

(<https://slate.com/news-and-politics/2019/03/scotus-gerrymandering-case-mathematicians-brief-elena-kagan.html>, retrieved 3/30/2019)

The Supreme Court's Math Problem

Fixing partisan gerrymandering requires some technical calculations. That's why we filed a mathematicians' brief to better define the problem—and the solution.

Jordan Ellenberg, March 29, 2019 5:02 PM

On Tuesday, the Supreme Court heard arguments in two partisan gerrymandering cases that have the potential to reshape the way Americans select their representatives. State legislatures in Maryland and North Carolina, the former controlled by Democrats and the latter by Republicans, drew their congressional district lines so as to lock in a huge advantage for the party in control. No one disputes what happened. There are emails. The question before the court is whether the Constitution forbids this kind of outcome-fixing or whether it walks on by with an expression of faint disapproval.

This case is about voting, and the constitutional rights of free association and equal protection, and the balance of power between parties and voters. But it is also about math, because both gerrymandering and anti-gerrymandering measures have become deeply quantitative.¹ That's why this case included a "mathematicians' brief"² that was, as far as I know, the first such ever submitted to the Supreme Court. (Along with 10 other mathematicians, I signed onto this brief.)

Mathematicians are like the Ents in *The Lord of the Rings*—we don't like to get involved in the mundane conflicts of state, which are out of sync with our slow timescale. But sometimes (and I'm still inside this Ent simile, by the way), events in the world so offend our particular interests that we have to lumber in. That's where we are now, because the oral arguments in this case were largely premised on a fundamental quantitative misapprehension about the underlying legal theory, one that could very well determine the justices' decision.

The Supreme Court has already held that partisan gerrymandering is justiciable, meaning it's within the court's power to address. The question is: Where's the line between normal partisan jockeying for legislative control and unconstitutional vote-rigging? Justice Gorsuch, questioning the plaintiff's lawyer Emmet Bondurant, cuts to what he believes to be the chase:

"How much deviation from proportional representation is enough to dictate an outcome?"

In math, wrong answers are bad, but wrong questions are worse. And this is the wrong question. To explain why, I need to say something about proportions, and something about Massachusetts.

"Proportional representation" means that the fraction of seats a party holds should be roughly equal to the fraction of votes that party won overall. Many democracies have this principle built in by law; ours doesn't. North Carolina's Legislature very carefully drew North Carolina's 13 districts to ensure that 10 of them—more than three-quarters of the whole—had a robust Republican advantage, even though Republican voters in North Carolina don't make up anything like three-quarters of the electorate. So, the North Carolina districts push the state away from proportional representation. And isn't that, Gorsuch asks, what the plaintiffs are asking the court to forbid?

It's not. I can see why the court would *want* that to be the ask, because that would make its job a lot easier; there's already established precedent³ that a map isn't unconstitutional just because it's not

¹ <https://www.nytimes.com/2017/10/06/opinion/sunday/computers-gerrymandering-wisconsin.html>

² <https://magg.org/amicus>

³ <https://www.oyez.org/cases/1985/84-1244>

proportional, which would allow the court to just say no. But the plaintiffs here are asking for something different.

To see why, consider Massachusetts. Massachusetts is a Democratic state through and through, from the Berkshires to Boston Harbor. Its electorate is only about 35 percent Republican. Some parts of the state are more GOP-friendly and some less, but there's not a single congressional district with enough Republicans to make the party competitive there. It's been 22 years since a Republican has represented the state in the House of Representatives. Paul Clement, representing North Carolina in defense of its gerrymandered map, brought up this case, pointing out that Massachusetts Republicans don't complain about their lack of proportional representation and aren't dragging their state Legislature into court. "It might be unfortunate for them," Clement says, "but I don't think it's unfair." And he's right! Proportional representation, in general, is the wrong goal to strive for. It doesn't reflect what we think of as fairness.

Then what does? The justices seemed to struggle with this point. "[W]e need a baseline," Gorsuch said. "And the baseline, I still think, if it's not proportional representation, what is the baseline that you would have us use?"

He was asking a question that had just been answered, a moment before, by Elena Kagan. The baseline is "what the state would have come up with, absent partisan considerations." What else could it be? That's how we measure harm in every other context—if someone defrauds me, the financial harm done to me is the difference between the amount of money I have and the amount of money I would have had if I hadn't been defrauded.

In North Carolina, we have a very good sense of what the maps might look like if they hadn't been drawn with the intent of producing a 10–3 GOP advantage. That's what the mathematicians' brief is all about. Just as gerrymanderers use computers and extensive collections of voter data to draw tens of thousands of maps to find the one that suits their party best, mathematicians can draw tens of thousands of maps *without* thumbing the scale to see what neutrally drawn district maps of North Carolina tend to look like. They don't all look the same, but they have a lot in common. And fewer than 1 percent of them have 10 Republican seats. The GOP-drawn map is an extreme outlier, inexplicable except as a case of gerrymandering.

In Massachusetts, on the other hand, the neutral maps drawn by machine confirm Clement's intuition: Look at thousands and thousands of maps, and you get nine of nine Democratic-leaning districts in almost every case, which is what Massachusetts has. If Massachusetts were to have proportional representation—three out of nine Republican representatives—*that* would be very strong evidence of gerrymandering. The opposite of gerrymandering isn't proportional representation; the opposite of gerrymandering is not gerrymandering.

The people suing North Carolina aren't asking the courts to require states to hew to an abstract norm of proportional representation; they're asking that they throw out the outliers, the freakiest of freaky gerrymanders, leaving state lawmakers the rest of the vast universe of maps to choose from with a free hand.

The oral arguments, from this point on, become very weird. Elena Kagan, as in all the recent gerrymandering cases, is the only justice who seems to have fully grasped what the two sides are asking for. She lays it out very clearly, as well as any math professor could—and then the rest of the court carries on as if she hadn't spoken. Sonia Sotomayor and John Roberts say less but what they say is mostly right. Stephen Breyer has his own gerrymandering test, which neither side likes much. And Gorsuch, Samuel Alito, and to some extent Brett Kavanaugh, with help from Clement, collaborate on building a fictional version of the case in which the plaintiffs are asking the court to impose some form of proportional representation on the state. If you don't want to get into the math, here's a re-enactment of the argument, but about sandwiches instead:

COUNSEL: I'd like a grilled cheese.

ALITO: OK, one tuna melt.

COUNSEL: No, I said grilled cheese.

KAVANAUGH: I hear the tuna melt's good.

GORSUCH: You want that tuna melt open face or closed?

COUNSEL: I don't want a tuna melt, I want a—

GORSUCH: It seems like you don't want to just come out and say it, but don't you want a tuna melt?

COUNSEL: No!

KAGAN: She asked for a grilled cheese. That's not a tuna melt because there's no tuna in it.

GORSUCH: But if, as you say, you don't want a tuna melt, what *do* you want? Are we supposed to just make up a sandwich for you?

ALITO: You come in here, you ask for a hot sandwich on toasted bread with cheese on it. To me, that's a tuna melt.

BREYER: Nobody ever orders the chopped liver, but have they really given it a chance?

OPPOSING COUNSEL: The framers had every opportunity to make you a tuna melt, but they chose not to.

My biggest worry is that, six months from now, we'll get a decision that lets the gerrymandered maps stand, on the utterly irrelevant grounds that voters don't have a constitutional right to proportional representation. In other words, the justices will simply say: Even though you want a tuna melt, we can't actually make you one, because a tuna melt isn't on the menu.

Don't be fooled. Nobody ordered the tuna melt.
