House of Representatives or House of Lords?
How to Abolish the Gerrymander:
An Algorithmic Approach to Redistricting

http://www.burtonsys.com/redist.html

By David A. Burton

There is an inherent conflict of interest with having politicians draw political districts. They will inevitably draw them with a particular outcome in mind, to predetermine election results and protect their own interests. Even when the resulting districts don't look like Elbridge Gerry's Massachusetts salamander, the process disenfranchises voters to protect the interests of politicians.

A politician in an artificially safe district is not accountable to the voters. He is not, in any meaningful sense, their representative. He needn't be much concerned with their needs or their opinions.

We might as well grant lifetime appointments and dispense with the pretense of republican government: Don't call it the N.C. House of Representatives anymore, call it the N.C. House of Lords.

There is a better way. It is possible to create a truly fair redistricting process, which is immune to gerrymandering, and which draws the most regular, compact districts that are physically possible. It will be a three step process:

Step 1: Identify a set of neutral, non-partisan principles for drawing districts.

That's not difficult. There is general agreement about what makes a good plan: the more counties, towns, or precincts it splits, the worse it is; the more irregular or elongated the districts are, the worse it is. Plus, according to the principle of "one man, one vote," we should design districts with equal numbers of voters. Also, we should probably forbid multiple-member districts.

Step 2: Quantify those principles, by devising a mathematical formula to "score" proposed redistricting plans.

For example, to avoid elongated or irregular districts, the "Reock" or "smallest circle" test can be used. It is the ratio of a district's area to the area of the smallest possible enclosing circle. It is one of several mathematical measures of compactness which North Carolina's "DistrictBuilder" software is programmed to compute. (See the sidebar for full details of one possible formula for scoring plans.)

Step 3: Find the redistricting plan with the best possible score.

It would not be difficult to write a computer program to find a good plan, using an algorithmic technique called "heuristic search." An independent commission could be given the task of supervising the process. But I recommend, instead, that we simply permit any citizen to devise a plan and submit it to the NC Board of Elections, and require that the BOE score the plans according to the formula, and select the plan with the best score. (Some will surely write and use heuristic search computer programs to assist them – let a thousand programs bloom!)

This approach to redistricting is straightforward, foolproof, and totally immune to gerrymandering. It will take the politics out of redistricting, and end the disreputable practice of politicians drawing safe districts for themselves and their allies. It will create regular, compact districts with an absolute minimum of split counties and cities, and it will enable us, for the first time, to prove to the courts that the districts were drawn without racial or partisan bias. If we write this process into the State Constitution, then North Carolina citizens will never again be disenfranchised by gerrymanders.

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Details: A Formula to Quantify the Quality of Redistricting Plans

Or: How to Answer the Question, "Which Plan is Best?"

Goals:

1) Compactness (minimize elongation and irregularity of districts).

2) One person, one vote! (Every vote should have the same weight.)

3) Minimize number of split counties and municipalities.

Strategy:

The formula will consist of three scores (one per goal), added together. The higher the total score, the better the plan.

Formulas to score a plan's conformance to each goal:

1) A measurement of compactness:

For each proposed district, compute the Reock quotient, which is the area of the district divided by the area of the smallest possible enclosing circle, a number between 0 and 1. Average the Reock quotients of all the districts in the plan. The closer the result is to 1, the better.

2) A measurement of variation in number of voters:

First, compute X, the "ideal district voting strength," defined as the total number of votes cast in the most recent gubernatorial election divided by the number of districts in the State. Then, for each proposed district, compute Y, the number of those voters who reside in the proposed district. Then, for each proposed district, divide the smaller of X and Y by the larger of X and Y, resulting in a number between 0 and 1. Average these quotients for all the districts in the plan. The closer the result is to 1, the better.

3) A measurement of how badly the plan splits counties/municipalities/precincts:

For each county, municipality, or precinct that the plan splits, take the number of districts that it is split into (or, if a county or municipality is too large to fit into a single district, take the number of "excess" splits), and cube that number. Sum the cubed numbers for all split counties/municipalities/precincts, divide the sum by twice the number of districts, and subtract the quotient from one. The closer the result is to 1, the better.

Finally, sum the three scores. The higher the total score, the better the plan.