Mapping the 2006 Canadian election: a user-controlled multilayered overlay map of federal electoral districts

Richard Hunt

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Abstract

This project investigates the use of information design principles to create an engaging, interactive map of the 2006 Canadian federal election. Its purpose is to improve on existing political maps by representing electoral districts on the basis of their importance in the constitution of Canada's government, rather than their geography. Furthermore, the map shows not simply the results of the election, but also provides more information about the behaviour of voters, as well as giving insight into differences and similarities between voter behaviour in different parts of the country, and allows the user to explore and make critical comment of the visual representations of that data.

To my family

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Thanks to all who helped me with this, including but not limited to my supervisors, Angela Norwood and Wendy Wong, the rest of the Department of Design at York University, Rebeca Lamadrid, Moiz Syed, Pietro Gagliano, and other past and present students in the York design programme. I also thank Deb Fels' Ryerson group and most of all Berry and Jeremy, without whose support the project would have been impossible.

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Since at least the seventeenth century, scientific atlases have served to train the eye of the novice and calibrate that of the old hand. They teach how to see the essential and overlook the incidental."[1]

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[1]Lorraine Daston and Peter Galison, *Objectivity* (New York, Zone, forthcoming), galley p. 17.

INTRODUCTION

In a world with ever-increasing amounts of information, we are in danger of suffering from information overload as it becomes increasingly hard to differentiate the "essential and the incidental." Richard Saul Wurman states "The amount of available information now doubles every 5 years; soon it will be doubling every four"[2] The accuracy of the number is not important; it is at least certain that information is increasing at a geometric rate.[3] The ramifications of this increase are many, but in terms of the experience of individuals, in the negative extreme, it means that we suffer from informational saturation, i.e., that we encounter such an overwhelming amount of information that it becomes difficult to determine which information is useful or relevant. In the positive sense, it means that we can find out what ever we want, a democratic and leveling force that works in two ways; we have more and easier access to information, and for the first time in history after the advent of mass media, we can also contribute to the information set, as in the "wikipedia" and open source software models.

We are becoming increasingly our own gatekeepers.[4] Certainly the gatekeeper's role has always been partly that of the individual. Individuals past the level of primary education, have choices in what they choose to read or listen to, though, in the world of mass media, has always been from a set that has been chosen by the gatekeepers. But

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[2]Richard Saul Wurman, *Information Anxiety* (New York: Doubleday, 1989), p. 33.

[3]Hans Rosling, http://www.ted.com/tedtalksplayer.cfm?key=jans_rosling.

[4]Pamela J. Shoemaker, *Communication Concepts 3: Gatekeeping* (Newbury Park, CA: Sage, 1991), p. 22.

sorting, choosing and using it becomes more difficult as it becomes more accessible, less structured, and less reliable, in that information can be supplied by individuals; the economically-driven gatekeeping functions of cost that made publication of periodicals and books and other media something to be carefully considered are disappearing. Visual presentation of information becomes both more attractive as data sets grow larger, and more problematic, as visual aesthetic quality and ease of use become more important than the information itself.

Developments in information storage and manipulation as well as communication technologies, which are at the heart of this burgeoning information, also provide the possibility of a solution. It becomes possible for individuals to use the computer to choose and filter the information that they see, and to thereby become more aware of the different interpretations that can be applied to information.

This map is intended for anyone who is interested in the Canadian electoral system, in similarities and differences between voters in different parts of the country, and as a source of contemplation on whether or not our political system is the best way of representing the political will of the Canadian voter.

Definitions

Data are defined in this paper as individual facts or measurements, with little visual or organizational context, essentially records; information is defined as those data structured in such a way as to successfully have meaning to the user;[5] the word map is used to indicate visual organization of data spatially in order to communicate information. Though a map may be conceptual, in this case, the word map will imply the depiction of spatial relationships, though not their literal representation.

The principles of information design are defined as the principles of graphic design, (balance, contrast, rhythm, emphasis, and unity) to address the questions of who is the information presented intended for? What is the intended impact on the user? Which is the optimum way to convey it to that user?

Research questions

Can an interface that displays user-chosen transparency overlays give a better understanding of and stimulate thought about the Canadian federal electoral system?

How can information be displayed in a way that offers the user the ability to perceive varying, even contradictory, interpretations of the same information, rather than presenting them with a conclusion controlled by the designer?

What is the best way to construct maps emphasize the information they are intended to communicate and avoid misleading extraneous information?

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[5] This definition is informed by information theory, as discussed by Werner Severin and James Tankard in their *Communication Theories,* Jacques Bertin, who proposes that in graphic representation it is important to "strictly separate the content (the *information* to be transmitted) from the container (the *properties* of the graphic system)" He defines information in graphic representation as "the translatable content of a thought" and "data to be transcribed." Jacques Bertin, *The Semiology of Graphics: Diagrams, Networks, Maps* (Madison, WI: University of Wisconsin Press, 1993), p. 9.

How should the overlay colours be best chosen by the designer to maximize utility of overlays to convey information while minimizing the contextual problems of colour use?

VISUAL REPRESENTATIONS OF DATA

Though we have the choice to decide what information we focus our attention on and use, that information is nonetheless presented to us in a designed form, which affects both our initial decision to pay attention to that information, and our subsequent thought about and any analysis we may make of it. Graphic representations of information, and visual explanations and interpretations of that information are appealing because they offer the possibility of a simple and concise representation of relationships and trends and a means of presenting large amounts of information. As Jacques Bertin wrote in his comprehensive and authoritative *The Semiology of Graphics*, "It would take at least 20,000 successive instants of perception to compare 2 data tables of 100 rows by 100 columns. If the data are transcribed graphically, comparison becomes easy; it can even be instantaneous."[6]

Charts, diagrams, graphs, tables, guides, instructions, directories, and maps comprise an enormous accumulation of material, symptomatic of the amount of information that exists. Tufte, speaking of the importance and accumulation of graphic representations of information, writes that it has been described as "'cognitive art'[…]it embodies tens of trillions of images created and multiplied the world over every year."[7]

However, visual representations unavoidably simplify the reality of almost any relationship. Real world relationships are complex, and while visual representations of them are useful, their analysis and commentary depend on the use of language. Graphic

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[6]Bertin, p. 9.

[7]Edward R. Tufte, *Envisioning Information* (Cheshire, CT: Graphics Press, 1990), p. 9.

tools such as graphs, diagrams and maps are aids to, and particularly suitable for understanding relationships, but are in a way incomplete, because it is impossible for them to explain the reasons for relationships.

This tendency of visual communication to present unanalyzed conclusions is inevitable to some extent, but should not be simply accepted. There are many choices that are made when creating visual representations of "real world" relationships. There is the choice of what to portray, how to portray it, (i.e., scatter plot, graph, chart [and what kind of chart, bar, pie, etc.], diagram, etc. Once that decision is made, many decisions have to be made in its presentation. Elements such as composition, typography, organization and emphasis are design elements that shape the information, and consequently, its interpretation. But in most cases the intention of visual explanations is to clarify, often by means of simplifying, the information presented, (though Edward Tufte, a well-known contemporary writer on information design, would disagree, claiming that "graphics can be more precise and revealing than conventional statistical computations")[8]. Revealing, certainly, but almost never more precise. Graphical representation of statistics can show trends and comparisons, but precision must be left to the numbers themselves. Consequently, when possible, the underlying data should also be made available to users, whether or not they choose to avail themselves of it. The world is complex, and the use of visual explanations may simultaneously enable a grasp of the significance of a complex set of information, and at the same time, give a misleading oversimplification of that information. This is an essential problem. The problem is that visual explanations tend to fix a viewer's interpretation of the underlying data portrayed. They carry within themselves the suggestion that the visual explanation *is* the correct and complete representation of the information being communicated, and thereby discourage the viewer's consideration of alternate interpretations, potentially hindering critical thought.

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[8] Edward R. Tufte, *The Visual Display of Quantitative Information* (Cheshire, CT, Graphics Press, 2001), p. 13.

This is not always the case, though. At best, graphics give an effective distillation of complex information, and as I propose, can function as a tool controlled by the user, who can use artifacts of information design to draw their own conclusions, and discover new relationships. Bertin suggests that graphic representations are effective, because they enable users to use the human talent for

> utilising the mechanisms of ordering and classing, for the purposes of discovering
> –the groupings contained in the information being processed, and
> –deriving from it new components or categories, reduced in number and consequently easier to memorize than the comprehensive information.[9]

[9]Bertin, p. 160.

THE POLITICAL MAP OF CANADA

Figure 1 shows a political map of Canada supplied by Elections Canada, the body set up by the Canadian government to supply election information to Canadians. This map is typical of its kind, and it does what it implicitly claims to do well. That is, it shows an image of the political geography of the nation of Canada, and accurately and truthfully shows that the inhabitants of those geographically defined political boundaries of the federal election districts of Canada are represented by whichever of the political parties received the greatest number of votes in those districts in the last election. Few would question that a map of some kind is an appropriate medium for showing and contemplating this information. This map confirms our conceptions, i.e., that Ontario voters largely voted for Liberal party candidates, that the Prairie provinces elected Conservative candidates, and that the Quebec electorate in large numbers voted for the Bloc. This is not to say it may not also hold some thought-provoking surprises. For example, many people may find it surprising to see the number of Conservatives elected around Quebec City, which, being the provincial (or as the Quebecois would say, national) capital of Quebec, might be expected by many Canadians to be a bastion of separatist, and therefore, Bloc Quebecois, voters.

But this map has two significant problems, one of which is due to the form of the map, and the other due to its treatment of the subject it represents. First, it insists too much on the geography, which in the process of democracy is largely irrelevant, being a reflection of people's will, with the boundaries of electoral districts depending on where people live, and not the converse. In Canada, a geographical model is particularly and uniquely misleading. In the Canadian political system, the principle of "representation by

population" was established at confederation.[10] Electoral districts are described by geography, but they are defined principally by population. This principle might seem obvious, but though it was necessary to secure the agreement of the fast growing western areas of the country to gain their agreement to Confederation, it was strongly contested. (Ironically, the principle of representation by population is not honoured in practice).[11]

Generally, though, the ideal of representation by population means that the size of electoral districts is defined by their population. Not only are the coast lines, rivers, and other geographical features irrelevant to the process and results of democracy, the population is so unevenly distributed that to adhere to a geographical representation is, in any kind of practically sized format, impossible. Since the population of Canada is concentrated in the urban, suburban and intensively farmed areas of the east, and in scattered urban areas in the rest of the country, there are many small electoral districts, particularly in the southeastern part of the country, while most of the country consists of relatively few large sparsely populated areas and hence large electoral districts. Because we live in a democracy, the small, highly populated areas have more power in the formation of the government, while the areas that are sparsely populated have very little political power for a given area. The official map of Canada makes the opposite case: the

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[10] www.collectionscanada.ca/confederation/023001-2990-e.html. Accessed March 10, 2007.

[11] www.elections.canada.ca. As the division of power established at Confederation in 1867 did not account for the difference in growth between the Atlantic provinces and the rest of Canada, and certain parts of the Constitution relating to the number of seats apportioned to each province in the Senate and their relationship to the number of seats in the House of Commons has led to smaller electoral districts in the House of Commons, and thus their votes have more weight. A federal vote in Prince Edward Island, for example, is worth almost three times as much as a vote in most other parts of the country.

map gives sparsely populated areas more visual importance, when in the democratic model, where the population, and thus the voters, live naturally defines where power lies. Ironically, the map's fidelity to the geography of the country results in an effective distortion of the democratic fact. As Tufte writes about statistically based geographically accurate maps of cancer distribution in the United States, "they wrongly equate the visual importance of each county with its geographical area rather than with the number of people living in the county."[12]

So why are we presented with this geographical representation with the results of people voting overlaid upon it, when it clearly has its faults? There are reasons, some of them defensible, some less so. First, there is a convention of using geographically accurate maps. It is very common to use a fairly accurate geographical representation of demographic data, elections included; this convention, though it is less suitable for Canada than other countries with a more consistent distribution of population may be in keeping with user expectations. In her essay, "Chaos, Order, Sense-Making: A Proposed Theory for Information Design," Brenda Dervin, discusses the evolution of the treatment of information in the western tradition, writing, "[h]istorically, information was conceptualized as a natural description of natural reality. This way of seeing information remains the dominant conceptualization assumed in the design of information systems—and it is a heavy baggage."[13]

The map we are offered is certainly dramatic, simple and clear, but we should be suspicious of this drama, simplicity and clarity. A dramatic map may entertain more than

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[12]Tufte, *Visual Display*, p. 20. Like the geographically-based electoral map of Canada, the demographic map he is writing about inversely emphasizes the relationship between the population and its density.

[13]Brenda Dervin, p. 39. "Chaos, Order, Sense-Making: A Proposed Theory for Information Design," in *Information Design*, Robert Jacobsen, ed. (Cambridge, MA: MIT Press, 1999),

enlighten, and drama is often the product of the news media's attempts to hold our attentions.[14] This map tends to reinforce and amplify what it portrays. It does not represent the system itself, nor any of the factors that contribute to the end result of the system, it represents only voters who voted for the party that won the given electoral district. There is a kind of inevitability to this; the system that puts the governing party in power is not surprisingly one that the governing parties are not strongly motivated to change. So the map that is supplied to the electorate by the government Web site tends to reinforce and validate that system. It also has an added advantage to news media, in that it creates clear divisions and geographical political dynamics in national politics that make for entertaining writing. The map encourages Canadians to perceive Canadians from other parts of the country as the Other. The Conservative voters in the Prairies view the Liberals of Ontario with suspicion, the perceived difference of Quebeckers from Canadians of other provinces is, though undoubtedly valid to some degree, made stronger by the light blue of the Bloc that characterizes most of Quebec past west Montreal.

There are also many data sets on the Elections Canada Web site not visually represented except by means of tables or as CSV (comma separated value) files (figure 2). Found under the heading "Raw data version (for researchers)" these data are not hidden (though less than optimally accessible) and are freely available to all.[15] The argument for not visually representing these data sets may be somewhat circular, in that because they are not germane to the formation of the government, it might be argued that they are less relevant than the mapped information. Additionally there is the argument that only so much data can be presented, and that the amount of available data is more than can be represented or absorbed.

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[14]Pamela J. Shoemaker, *Communication Concepts 3: Gatekeeping* (Newbury Park, CA: Sage, 1991).

[15] http://www.elections.ca/content.asp?section=pas&document=index&dir=39ge&lang. Accessed March 15, 2007.

This argument is does have merits and in the past, was probably valid; the print environment's ability to portray all available information is limited by cost and structure, but in the computer environment, these limits are largely invalid. Technology available today allows far more latitude in showing information, for example by allowing zooming and pulling back from visual material, enabling network organization of information rather than the traditional more linear forms, and, more important, offers the opportunity for the designer to allow the user to both choose what information is to be presented, and to what degree that information be more complex, and by corollary, less clear.

In his *Semiology of Graphics*, Bertin shows many images of French representing demographic data, and though he uses distortions of the geography as examples of ways to solve problems of showing variations in density (such as the concentration of population in the area of Paris), the approximate shape of France is still maintained (figure 3).[16] He points out that it is somewhat unsatisfactory, as the distortions caused by the variations in data distort the map, and furthermore, as there is no conventional method, every designer will produce a different map).

In their book *Interactive Spatial Data Analysis*, Trevor Bailey and Anthony Gatrell point out the same problem with cartograms, suggesting that the designer "relax the contiguity restraint and to endeavour to see, but not to insist, that adjacent areal units remain adjacent… [17] This problem of distortion seems acceptable in the case of a highly populated, relatively consistently inhabited European country such as France. Maps of more unevenly populated countries such as Australia, Russia, or large countries in the Middle East or North Africa are, like Canada, more difficult. A similar approach to distortion in the United States can be seen in figures 4 to 6.

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[16]Bertin, p. 100ff.

[17] Trevor C. Bailey and Anthony C. Gatrell, *Interactive Spatial Data Analysis* (Harlow, UK: Longman Scientific & Technical, 1995), p. 258

Another advantage to presenting a geographically faithful representation of demographic data is that it incorporates the experience and knowledge of the reader. Because inhabitants of a country are generally aware of the shape of the national and internal political boundaries, and where they live in relationship to those boundaries, they are able to quickly see which data apply to their area, and thus themselves. This is significant; less orthodox representations will require some adjustment and learning on the part of the user. However, the necessary adjustment to this unorthodoxy may be repaid by giving a more clear representation of the data, and more successfully in showing the significance of the data.

The insistence on geography in a map representing statistical information, not of the geography, but of statistics relating to those who live there, is, in terms of information design, especially difficult to support in cases such as Canada. Not that the geographical representation is intrinsically problematic, but the creator of almost every map must choose what to represent in order to avoid chaotic over-representation of data if they wish to successfully provide to the user the possibility of deriving information relevant to the user's interest.[18] Choosing to faithfully depict the geography draws the reader's eye to that geography and away from the information that is putatively being presented. Tufte suggests that "[o]ur visual impression of the data is entangled with the circumstance of geographic boundaries, shapes, and areas," again implying that the depiction of geography is actually a liability.[19]

Bailey and Gatrell refer specifically to the problem of representing Canadian voting data:

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[18]Denis Wood, *The Power of Maps* (New York: Guilford, 1992). Any single map is but one of an indefinitely large number of maps that might be produced with the same data.

[19] Tufte, *Visual Display*, p. 20.

> if we wished to map [Canadian voting data] on a traditional choropleth map, we would see little of interest in the major Ontario cities, since they would be swamped by the need to also show the vast (but rather uninteresting from the point of view of electoral geography!) areas of Yukon and the Northern territories.[20]

Canada's political system at the municipal, provincial, and federal levels is the simple majority "the first-past-the-post" system. In the Canadian federal system, in each electoral district, the candidate (usually the representative of one of the major political parties) who garners the most votes wins the district and becomes the representative of that district in the House of Commons. This is the British parliamentary system, and is generally the one used, with adaptations, in former British Colonies. The most common alternative in democracies is one that includes elements of proportional representation, which, in varying forms is used in much of Europe. It has the advantage of representing the wishes of all parts of the population to a greater or less degree. This system may be implemented in various ways and synthesize different systems. For example, Germany's political system uses a mixture of regional and proportional representation. Support for this type of system gaining support in Canada from voters and the smaller federal political parties.[21]

Another alternative to the first-past-the-post system is the preference ballot, in which voters rank candidates by preference, with a weighting applied to each ranking. Though it is difficult to estimate the results of such a system in Canada, it also is likely to

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[20] Bailey and Gatrell, p 256.

[21] www.fairvotecanada.org. Accessed March 14, 2007. This site discusses the proportional vote movement in Canada.

more fairly represent the wishes of voters than the first-past-the-post system.[22]

The first-past-the-post system has its advantages. It leads to stable governments, unlike those of some countries that have some form of proportional representation, such as Italy (well-known for the frequency of changes of government since the Second World War) but in the Canadian example, ignores the thousands of votes made for the Green and less popular, but still valid other parties, such as the First Peoples National Party of Canada, the Marxist-Leninist Party, the Christian Heritage Party, and others.

The single-member plurality (SMP) system tends to over-reward major parties, and under-reward smaller parties. Under SMP it is all too common for major parties to receive a higher percentage of seats than their share of the popular vote, while smaller parties receive fewer seats. For example, in the June 2004 federal election, the Green Party received 4.3 percent of the popular vote, but did not win any seats. Similarly, the New Democratic Party received 15.69 percent of the popular vote, but won only 19 out of 308 (approximately six percent) of House of Commons seats. By contrast, despite being reduced to a minority government, the Liberals still received a higher percentage of seats than their share of the popular vote (the party received 36.7 percent of the popular vote, but won nearly 44 percent of the seats). This discrepancy between votes and representation becomes even clearer when looking at the 2000 federal election, where 40.8 of the popular vote was enough to give the Liberals over 55 percent of the seats, and a clear parliamentary majority[23] If Canada had had a purely proportional representation

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[22]Brian O'Neal, "Electoral Systems," 1993. http://www.parl.gc.ca/information/library/PRBpubs/bp334-e.htm. Accessed March 11, 2007. This paper gives a good overview of the Canadian Federal Electoral system and possible alternatives.

[23]www.elections.ca. Accessed February 6, 2007. For various reasons a few electoral districts have significantly less voters than others. One reason is due to Confederation and demographic changes since its establishment in 1867, another because it is considered

system operating in the 2006 federal election the results would have been quite different. The results of the election were:

Conservatives	124
Liberals	103
BQ	51
NDP	29
Independent	14[24]

Under a purely proportional representation system, the breakdown would have been as follows, based on the popular vote percentages:

Conservatives	111
Liberals	93
BQ	31
NDP	54
Green	14[25]

The minor parties would on the whole have done relatively better than the two major parties, which would have done relatively worse; it is not surprising that parties in power prefer the status quo.

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logical for the large sparsely-populated territories of the North to have representation in Parliament even though there are relatively few voters there.

[24] http://en.wikipedia.org/wiki/Canadian_federal_election,_2006#Overall_results. Accessed March 14, 2007.

[25] http://en.wikipedia.org/wiki/Canadian_federal_election,_2006#Overall_results. Accessed March 14, 2007.

There is another separate, though related problem: the difference in concentration of population between urban and rural electoral districts, and the resulting huge difference in sizes between different electoral districts means that districts are nearly impossible to show accurately and simultaneously on the same scale. This is dealt with, in the Elections Canada map, by means of showing the urban electoral districts on the bottom left and right corners. This does not provide any information about the numbers of voters or geographical relationships (without any indication of scale, they fail to communicate even geographic information), The otherwise faithful depiction of geographic form on this map does have a purpose. It is clearly an image of Canada. The map, with its meticulously drawn coastline, its rivers, and lakes, gives an air of accuracy, of strict adherence to the truth, and most usefully, has the ability for users to quickly understand where they live and what party represents them (though this is less true in the urban areas, where people may identify themselves as citizens of a particular city, but be unaware of their electoral district.) If the purpose is to show the results of a voting process within the context of the country's population as a whole, the map could do a better job prioritizing the political significance of areas of the country over the literal geography of the country itself. We cannot completely ignore it, because the sense people have of being Canadians and citizens is to some degree naturally a geographic one, as Canada itself is defined by geographic and political borders, and without question the relationship between the federal government and the provincial government and, to a lesser extent, municipal governments, is relevant to citizens and thus their individual relationships to the federal government.

Tufte suggests that distortion due to differing perceptions and interpretations of users is difficult to avoid, but that two principles help achieve the goals of achieving uniformity and the opportunity for users will understand the numbers represented by the graphics.

> The representation of numbers, as physically measured on the surface of the graphic, should be directly proportional to the numerical quantities represented.[26]

The electoral map of Canada in figure 1 fails the criterion of visually depicting the number of Canadians represented by the parties that won any given riding. The presentation of political information too, is more of a problem than other demographic data, as the boundaries are often artificial, particularly in urban areas.

Of course, any alternate way of visually representing the Canadian federal electoral system will involve compromises and omissions. We could, for example, represent the geography of the ridings at a size proportionate to their population of voters, or their importance in the constitution of the federal government.[27] This makes the political relevance of the different ridings more clear, but distorts the geography of the country to the point that it becomes at best distracting and at worse confusing and almost meaningless. Such representation may point out the disparity of population and thus political power, but may distract the user from the importance of that political power itself. This would be an extreme representation of the cartogram, which, as Bertin points out, may be useful "but at the expense of deforming the geographic shape with which the reader is familiar."[28]

To approach the problem from the opposite direction, that is, by ignoring geography and concentrating on the results of voting, one might choose instead to use a map of the seating plan of the seats in the House of Commons (figure 7). This, suitably coded, makes clear the distribution of federal representation in terms of the name of electoral district, and the user may well understand that, but the map gives no information about the political constitution of the federal government other than by party unless the

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[26]Tufte, *Visual Display*, p. 56.

[27]See note 1. The number of voters and their relative power are not necessarily equivalent.

[28]Bertin, p. 285.

user recognizes and is familiar with the names of the electoral district. By changing the seats from their actual plan and rearranging them, one may be able to impart much of that information visually, and by subsequent further rearrangements, show all kinds of relationships, by moving and grouping seats according to category (figure 8).

However, the House of Commons model-as-map, though useful for clearly showing how many seats each party has, and showing which party is in power, seems to be unnecessarily dismissive of the geography of the country, which without question, is significant in the constitution of the federal government, as may be seen by any geographically based map of Canadian electoral districts, which show that certain areas tend to elect candidates of particular parties. Furthermore, the rearranging of the seats would create inaccurate impressions, and quite possibly mislead the user, in different ways than the strict geographic interpretation to be sure, but no less problematic.

THE PROJECT: AN INTERACTIVE OVERLAY MAP OF THE 2006 CANADIAN FEDERAL ELECTION

Having established that the electoral map of Canada is misleading both in how it represents what it purports to represent, and in how it glosses over, the political reality of how people vote, it remained to find a more satisfactory way to approach the problem. The visual problems that arose were challenging and interesting. Initially the most difficult issue was how to deal with the uneven distribution of the population (and hence the voters) in the country, was an initial problem. It is intuitively clear that the geographic map of electoral districts and the seating plan of the House of Commons are at the opposite poles of an axis of possible emphases, and that neither satisfactorily represent the political reality of how individual voters are represented in Ottawa.

The geographic map prioritizes the geography at the expense of correct representation of votes, while the seating plan, while it accurately visually represents the distribution of power between the parties, does so at the expense of information about what part of the country they come from. There are many degrees between these two. For example, one could take the approach of distorting the map rather than the representation of voters. This works well enough if the variations of population are not too great, but in the case of Canada, trying to portray the 9km^2 of Papineau and its approximately 80,000 registered voters and the nearly 2,000,000 km^2 land area of Nunavut with its 30,000 registered voters[29] (figure 9) on the same scale will distort the geography to such a point it

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[29]See note 16. When Nunavut was formed as a separate political identity in 1991, it was given a seat in Parliament, though its population was about a third of that of a normally determined-by-population electoral district.

would be both absurd and unrecognizable. Another approach is to treat the geography more diagrammatically, thereby making it clear to the user that it is not a literal representation of the geography, and represent the electoral districts schematically. This is useful for orienting the user to the map, but again the location on the map of the electoral districts is misleading. In the case of highly populated areas, the districts are to be very far away from their "actual" location on the map. In sparsely populated areas, the representation of all the voters in one area would speciously imply a concentration of population.

The principle of elegance is an important one in any kind of design Leslie Segal writes in his introduction to *Graphis Diagrams: the Graphic Visualization of Abstract Data*, that "elegance is a measure of the grace and simplicity of the designed product relative to the complexity of its functions." He continues.

> Given two charts, or tables, or maps, of equal simplicity, we know the one conveying more information is the more elegant. Conversely, of two charts conveying the same information, the simpler is the more elegant.[30]

Given the conflicting visual relationships of density and area, finding a satisfactory way to depict these together simultaneously is a difficult problem, particularly so in the case of Canada. The cartogram is unsatisfactory in Canada for the reasons discussed Bailey and Gatrell suggest that "the ideal is to avoid using area aggregated data altogether if possible."[31] With this in mind it was decided to start from the House of Commons seating model, because it contains nothing but the essential information of which party won the seats in the House of Common.

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[30] *Graphis Diagrams: the Graphic Visualization of Abstract Data*, Walter Herdeg (Zurich: Graphis Press, 1980), p. 8.

[31] Bailey and Gatrell, p. 258.

A hexagonal form was chosen for the electoral district because of its efficient use of space, and because it allows a maximum number of adjoining shapes, which is appropriate as the irregular shape of electoral districts leads to cases where several electoral districts share borders.

The next step was to add and distribute the ridings in way that as closely as possible represented their actual proximal relationships (figure 10). Any attempt to represent distances or other geographical relationship beyond approximate cardinal directions was both an inefficient use of space and appeared to depict a relationship that had little association with reality. However, it does convey the geographic relationships, if not the actual geographic form, that are germane to Canadian democracy. There is no question that certain parts of the country tend to vote in certain ways, and have certain common interests.

By giving up the attempt to portray geographic reality, this schematic political map of Canada provides the possibility for the viewer to better understand in whose hands the democratic political power lies, once he or she is reconciled to the fact that the map has only the most rudimentary geographical references, and shows only the approximate relative locations of the districts. As Wurman writes, quoting Joel Katz,

> "What are the simplest questions you would ask yourself if you were doing a map? How would you start? There's one question: what's the purpose of the map?… The purpose of the map relates to the experience that's appropriate for the person using to have. There are even cases for nongeographic…maps that depart from reality."[32]

On looking at this new map, the first realization may be that Ontario and Quebec hold the bulk of political power in Canada. This may be common knowledge, but the visual

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[32]Wurman, p. 266.

representation makes it clear and immediate. A slightly closer inspection of the names of the ridings in Ontario and Quebec will provide a second realization to those familiar with the names of the ridings: most of those Ontario and Quebec seats represent the Toronto and Montreal areas. The 32 Toronto area districts mean that there are more Toronto area Members of Parliament than there are from the provinces of Manitoba and Saskatchewan combined. In a democratic system that gives (in principle) equal voice to each voter, of course the more densely populated areas have a greater voice. But it may be sobering to see it thus visually presented. This shows that the most parts of the country are unlikely to have even the potential to significantly affect the constitution of the government (though the most recent election was close enough that winning a given electoral district was significant; this apparently made the importance of voting in parts of the country with few electoral districts more important, though this situation is of course dependent on the electoral-district-rich parts of the country and their results.)

Having reduced complexity by designing the map to most usefully and effectively show the results of the election, the second aim of this map is to better represent the complexity of voter behaviour and relationships between different parts of Canada, and to refute the validity of the simple conclusions that are the result of Canada's political system and which are unquestioningly endorsed by the design of the electoral map. The abilities of the computer provide both access to the data that shows this complexity, and the tools to visually represent it. In order to show relationships between electoral districts and associated information, an opacity-defined choropleth model chosen as being an appropriate choice for the type of information and the medium of the computer screen. [33] This kind of map has traditionally uses patterns or textures to

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[33]Robert L. Harris, *Information Graphics: A Comprehensive Illustrated Reference* (Atlanta: Management Graphics, 1996), p. 72.

Sometimes referred to as a shaded, cross-hatched, or textured map. A choropleth map is a variation of a statistical map that displays area data by means of shading,

represent different values, largely because of the economic cost of using colour in the print. In the computer environment, where colour costs nothing to employ, maps using colour intensity to compare values are common, and often known as “heat maps,” typically used for representing meteorological information, though they usually use different colours as well as different intensities.

For this project, a number of factors are considered. The first principle is that all data should be from Elections Canada, and that it be either electoral information found on the site, or figures that could be derived from applying simple arithmetical functions to data relationships.

The categories chosen are the percentages of Conservative, Liberal, and NDP vote for each riding, assigned blue, red, and yellow respectively. The percentage of votes received by each party is represented by a layer of colour with opacity equal to that percentage rounded to the nearest percent. Because the Green Party ran candidates in every electoral district, it is also represented, although the 4 to 6 percent they generally receive is almost imperceptible to the viewer when translated to 4 to 6 percent colour on a computer screen. At the risk of editorializing unnecessarily, it was decided to use a stronger opacity to show districts that had between 5 and 10 percent of the popular vote, and a still stronger one to show districts where the Green candidate received more than 10 percent of the vote. The Green Party is included because it is the only other party apart from the four major parties that would have enough votes to gain seats in a proportional representation system.

The participation percentage of eligible voters is set in shades of grey, with the opacity equal to the voter turnout, again rounded to the nearest percent.

Voter plurality seems especially significant, as it shows not percentage, but the

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color, or patterns. The areas (sometimes called areal units) might be countries, states, territories, counties, zip codes, trading areas, etc. The data is generally in terms of ratios, percents, or rates as opposed to absolute units.

degree by which the winning candidate won. This, like the case of the Green party, requires a different method to represent the underlying data for three reasons. First, because whether a seat is won by an absolute majority seems significant, a different colour (purple) is used to designate these districts, with the opacity showing the percentage vote of the winning candidate. Second, shades of black are used to show the difference between the winning candidate and the candidate receiving the next highest number of votes. Third, because opacity values of under 10 percent are difficult to discern, a pale green value of 50 percent is used to indicate those ridings where the winning candidate won by a margin of less than 5 percent of the popular vote.

Density of population is also relevant, for reasons of representation discussed earlier, but also because urban voters may have different interests and priorities than urban voters. There are three levels of voter density shown on the map. The most densely populated districts, defined as those with over 1500 voters per $km^{2,}$ are shown with the largest black dots. This gives an approximate representation of urban areas. Those with between 1500 and 100 voters per area are represented with smaller dots, which represent suburban and populous rural areas, as well as districts that include both urban and more sparsely populated areas. Those districts with no dots represent sparsely populated areas, defined as those with fewer than 100 per km^2.

Though the provincial borders and cities are irrelevant in the actual operation of the federal election, as voters choose directly choose their Member of Parliament, these political labels were included as options as they may help orient users, and do not impinge on the area of the map itself, and thus do not interfere with the information.

The use of colour is somewhat problematic, bringing disadvantages as well as advantages. Donald Norman suggests that "'natural' mapping of percentage uses relative density to show relative increments of percentages,"[34] instead of other methods, such as different patterns. Technology encourages the use of colour, as unlike the print

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[34]Donald Norman, *Things that Make Us Smart* (New York: Basic Books, 1993), p. 100.

environment, colours have no application cost on computer screens, and colour is a useful tool for presenting data, and furthermore, shades of colour are useful for showing degrees of information. As Tufte writes: "Colour is a natural quantifier, with a perceptually continuous (in value and saturation) span of incredible fineness of distinction, at a precision comparable to most measurement"[35] and defines "the fundamental uses of color in information design: *to label* (color as noun), *to measure* (color as quantity), *to represent or imitate reality* (color as representation) and *to enliven and decorate* (color as beauty).[36]

He adds a warning, saying "In practice everything is not this wonderful [referring to Paul Klee's statement "And what tremendous possibilities for the variation of meaning are offered by the combination of colors…"] given the frequently uneasy translations from number to corresponding color and thence to human readings and interpretations."

It is true that colour is less definitive than measurable length or size. It is easy for the user to see that one line, for example, is twice as long as another line. Perceiving a 70% percent opaque red as twice a 35% opaque red is not as easy. But colour opacity is useful precisely because it is not dependent on physical space, and is thus suitable for relative intensity of data associated with a given visual area, rather than measurement. In the case of a democratic system, intensity is an apposite description. Groups of voters do not prefer one candidate to another by some binary factor, but on a varying continuum.

Tufte adds another warning about the use of colour, citing Eduard Imhoff's *Cartographic Relief Presentation*: "*First rule:* Pure, bright or very strong colours have loud, unbearable effects when they stand unrelieved over large areas adjacent to each other, but extraordinary effect can be achieved when they are used sparingly on or

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[35]Tufte, *Envisioning Information*, p. 93.

[36]Tufte, *Envisioning Information*, p. 83

between dull background tones."[37] This may be true, but almost unavoidably brings the user's focus to those colourful points or areas. The interactive map does have large areas of bright and strong colours, but this visual activity does successfully represent the complexity of the data it represents.

Tufte also extrapolates from Imhof's first rule "[C]olor spots against a light gray or muted field highlight and italicize data, and also help weave an overall harmony."[38] This may be true, but if one highlights and italicizes data, one risks editorializing, and further taking away the user's objective attitude to the information. In some regards, using different colours as measures of comparison is difficult, because value depends on the colour, and proximate colours may affect the perception of a given colour.[39]

The most problematic aspect is one that Bertin points out: "The saturated tone [of different colours] varies in value according to the color…It is this fact that leads to many of the main problems raised by the use of color."[40]

This is a valid point. For some purposes, it might be better to use the same colour to compare similar data sets. In the existing model, the NDP's yellow appears weaker than the Liberals' red, and even more weak than the Conservatives' blue, and for side-by-side

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[37]Tufte, *Envisioning Information*, p. 83. In most writing, highlighting and editorializing, particularly if the person doing it is not the author, creates an artificial focus and actually dissuades the reader from reading the entire argument, and instead leading them to concentrate on a particular points. This can be seen as a continuum; while informal writing, the roman text / italicization dichotomy is the norm, while in formal writing, a roman text/footnoting and end matter dichotomy is preferred.

[38]Tufte, *Envisioning Information*, p. 83.

[39]_Tufte, *Envisioning Information*, p. 83. There is an excellent example of a single colour appearing completely differently depending on what field it is seen on.

[40]Bertin, p. 85.

comparisons, shades of one colour, such as gray might well prove more effective.[41] But for an overlay model where the user is intended to be able to make comparisons between two or more areas of overlaid information, using one colour for different categories is obviously unsatisfactory, and the introduction of the weaknesses in using colour as a basis for comparison cited by Bertin seems a compromise worth making.

This possible problem is mitigated by making the relevant electoral data for each electoral district available to the user. By clicking on a district one is shown the name of the district (it is impossible to label the districts as would be desirable because of the constraints of size and resolution, especially as some electoral districts have names in excess of 50 characters in length) as well as the electoral data that drive the map. These data are naturally also impossible to represent simultaneously on a typical 1200 x 900 computer screen. By incorporating the data, and only presenting it when requested by the user, we make the data available but avoid the space and confusion of having them all shown at the same time.

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[41] Bertin, p. 54. "Because the do have natural visual hierarchy, varying shades of gray show varying qualities better than color."

USING THE MAP

This map is intended for anyone who is interested in the voting behaviour of Canadians, and how that behaviour leads to the government we have under our existing voting system. It also encourages the voter or potential voter to rethink the relationship between geography and population, and how those are represented in the federal government and on the standard geographically based map.

The decisions of what to show on the map and how to show it is within the usual set of decisions made by a designer. In this case the designer has chosen what to keep on the map and what to omit, and how those data will be represented. But what is relatively unusual is the designed ability for the user to choose which layers to view in concert with each other. This enables the user to view layers in a user-controlled sequence, overlay two or more layers, which because they are transparent, can be seen simultaneously.

In keeping with the current focus on usability and interest in the user experience, the user can overlay as many layers as they wish, to the point of colourful chaos. Though specific relationships and meanings become increasingly hard to discern as layers are superimposed, this too is both thought provoking, and in some ways a comment on the reality of what is being portrayed, though less discernable information is apparent, as the signal-to-noise ratio decreases.[42] If at one end of the information design spectrum is the

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[42] Werner J. Severin and James Tankard, *Communication Theories: Origins, Methods, Uses* (New York: Hastings House, 1979). A brief description of Claude Shannon's theory of communication, which, though originating from an engineering point of view, and instrumental in the establishment of successful electronic facsimile protocols, is relevant to

results of the vote without any evidence of the process or factors that led to that result, at the other end is a map that enables only vague impressions and a perception of complexity, which is more in keeping with individual's experienced reality. Dervin suggests that this current reality evolved through the history of information, breaking the evolution of information into seven stages of development: "At one extreme we have an ordered and universal reality; at the other, a chaotic and inaccessible reality."[43] She proposes an eighth narrative: "Information is a tool designed by human beings to make sense of reality assumed to be both chaotic and orderly."

But there is more missing from the geographical map than a failure to successfully deal with the problems of relative scale and distribution of electoral districts that are unavoidable in any attempt to show all Canada's electoral map on a geographically accurate scale. Every map chooses what it will portray. But in a world with ever-increasing amounts of available data, and the attendant increase in available modes of representation, the choice of showing one interpretation of reality (and thus implying that it is the only possible version of reality) becomes less defensible. This is especially true when faced with the Canadian political system, structurally already an oversimplification of the wishes of the voters, with its first-past-the-post system meaning that the votes of an individual are likely to be irrelevant, and a vote supporting a small party is virtually certain to be irrelevant, at least as far as the constitution of the federal government is concerned.

Given the problems with the existing political map, both in terms of effectiveness of representing information, and its unquestioning promotion of the results of an existing system that is, in fact, being questioned by Canadians, it seems appropriate to take a new

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human communication. In essence, it calculates the degree to which redundancy necessary in an environment when the quality of information is uncertain.

[43]Dervin, p. 39.

approach to the design of this map

> Complex problems are made up of many interrelated elements. They demand innovative approaches – flexible processes that reveal relationships among parts – that require us to look problems from new and varied points of view merely to understand them, much less to solve them. Problems are situated in specific contexts and their parts interact at many levels and across shifting boundaries.[44]

This is the direction I take with my project. I want to clearly show the relevant electoral information that leads to the constitution of the federal government. This includes a representation of the simple "first-past-the-post" results, with irrelevant or misleading geographical information sacrificed in order to more clearly represent the electoral end result, but with the all electoral information presented, information that can be viewed separately or superimposed by the agency of transparent overlays of data. These data are represented using a "heat map" method, whereby the percentages are represented by a colour overlay, of which the transparency is set, in most cases, to be the same as the percentage of the voters or their behaviours in a given riding, rounded to the nearest per cent. For example if the New Democratic Party received 20 percent of the vote in a given electoral district, this would be represented by a yellow colour at 20 percent opacity. This data can be overlaid successively to the point of apparent meaninglessness. However that meaningless is only apparent. The user may understand that all these layers of valid data overlaid to the point of incomprehensibility in fact is a fair representation of the Canadian electorate, something that cannot be summed up with a simple set of colours and associated electoral results.

This approach has several advantages. First, it avoids the idea of the average user.

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[44]Yvonne M. Hansen, "Graphic Tools for Thinking, Planning, and Problem Solving," in Jacobson, p. 93.

Any form of information design of course is used and interpreted differently by different users and any attempt to address the needs of the "average user" involves more compromises than those that are an unavoidable part of the design process. Likewise information design often allows different users to take a different path through the design of the information, and go to different places. But this approach takes a less prescriptive, less condescending, attitude. The users do not simply choose how (or whether) to use the information, but are involved in designing what they are see and contemplate, by choosing which overlays to use. And without question different conclusions may be drawn depending on which of the available layers they choose to consider. For example, if one displays only the layer of the Liberal party, one sees that there are significant numbers of Liberal voters everywhere. Certainly there are fewer in Alberta and Quebec. Nevertheless, the user sees something that suggests that Canadians everywhere vote for the Liberal party, something not apparent in the "results" layer.

Conversely, though, if we overlay the "plurality" layer on the "results" layer, we realize that the Conservative vote in Alberta is much stronger than votes for any other party in any other part of Canada, which might be more in accordance with user's preconceptions.

And again, if we impose the Green Party layer, we may see, to our surprise, that the highest percentage of Green Party votes are found in urban Calgary districts, something probably contrary to the expectations of many Canadians.

Which of these apparently contradictory conclusions is correct? Clearly, they all are, but their apparent contradictions show that a complete and definitive conclusion is out of reach . By presented these data with as little bias as possible, we put the interpretation in the hands of the user, instead of trying to communicate and idea and thereby impose a conclusion.

Each different overlay by itself or imposed on others will lead to different conclusions or ideas. If several are superimposed, it becomes more difficult to derive coherent information from them. Sometimes relationships may be shown by the colour

fields that result from the overlays, and at other times not. And the visual patterns that emerge from several overlays may serve no more purpose than to remind the user that the will and behaviours of the Canadian electorate are complex and resistant to simple generalizations. These patterns may be attractive; and like many attractive statistical and other representations, they may be, in their visual aggregate, essentially meaningless. My project, using the computer's capacity to store and display data, attempts to allow the user to both view information in a both a chaotic and orderly way, and further, to participate in the construction of both ways of so viewing.

These overlays have the fault that visual explanations often have. They are useful for seeing trends and relationships, but they do not provide accurate numbers. Visual representations of statistical data usually sacrifice the accuracy of the data and furthermore, in the case of sampled data usually do not show the confidence level or other statistical information relating to the degree to which the sampled data may be expected to represent the statistical universe's "reality."

The actual accurate numbers are not always important, when showing trends or comparisons, but again, technology allows us to provide those hard data at a small cost of visual efficiency (though perhaps a larger aesthetic cost). These data, though they may be discouragingly complete in their original form, are valuable to those who might want to investigate the meaning of observations taken from the overlays. By clicking on an electoral district, one can see the numbers that are represented in the map. We thereby have the best of both worlds; we can use the strength of graphics in showing data from a comparative perspective.[45]

The enormous abilities of computers to hold and present data has lead to a situation where data is so ubiquitous and easily translated into visual form that its function becomes lost. It is tempting to use data as an engine for what is essentially an aesthetic project. We have all seen attractive and engaging exhibitions of data that do not actually

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[45]Tufte, *Envisioning Information*, p. 32.

provide any enlightenment on their meaning. This is the use of data as raw material with an essentially aesthetic end. These works are often beautiful and thought provoking, but to include them under the title of "information design" is misleading. Data may be the raw material, but without a structure enabling it to be understood by the user, it is not information, but visual static. It becomes "noise" with no discernable "signal."[46]

The map I am proposing provides the opportunity for the user to choose the relationships they see. Each single layer provides clearly understandable visual relationships between the electoral districts (For example, the Liberal voter layer clearly shows comparative relationships between electoral districts). Overlaying one layer upon another may, also lead to further understanding of relationships between the electoral districts (for example, there is a visible correlation between Liberal votes and districts with high voter density) as well comparing two different layers relationships with a particular layer (switching between Liberal and Conservative layers in juxtaposition with the plurality layer reveals the degree to which Conservative ridings tended to be won with larger majorities.) Or to choose another example, possible correlations between high voter participation and party choice could be sought. Of course, any observed relationships would just be a starting point, a source of ideas. To pursue ideas generated from this map would need to be developed elsewhere.

There is a philosophical dimension to this method of presenting data. One, it gives the user power to both design, in a sense, their political map, and two, it questions the assumptions that designer's have to make when they present visual explanations. If map makers historically have to choose what their maps display, because it is impossible to display everything, this map leaves to the user to choose what it is that they put on the map. So the gatekeeping power of the designer is to some degree given to the user. And if the user wishes to superimpose many the layers simultaneously, they can. This may

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[46] Severin and Tankard, p. 44. The authors discuss signal and noise from an information theory perspective.

make it impossible to derive comprehensible relationships from the map, but on the other hand, it does represent a reality: no human endeavour is simple and no human relationships can be completely explained. We can only choose structural models as tools to analyze reality and draw useful, though limited, generalizations.

CONCLUSION

This map may be used as a tool for analysis, as it makes use of the ability of computers to help find, gather and display information, meaning that the Canadian electoral map can do more than function as a summation of the result of votes within a system, as well as better representing the distribution of electoral power. The division between different areas is weakened, as the continuum of voter will becomes clear rather than the apparent clear-cut divisions that characterize the existing map. The importance of the choropleth approach is clear when we deal with a single party. It is intuitively clear to anyone that there must be at least a few voters from all parties in any given riding, but the choropleth shows the degree to which each is present. Overlays of two parties are also interesting as one begins to see the degree to which voters are polarized or not. For example, in some cases, there are a relatively high number of NDP voters in a Conservative riding (for example, Pitt Meadows - Maple Ridge – Mission, an electoral district in southern British Columbia). This may suggest that a socioeconomic class difference may play a part in politics in that riding, or suggest an area covering a diverse socioeconomic area. Or there may be other reasons. Like the electoral result map, these maps do not lead to reasons, but they do give insight into the actions of the voters who lead to that result. If these were to be coupled with changes over time, that is overlaid relationships between elections, complex trends as well as relationships might be observed.

The success of democratic political systems, which is exemplified by the map of ridings won, is largely dependent on the confidence and participation of systems. An analysis, insofar as it is possible, participation is big disadvantage; this is certainly a

symptom of first-past-the-post, but is not mitigated, and may even be exacerbated, by maps of ridings. To take an example, if a Liberal voter looks at a map of the voter's Conservative riding, it shows no sign of that vote, or any of the other what might be tens of thousands of votes; of course, a given vote is very unlikely to have any direct bearing in an election. Recognition of this is probably one reason why voting participation has been going down.[47] The visual representation of the percentage of vote comes much closer to showing the individual vote, and certainly recognizes the desires of the Liberal voters, if not changing the lack of affect of those votes. But recognition is a powerful motivator and seems more likely to encourage the citizen to vote more than any other result.

A map of this type may lead to less perception of "otherness" that is not unnatural to a large, sparsely populated country with different regional economies and interests. That is, it may keep the advantages of visual explanations without being constrained by their finality. One possibility is to consider to what extent the uncertainty and complexity of what they portray may be included in their portrayal. Political maps are a good example in that people vote all different ways, but the maps are imply divisions between united groups of people, when the reality is the opposite: Canada is composed of heterogeneous groups whose voting behavior is not very different from one part of the country to the other. A map that shows the result, but that also shows the proportion of votes that each party received seems useful, truthful and more accurate in its representation of the will of the voters, at the cost of the ease of understanding that is often a consequence of oversimplicity.

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[47]"Explaining the Turnout Decline in Canadian Federal Elections: A New Survey of Non-voters." www.elections.ca/content.asp?section=loi&dir=tur/tud&document=index&lang=e. Accessed March 12, 2007.

The future

Although this project was confined to directly quantifiable information about voter behaviour, other figures could be incorporated this way. Though census districts do not correlate exactly with electoral districts, it would be interesting to take a similar approach as we have here incorporating voting information juxtaposed with other demographic information, though if we are not focusing on electoral behaviour, it is clear that the structure of the map model may require rethinking.

The user-controlled overlay method may have more general applications, as it seems a useful way to look for relationships between data sets that will become ever greater and amenable to computer applications. As Bertin wrote:

> When one can superimpose, juxtapose, transpose, and permute graphics images in ways that lead to groupings and classings, the graphic image passes from the dead image, the "illustration" to the living image, the widely accessible research image it is now becoming. The graphic is no longer the representation of a final simplification, it is a point of departure for the discovery of these simplifications and means for their justification. The graphic has become, by its manageability, an instrument for information processing[48]

And

> Graphics owes its special significance to its double function as a storage mechanism and a research instrument. A rational and efficient tool when the properties of visual perception are competently utilized, graphics is one of the

[48]Bertin, p. 9.

major “languages” applicable to information processing. Electronic displays, such as the cathode ray tube, open up an unlimited future to graphics.[49]

Though these words were written in at least 25 years ago, they are clearly prescient. My map both shows the information in a cogent and useful way, but also allows for the possibility of finding new relationships.

It is also interesting to consider the degree to which this process may be automated. The making of my project involved colouring each of the ridings by hand with the correct percentage. This task could have been made somewhat easier by rounding to the nearest 5 percent rather than the 1 percent used, but it might be possible, using the data files in Extensible Mark-up Language (XML) format, to make maps that could be relatively easily updated with new data. Converting the data might be initially time consuming, but any data processing task on the computer that needs to be repeated can usually be automated. As a result, this type of map could be useful, if not an unalloyed benefit, for many types of situations. One can imagine a traffic map that juxtaposes air quality with such factors as driving time and fuel consumption, which might serve a social good, or conversely a map that juxtaposes position of responsibility in a company with education level, ethnic background and marital status, thereby creating a kind of information driven stereotyping, and in some sense, yet another weakening of privacy and an increase of the “panopticon” effect.[50] This type of map needs consideration of its design for the greatest effectiveness, and also needs thought about in

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[49]Bertin, p. 9.

[50]Conceived by Jeremy Bentham in the 19th C, the panopticon was a model for prisons in which the inmates would not know if they were being observed or not at any given time. Bentham proposed that the constant possibility of being observed would lead to self-imposed socially acceptable behaviour. Michel Foucault later suggested that this model now applies to society as a whole.

which cases it is appropriate to use, for both practical and social reasons.

The electoral map has the power to increase or decrease the sense of Canadians' participation in democracy, their sense of identification with citizens from other parts of the country. It also gives users the opportunity, by allowing them to juxtapose different overlays, to find greater understanding of how the political system works and to what degree it represents and misrepresents the democratic will of Canadian voters. If this map were to incorporate census data, it would become a tool for understanding how Canadians live. Because the electoral districts closely parallel the population of Canada, this approach is a useful tool for considering the behaviour of Canadians.

This is not to say that the map will have any affect on behaviour. Wilbur Schramm noted an effect of mass media that may apply in this case; he pointed out that knowing something about problems tends to be confused with doing something about them.[51] This map's potential to increase awareness does not have any clear purpose beyond that heightened awareness, though it may draw attention to the lack of proportionality in the federal electoral system.

Its structure is obviously not suitable for all applications. It makes a poor navigational map. It is not suitable for representing any kind of environmental phenomenon, except in the way such phenomena apply to demographic data, for example, it might be instructive to map air pollution in terms of which and how many Canadians are affected rather than geographically.

Maps are always a compromise between various purposes. Designers who consider what it is that the map is intended to represent and with whom it is intended to communicate will do best to start by thinking about the best form for the map, not simply about how previous or other maps are constructed.

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[51] Schramm, Wilbur. *Men, Messages, and Media* (New York: Harper & Row, 1973), p. 238.

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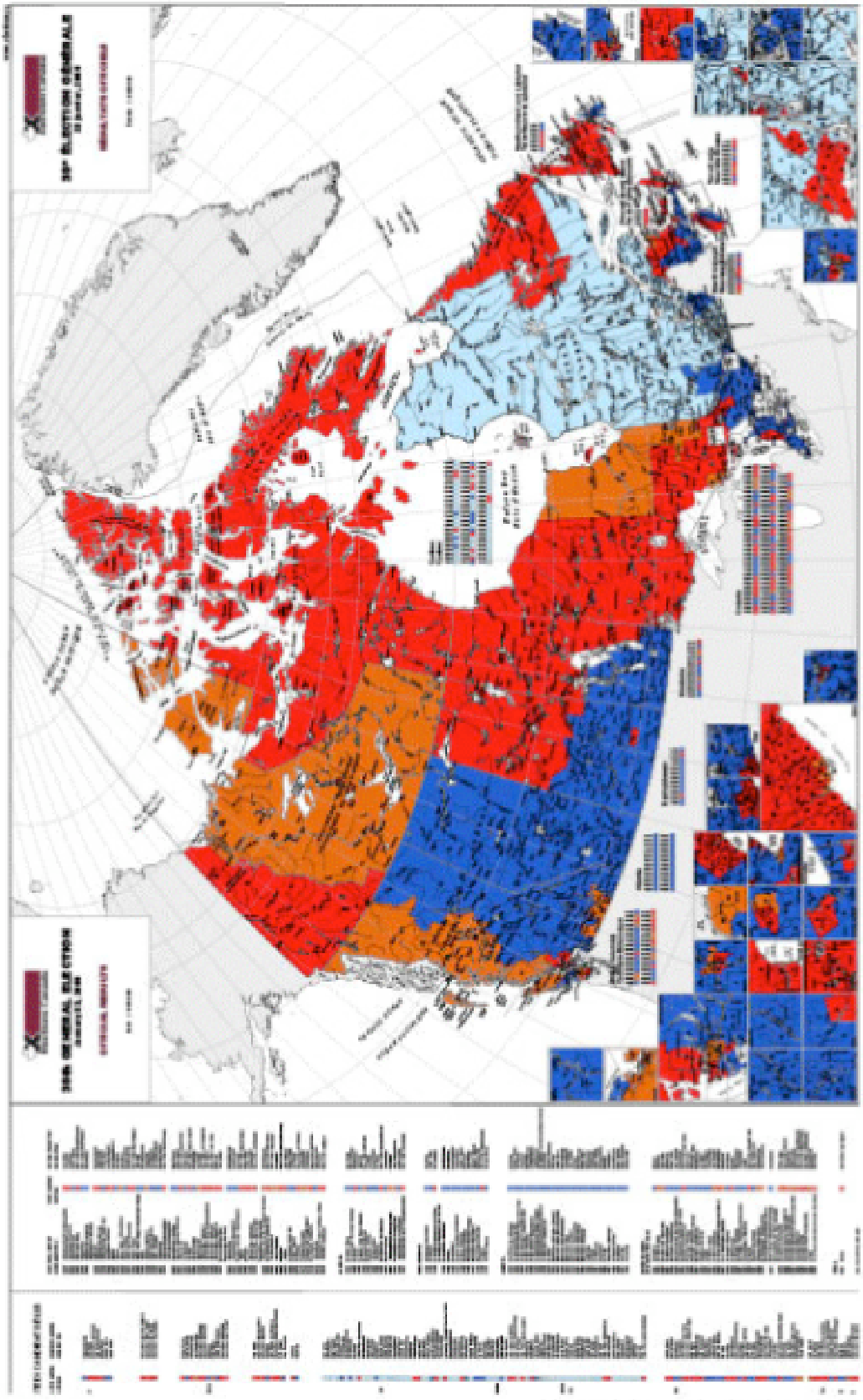

FIGURE 1: Map of the 2006 election found at the Elections Canada website (www.elections.ca)

	Electoral District/Circonscription	Ca	Can	C	Votes Obtained	Percentage	Majority	Majority Percentage/
2	Abbotsford	Ed	Abb	L	29825	63.27	21821	46.3
3	Abitibi – Baie-James – Nunavik – Eeyou	Yv	Val	P	13928	46.57	7228	24.2
4	Abitibi – TÈmiscamingue	Ma	Rou	L	24637	52.34	14003	29.7
5	Acadie – Bathurst	Yv	Bat	P	25195	49.9	9691	19.2
6	Ahuntsic	Ma	Sai	P	19428	38.91	834	1.7
7	Ajax – Pickering	Ma	Pic	P	25636	49.38	8644	16.6
8	Alfred-Pellan	Ro	Lav	B	23193	42.97	8298	15.4
9	Algoma – Manitoulin – Kapuskasing	Br	Elli	P	14652	38.18	1408	3.7
10	Ancaster – Dundas – Flamborough – Westdal	Da	And	P	24530	39.1	2874	4.6
11	Argenteuil – Papineau – Mirabel	Ma	Not	P	27855	52.13	15394	28.8
12	Avalon	Fa	St.	P	19132	51.55	4814	13
13	Barrie	Pa	Bar	L	23999	41.88	1543	2.7
14	Bas-Richelieu – Nicolet – BÈcancour	Lo	Sor	P	27742	55.92	16154	32.6
15	Battlefords – Lloydminster	Ge	St.	P	16491	53.96	11662	38.2
16	Beaches – East York	Ma	Tor	P	20678	40.39	2778	5.4
17	Beauce	Ma	Mo	L	36915	67.02	25918	47.1
18	Beauharnois – Salaberry	Cl	Orr	S	26190	47.53	11581	21
19	Beauport – Limoilou	Sy	Qu	A	19409	39.54	820	1.7
20	BeausÈjour	Do	Gra	P	22012	47.55	7093	15.3
21	Berthier – MaskinongÈ	Gu	Tro	P	26191	48.5	9233	17.1
22	Blackstrap	Ly	Ker	P	19430	47.99	7054	17.4
23	Bonavista – Gander – Grand Falls – Windsor	Sc	Bis	P	19866	52.04	4490	11.8
24	Bourassa	De	Mo	P	18705	43.41	4928	11.4
25	Bramalea – Gore – Malton	Gu	Bra	P	25348	50.68	8981	18
26	Brampton – Springdale	Ru	Mis	C	22294	47.34	7802	16.6
27	Brampton West/Brampton-Ouest	Co	Bra	P	27988	49.12	7643	13.4
28	Brandon – Souris	Me	Bra	P	20247	54.43	12719	34.2
29	Brant	Ll	Bra	P	22077	36.95	582	1
30	British Columbia Southern Interior/Colombie-	Al	Ca:	P	22742	48.96	13359	28.8
31	Brome – Missisquoi	Ch	Lac	A	18596	38.33	5027	10.4
32	Brossard – La Prairie	Ma	Bro	B	21433	37.17	1243	2.2
33	Bruce – Grey – Owen Sound	La	Hel	P	25133	48.18	10755	20.6
34	Burlington	Mi	Bur	N	28030	43.11	2599	4
35	Burnaby – Douglas	Bil	Bur	P	17323	35.57	1244	2.6
36	Burnaby – New Westminster	Pe	New	P	17391	38.79	3971	8.9
37	Calgary – Nose Hill	Di	Cal	P	37815	68.49	28372	51.4
38	Calgary Centre/Calgary-Centre	Le	Cal	B	30213	55.41	19749	36.2
39	Calgary Centre-North/Calgary-Centre-Nord	Jir	Cal	P	31174	56	21833	39.2
40	Calgary East/Calgary-Est	De	Cal	P	26766	67.1	21356	53.5
41	Calgary Northeast/Calgary-Nord-Est	Ar	Cal	P	27169	64.86	17928	42.8
42	Calgary Southeast/Calgary-Sud-Est	Ja	Cal	P	44987	75.18	38794	64.8
43	Calgary Southwest/Calgary-Sud-Ouest	St	Cal	B	41549	72.36	34996	61
44	Calgary West/Calgary-Ouest	Ro	Cal	P	38020	58.71	23692	36.6
45	Cambridge	Ga	Car	P	25337	43.85	5918	10.2
46	Cape Breton – Canso	Ro	Gla	P	21424	53.19	11684	29
47	Cardigan	La	St.	P	11542	56.21	4619	22.5
48	Cariboo – Prince George	Di	Prin	P	19624	44.94	9115	20.9
49	Carleton – Mississippi Mills	Gc	Kar	P	39004	56.19	22644	32.6
50	Central Nova/Nova-Centre	Pe	New	B	17134	40.66	3273	7.8
51	Ch,teauguay – Saint-Constant	Ca	LÈr	L	28274	51.38	17055	31
52	Chambly – Borduas	Yv	Sai	P	33703	54.7	21000	34.1
53	Charlesbourg – Haute-Saint-Charles	Da	Fos	L	20406	41.04	1372	2.8
54	Charleswood – St. James – Assiniboia	St	Wir	N	20791	46.98	4692	10.6
55	Charlottetown	Sh	Ch.	P	9586	50.16	3062	16
56	Chatham-Kent – Essex	Da	Ch.	C	20820	42.81	5616	11.5
57	Chicoutimi – Le Fjord	Ro	Chi	P	19226	38.49	4645	9.3
58	Chilliwack – Fraser Canyon	Ch	Chi	P	26842	55.99	16827	35.1
59	Churchill	Ti	Wir	C	10157	40.68	3064	12.3
60	Compton – Stanstead	Fr.	Asc	A	21316	42.77	9185	18.4
61	Crowfoot	Ke	Kill	P	43210	82.56	39335	75.2
62	Cumberland – Colchester – Musquodoboit Va	Bil	Am	B	22439	52.04	12140	28.2
63	Cypress Hills – Grasslands	Da	Fro	P	20035	66.48	14959	49.6
64	Dartmouth – Cole Harbour	Mi	Dar	P	19027	42.32	4415	9.8
65	Dauphin – Swan River – Marquette	In	Dau	P	20084	59.08	13863	40.8
66	Davenport	Ma	Tor	P	20172	51.87	7491	19.3

Figure 2: Typical data file available at www.elections.ca.

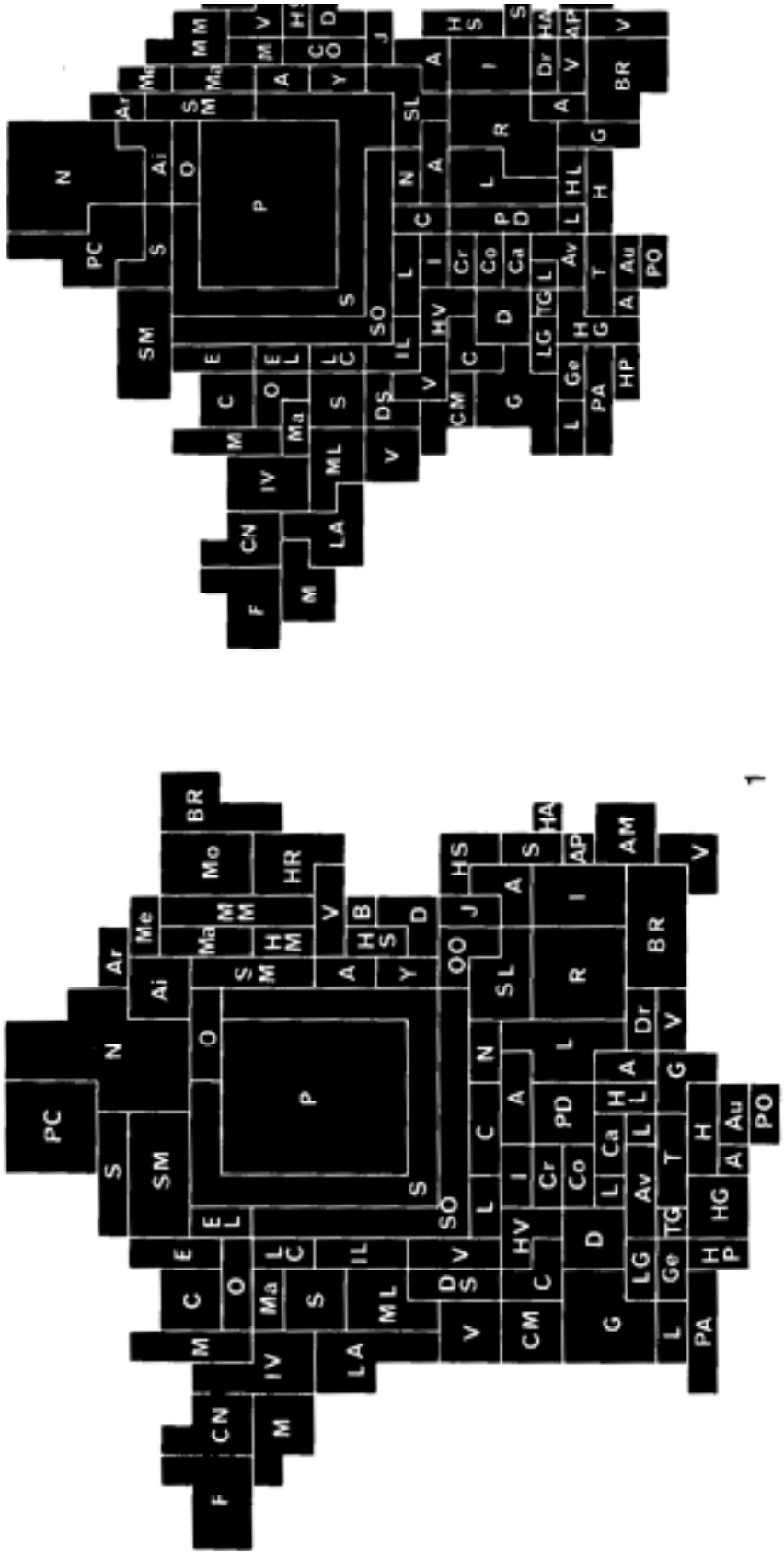

Figure 3: Examples of cartograms using distortion of area to represent population data (Bertin)

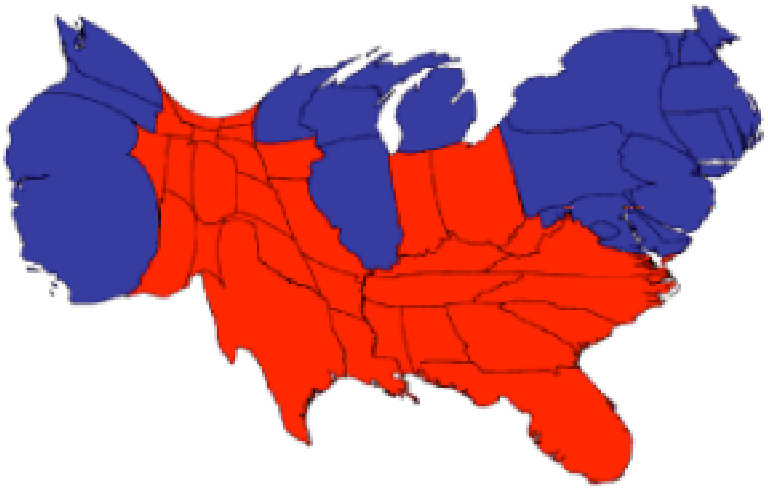

FIGURE 4: Map showing USA votes for the two major political parties, cartogram distorted by representing population (http://www-personal.umich.edu/~mejn/election/)

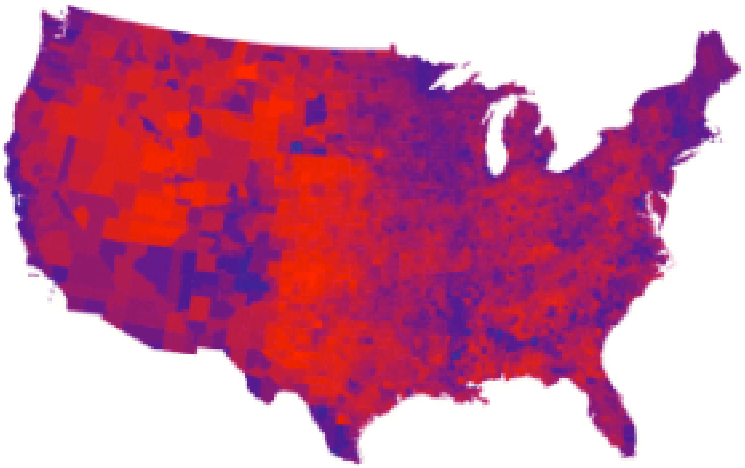

FIGURE 5: Map showing USA votes for the two major political parties, showing percentage of vote population (http://www-personal.umich.edu/~mejn/election/)

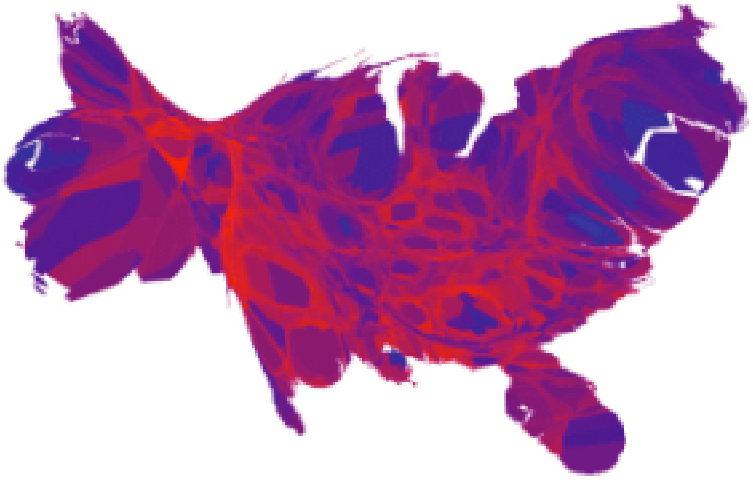

FIGURE 6: Map showing USA votes for the two major political parties, showing percentage of vote combined with cartogram population (http://www-personal.umich.edu/~mejn/election/)

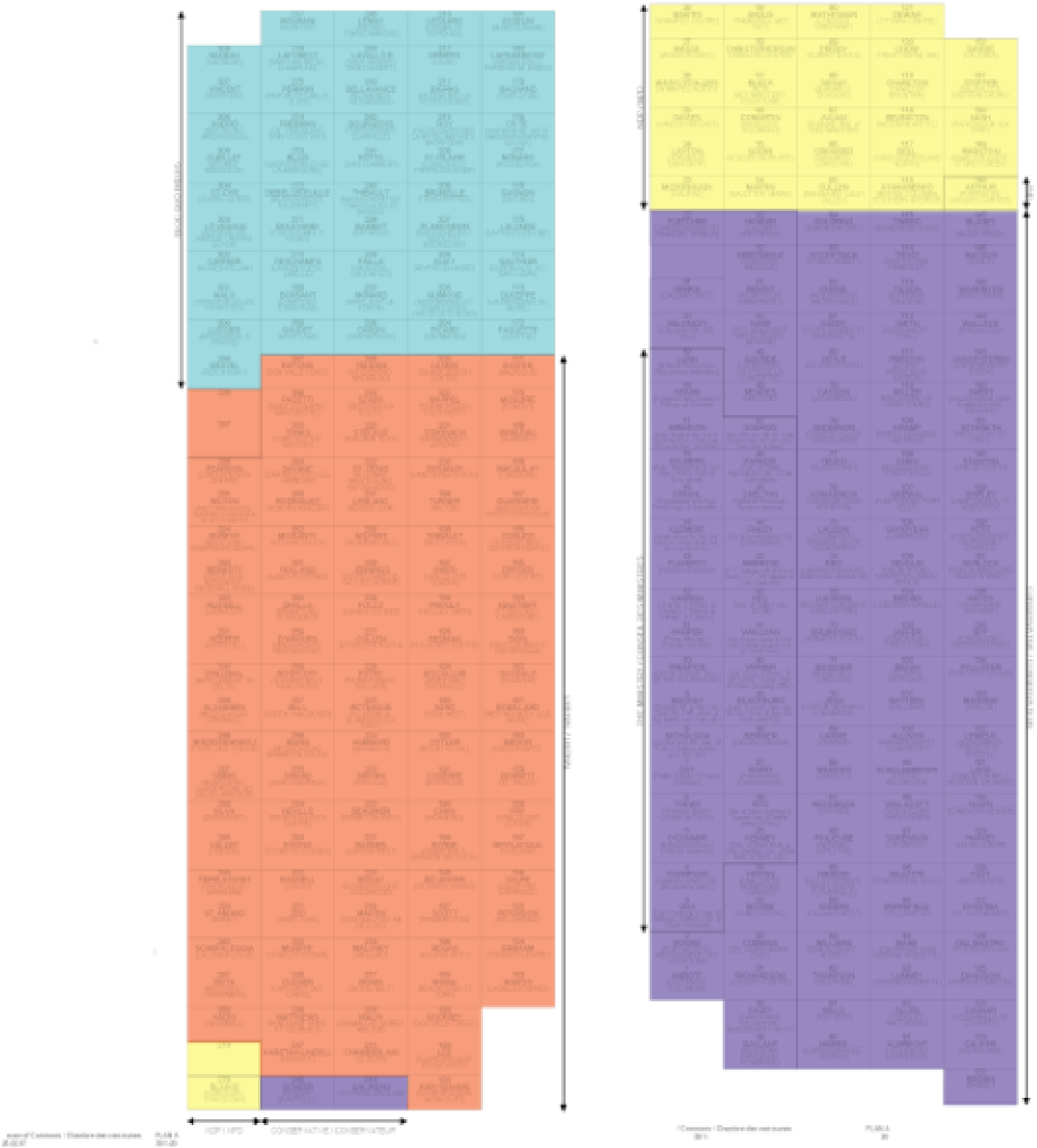

FIGURE 7:
Seating plan of Canada's House of Commons after 2006 federal election. Colour added (www.elections.ca)

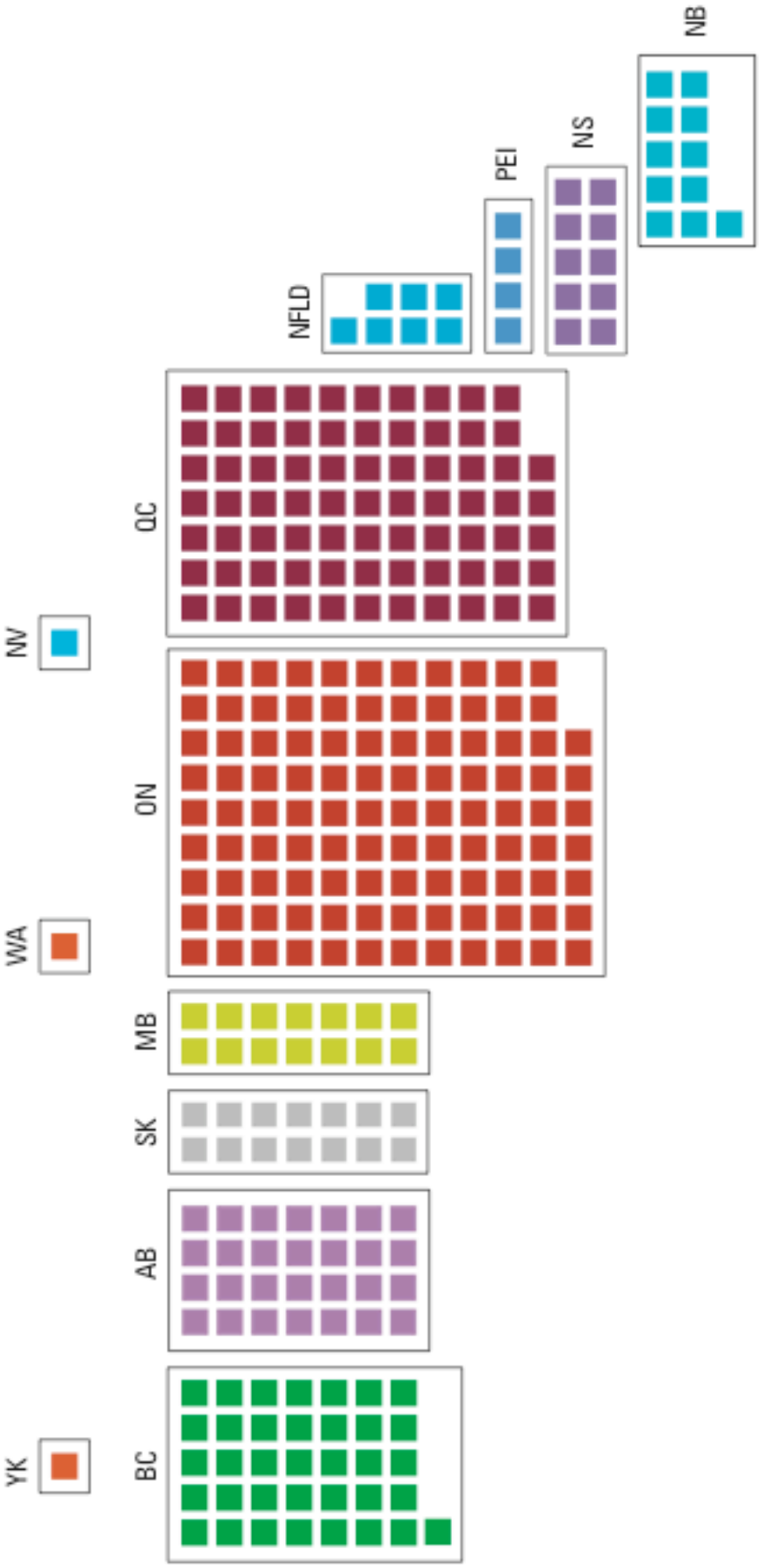

FIGURE 8: Combination schematic cartogram; overemphasizes the importance of provincial boundaries, and causes misleading distortions.

FIGURE 9:Illustration of range of sizes of electoral districts showing the largest, Nunavut and the smallest, Papineau

A do-it-yourself electoral map of the 2006 Canadian federal election

FIGURE 9
The electoral district layout of the project map