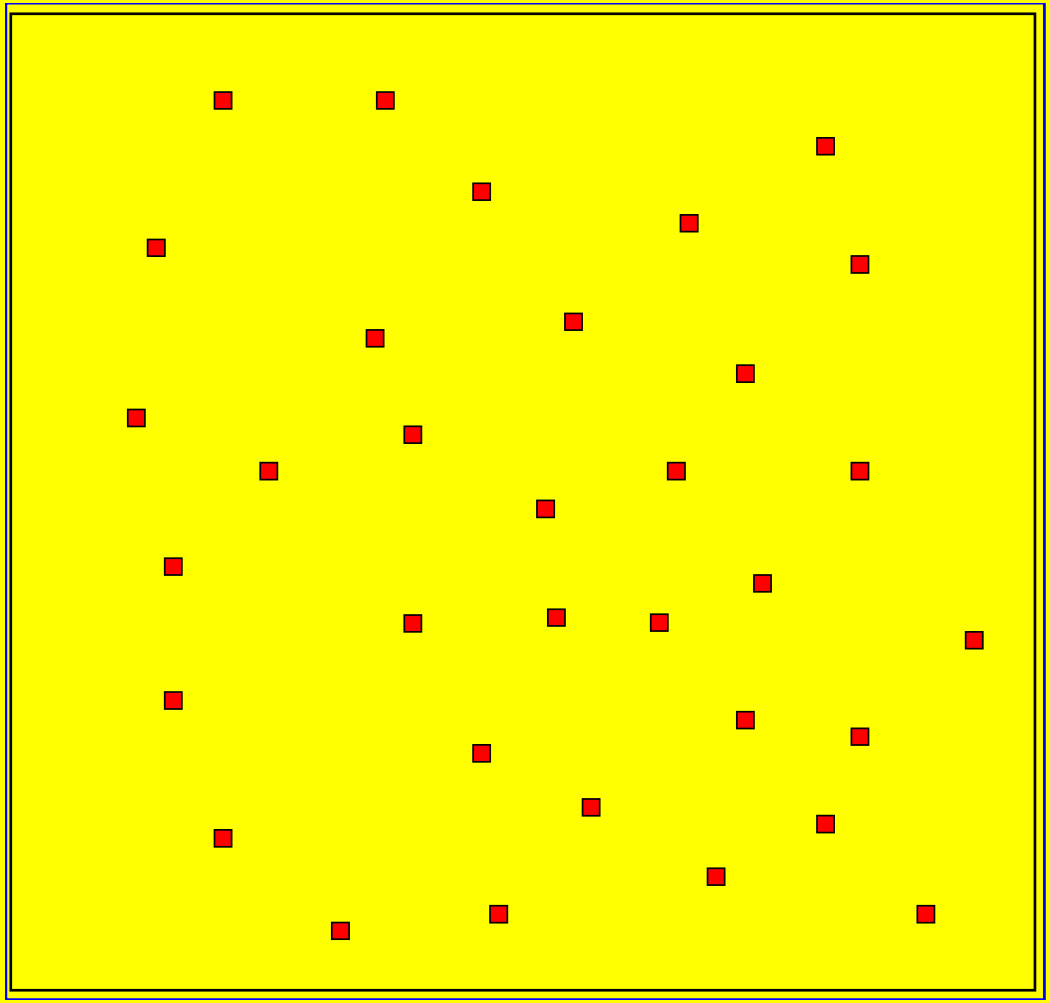
Day “2” end of lunch



A population of 33 persons with an unanimity against the reform

The person in charge of the reform is dismissed

Day “2” afternoon



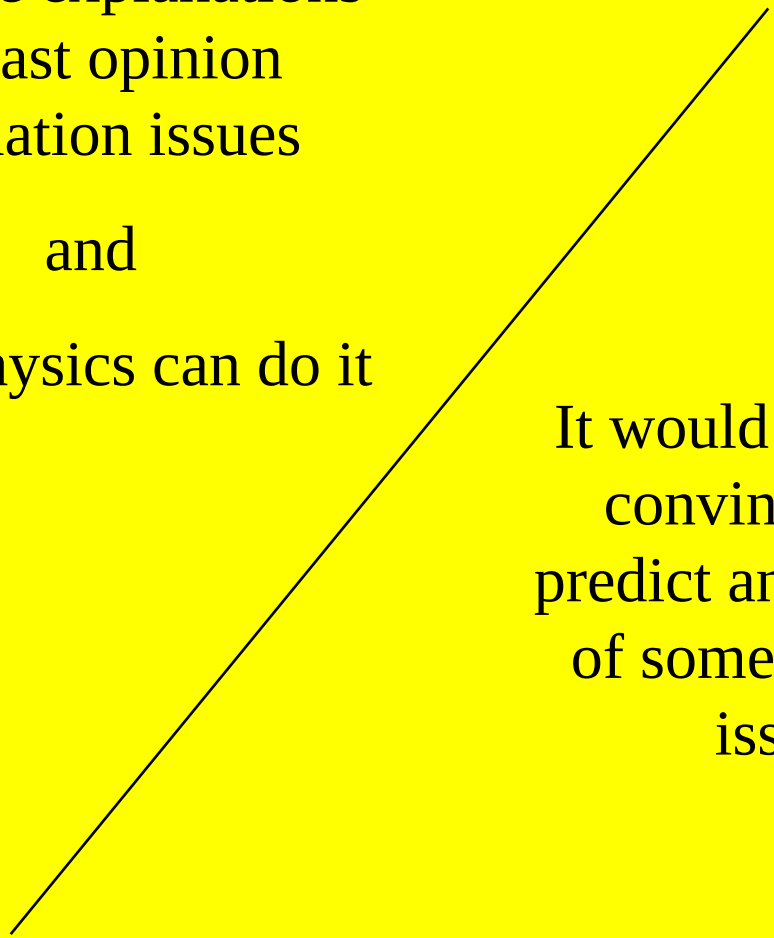
At the end of 2004 in France, Chirac decided to hold a referendum to adopt the project of European constitution

That was the opportunity to make a well defined and precise prediction

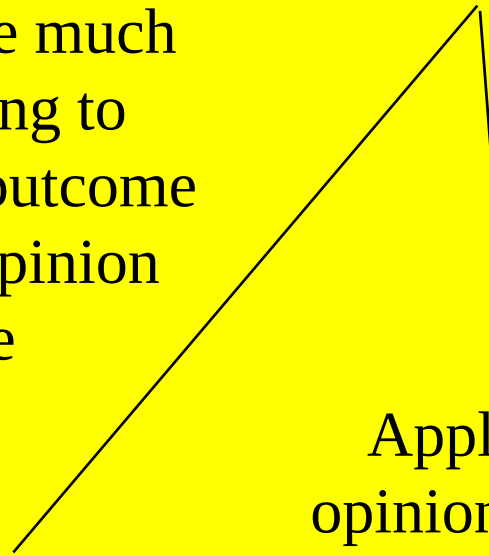
Indeed if it is nice to produce explanations of past opinion formation issues

and

sociophysics can do it



It would be much convincing to predict an outcome of some opinion issue



Apply my opinion model to predict the referendum outcome

The polls were giving 30% to the No and 70% to the Yes

The Yes was given winner by everyone, including the No people

The unique issue was the rate of participation to the vote, many abstentions being feared

In the mean time I was able to introduce the existence of heterogeneous beliefs to make the minority opinion spreading model applicable to more fuzzy issues with different subpopulations

Phys. Rev. E **71**, 046123 (2005)

I then made the analysis using rudimentary investigation and talking to many people

My conclusion was that the critical threshold for the No to start to inflate from the public debate was located in the vicinity of 15%

And that a long time would be needed to have the No passing over 50%

The No was scoring around 15%

And

There was five months of debate ahead of the vote

THEREFORE

given the current conditions of the debate, the No would win

And indeed the polls were giving 15% to the No and the debate will hold for five months

The conclusion from the model was thus that within the current conditions of the debate the No will eventually win the vote

That was nice and clear, the only problem was that…

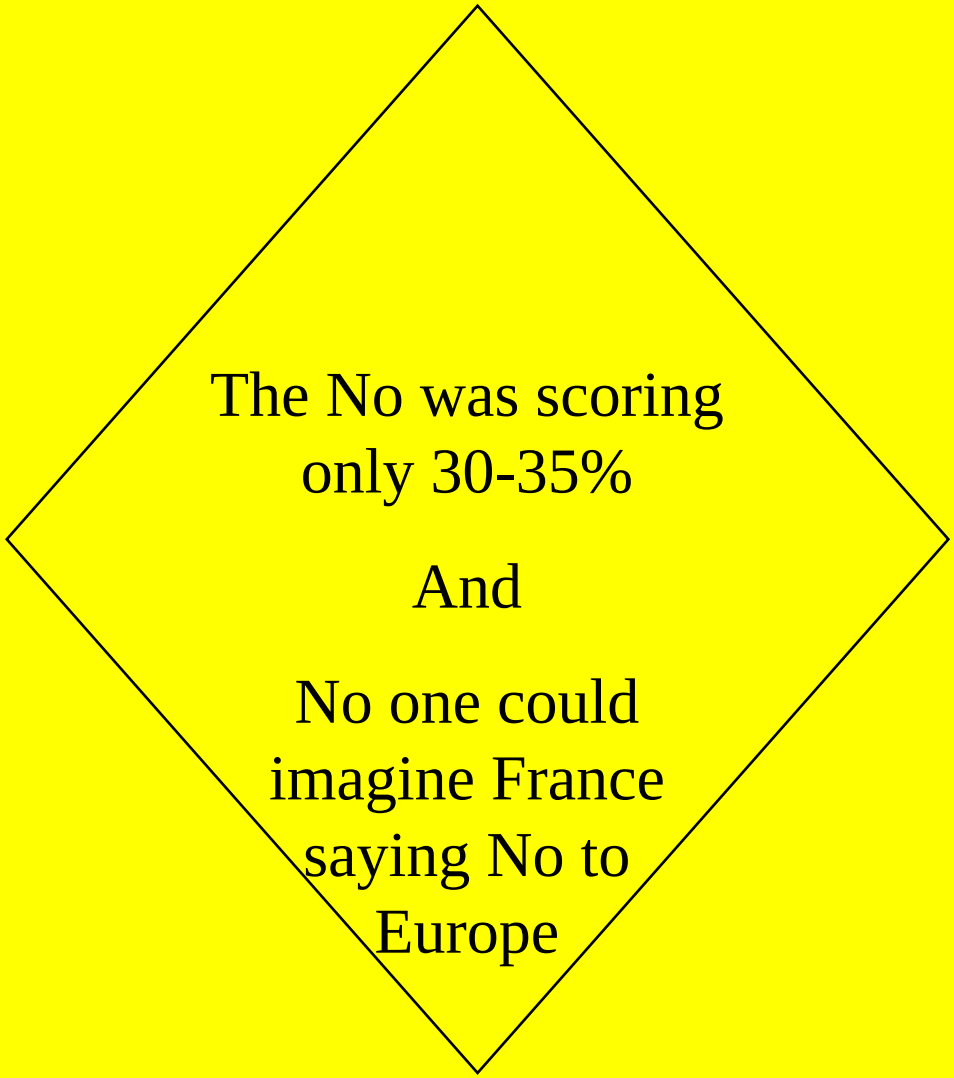
A huge majority of people were in favor of the Yes, almost all political leaders were in favor of the Yes,

France could not say No to Europe

The only problem at that time was that

I could not believed it

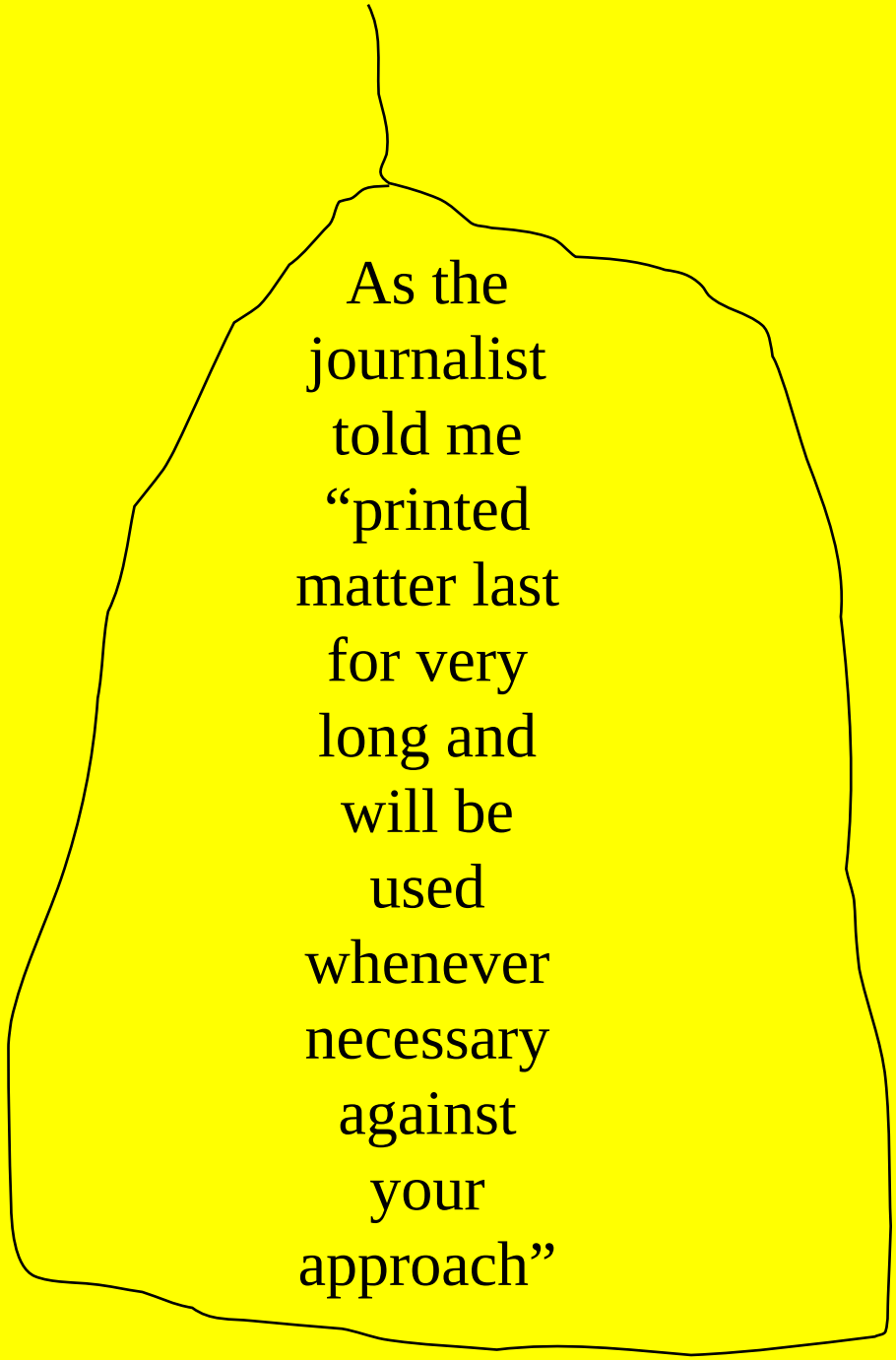
The BIG problem was that such a prediction was totally ABSURD

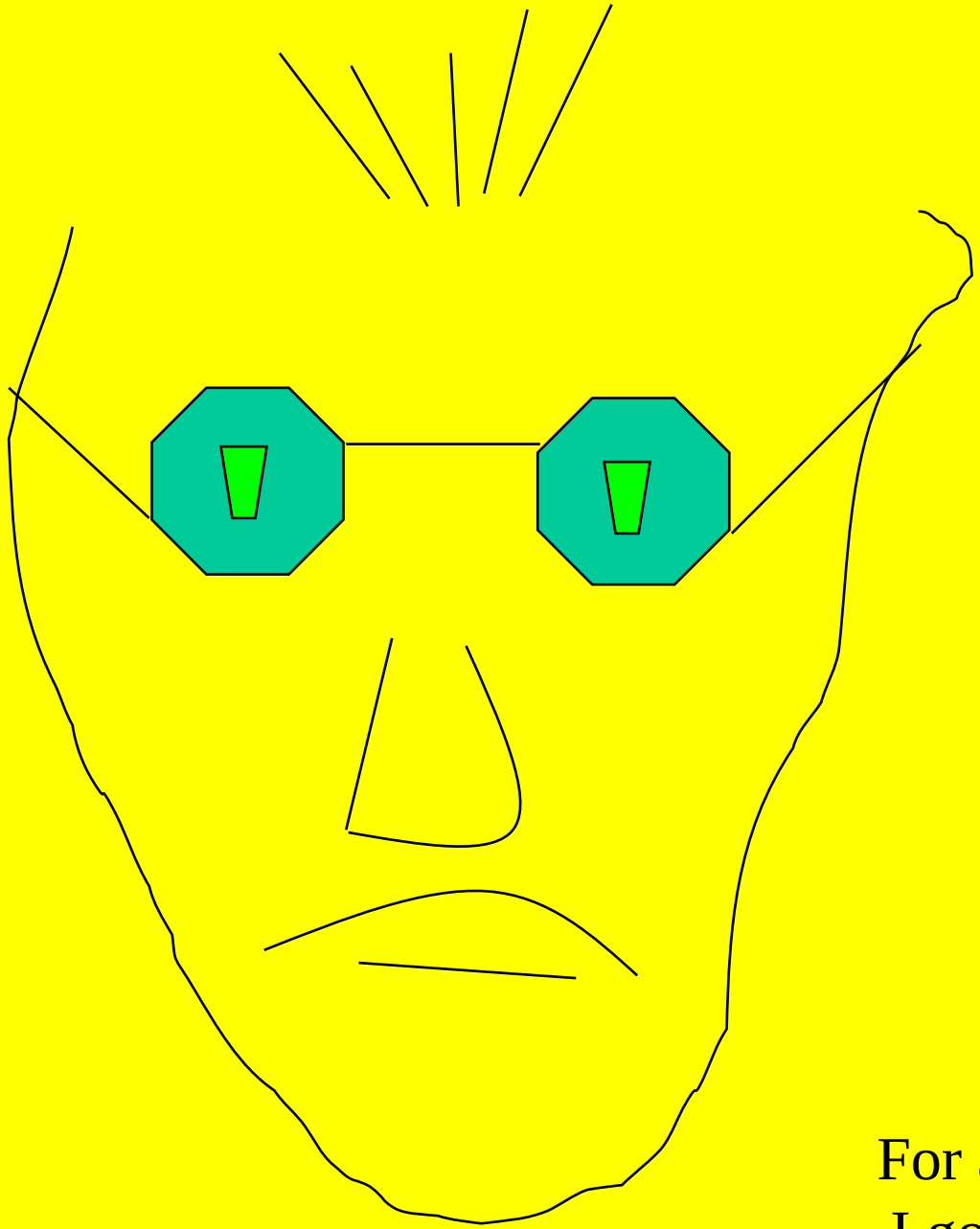


When the journalist from Le Monde made the interview, I was a bit dubitative

At the end it told me “are you sure you want to have your conclusion printed so clearly, your theory is nice but the conclusion in non-sense, you will lose all credibility for the future…”

Why to run to shout to millions of people I am a fool, moreover providing the printed proof of it





Why to announce a result I myself don’t believe in?

For a minute I got scared

But then I realized that all that was about the very core of the sociophysics challenge:

not trying to win a reputation but to build a robust theory of social behavior based on a scientific procedure

Not a personal issue

It the prediction turns right it validates the model if not the model has to be modified

Elaboré par un sociophysicien, un modèle décrit comment une opinion qui était au départ minoritaire peut finir par l'emporter

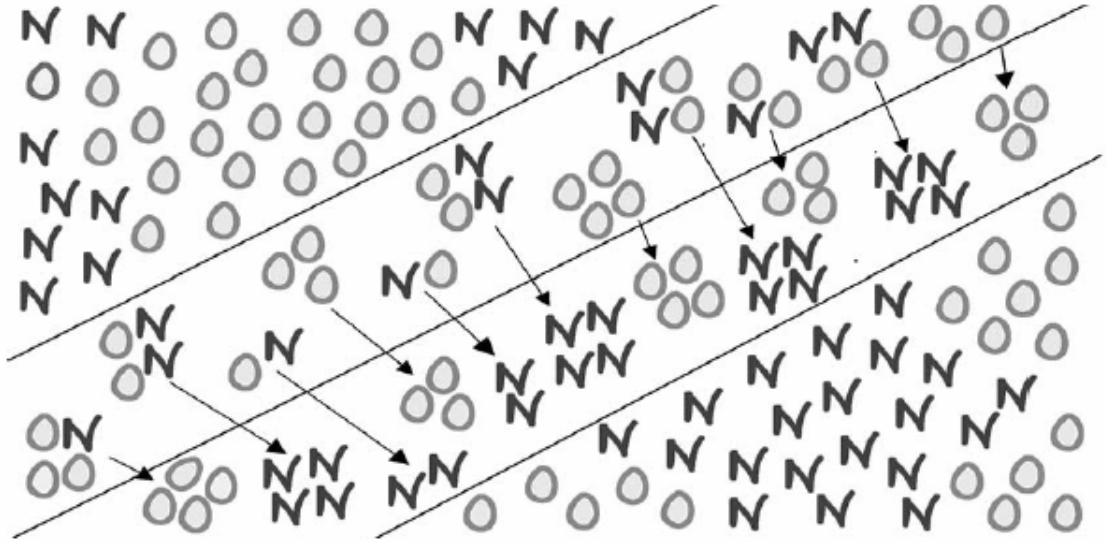
Les mathématiques s'invitent dans le débat européen

« LE "NON" au traité constitutionnel européen va l'emporter... Je le crains. » L'homme qui formule ce pronostic n'est pas un politologue, ne dirige pas un institut de sondages et ne lit pas davantage dans une boule de cristal. Il est chercheur et utilise, pour tout outil de travail, des modèles mathématiques.

Serge Galam, physicien de formation, spécialiste des théories du désordre, œuvre au rapprochement de sa discipline d'origine et des sciences humaines au sein du Centre de recherche en épistémologie appliquée (Ecole polytechnique-CNRS) de Paris. Ce « sociophysicien » s'intéresse, en particulier, aux mouvements d'opinion (*Le Monde* du 28 mars 2000).

L'un de ses modèles, décrivant *« la propagation d'opinions minoritaires en milieu démocratique »*, s'applique, comme un gant, au référendum sur la Constitution de l'Europe. Il montre comment le « non », aujourd'hui minoritaire dans les sondages, est en mesure, d'un strict point de vue mathématique, de s'imposer finalement.

Le chercheur considère une population devant effectuer un choix simple entre deux possibilités : oui ou non, pour ou contre, A ou B... Il pos-



SERGE GALAM

Au terme d'un seul cycle de discussion, 25 « oui » et 12 « non » peuvent se transformer en 20 « non » et 17 « oui ».

l'emporterait jamais. Et que, dans le cas le plus fréquent où une opinion prime au départ, celle-ci finit tôt ou tard, compte tenu des règles imposées au modèle, par recueillir tous les suffrages.

Même sur le papier, les choses ne sont bien sûr pas si simples. Serge Galam introduit dans ses équations un paramètre très humain : la part du doute. Celui-ci n'entre pas en jeu cas, suppose le chercheur, le groupe finit également par adopter une position commune (2 oui et 2 non donneront 4 oui ou 4 non), mais en se déterminant en fonction de *« représentations sociales, culturelles ou idéologiques »* ne relevant pas toujours de la question posée proprement dite.

« En cas de doute, précise Serge Galam, *c'est l'opinion la plus proche* ple, faire pencher la balance *« la croyance que ce traité signera la perte de la souveraineté nationale »* ou celle, pourtant dénuée de fondement, que *« sa ratification entraînera l'adhésion de la Turquie à l'Europe ».*

EN TACHE D'HUILE

Tout l'intérêt du modèle est de mettre en évidence comment, de sant que, sur 100 Français, 70 sont au départ favorables au « oui » au référendum, ils ne sont plus que 67 après le premier round de discussion, 63 après le deuxième, puis, la machine s'emballant, 56, 45, 30, 12, 2 et, pour finir, 0. Quatre cycles suffisent pour rendre le « oui » minoritaire, et huit pour l'éliminer complètement. Il faudrait que les partisans du « oui » soient 80 pour qu'ils finissent par convaincre les 20 défenseurs du « non », au bout de quatorze cycles de discussion.

Un tel scénario, qui réduit à néant une opinion au départ largement majoritaire, n'est évidemment guère vraisemblable. Cette construction arithmétique a en effet ses limites. Elle ne tient pas compte, en particulier, de tous les facteurs externes – interventions politiques, campagnes médiatiques, conjoncture économique, tensions internationales... – qui, dans la réalité, peuvent influencer l'opinion publique.

Les responsables politiques militant pour le « oui » au référendum pourraient néanmoins en tirer un enseignement, suggère, en chercheur-citoyen, Serge Galam. Puisque le « non » risque de prospérer sur la défense du statu quo, il leur faut convaincre les Français que ce

LE MONDE/SAMEDI 26 FÉVRIER 2005/**23**

In may 29, 2005 the No won the vote at 55%

It was the first time that a political vote outcome was predicted using a model from sociophyscis

Moreover it was highly improbable

Up to the last minute no-one among analysts could believe it will happen

In addition the prediction was made several months ahead of the actual vote against all polls and predictions

It was not a tail to head chance

It was up to few weeks ahead of the vote a zero probability event

It was even not a random selection with a low probability

Of course it does not means the model is correct

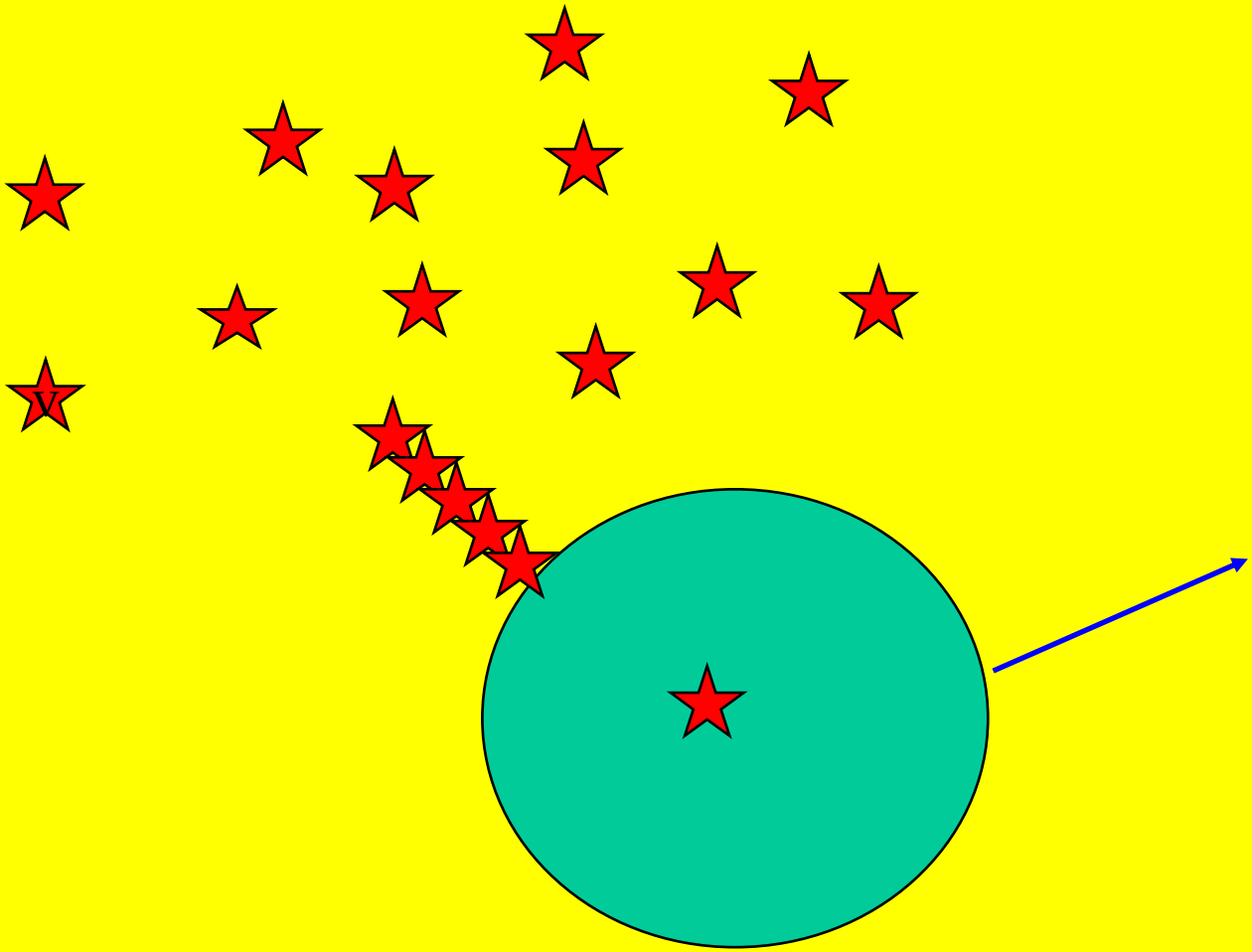
But it validates the model and the approach in a way to prove that sociophysics may become in the near future a real predictive tool

This will have drastic consequences on political life

No one is prepared to such a possibility

But hold on

To conclude,



We are on the right track but yet only at the very beginning

…

much work and checks have still to be made