

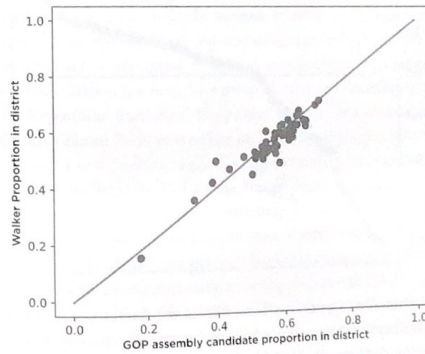
Chapter 14

How Math Broke Democracy
(And Might Still Save It)

The night of November 6, 2018, was a joyous one for long-suffering Democrats in the state of Wisconsin. Republican governor Scott Walker, who had survived two general elections and a recall campaign, who had brought Washington-style polarization to the state during his eight years in Madison, and who had, for a little while, seemed poised to be his party's 2016 presidential nominee, had finally been brought down, edged out by Tony Evers, a gee-whiz-saying, euchre-playing ex-schoolteacher of a certain age whose highest previous position was state superintendent of public instruction. In fact, Democrats swept the statewide offices up for election that night. Their Senate candidate, Tammy Baldwin, was reelected by an 11-point margin, the biggest victory by a statewide candidate of either party since 2010. They took over the attorney general and state treasurer positions previously held by Republicans. And all this was in the context of a national wave of pro-Democratic sentiment that saw the party win the majority in the U.S. House of Representatives, gaining forty-one seats.

But not everything was beer and roses for Wisconsin Democrats. In the Wisconsin State Assembly, the lower house of the state legislature, Republicans lost only one seat, retaining a 63–36 majority. In the state senate, the GOP actually gained a seat.

Why would the legislative elections in 2018, a year of massive Democratic gains, come out pretty much the way they did in 2016, when Republican U.S. senator Ron Johnson cruised to reelection and a Republican presidential nominee won the state for the first time in decades? One might look for a political explanation; maybe Wisconsin voters think Republicans are better at legislating even if they prefer a Democratic executive? If that were the story, you'd expect there to be a bunch of assembly districts that voted for a GOP representative while supporting Evers for governor. But in fact, if you plot the share of the vote Scott Walker got in each assembly district against the share of the vote the Republican assembly candidate got there, it looks like this.*

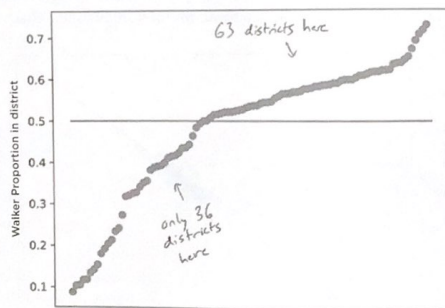


Districts liked Scott Walker just about exactly as much as they liked their Republican legislative candidate. Only two districts, both represented by Republican incumbents, voted for Evers but went for the GOP in the assembly. Walker lost the governorship while getting more votes in sixty-three out of ninety-nine assembly districts. Most of

* The very careful reader will note that there aren't ninety-nine dots on that chart, but only sixty-one; that's because we're only showing the sixty-one districts where both parties fielded candidates.

Wisconsin's voters in 2018 chose Democrats, but most of Wisconsin's districts chose Republicans.

This might seem like a funny accident, except that it's no accident and it's funny only in the hollow-laugh-with-your-head-in-your-hands kind of way. The districts in Wisconsin are Republican because the district lines were drawn by Republicans, and they were precisely engineered to produce that outcome. Here's a plot showing Walker's percentage of the vote in each assembly district, where I've ordered the districts by increasing Republican-ness:



There's a clear asymmetry here. Notice the dominance of districts where Walker just barely clears 50% of the vote. In thirty-eight out of ninety-nine districts, Walker's share was between 50% and 60%. His opponent, Tony Evers, got between 50% and 60% in just eleven districts. Tony Evers's tiny lead in the statewide race is a combination of winning big in about a third of the districts and losing, mostly narrowly, in the rest.

There are a few ways to read this graph. You could say that Democratic strength in Wisconsin is driven by a small, politically inflamed region that doesn't truly represent the politics of the state. That is, nat-

urally, the view of the Wisconsin Republican Party, one of whose leaders, Robin Vos, remarked after the election, "If you took Madison and Milwaukee out of the state election formula, we would have a clear majority."⁸ A more Democratic spin on state politics would be to observe that there are eighteen districts where Scott Walker got less than a third of the vote, against only five districts where Evers did that badly. In other words (still spinning here), Republicans have written off whole regions making up a fifth of the state, while there are substantial numbers of Democrats just about everywhere, including GOP-majority districts. Seventy-eight percent of Wisconsinites who voted for Scott Walker have a Republican representative in the assembly, but only 48% of Evers voters are represented by a Democrat.

Both these accounts treat the asymmetry of the curve as a peculiar natural feature of Wisconsin's political geography. It isn't. In fact, that curve was *built*, in the spring of 2011, in a locked room at a politically connected Madison law firm, by a group of aides and consultants working for Republican legislators. The project was part of a national effort by the Republican Party to translate its 2010 electoral gains into favorable district lines. That last digit, 0, at the end of 2010 is important; it's in the years divisible by 10 that the United States conducts a census, which generates new official population statistics, which, given the natural slosh of population from place to place, tends to make some of the existing districts bigger than others. That means new districts need to be made, and partisan actors jostle to be the ones to make them. In previous census years, both Democrats and Republicans had controlled either a house of the Wisconsin legislature or the governor's mansion, so any map that could be passed into law had to satisfy both parties. In practice that meant no map could be passed into law, and the courts had to do the job. In 2010, Republicans had majorities in both houses, and a brand-new Republican governor: Scott Walker, eager to set the rules for ten years of Wisconsin elections before he even finished measuring for

⁸ As the old Yiddish proverb goes, "If my grandmother had wheels, she'd be a wagon."

drapes. There was nothing but their own sense of decorum to hold them back from angling for maximal political advantage.

This is not going to be a story about the triumph of decorum.

THE LIFE AND TIMES OF JOE AGGRESSIVE

The Wisconsin mapmakers were bound to icy secrecy. Even Republican legislators were shown only their own proposed district, and forbidden from discussing what they'd seen with their colleagues. Democrats saw nothing at all. The map as a whole remained under wraps until the week before the legislature voted it into state law, along party lines,* as Act 43.

The mapmakers in their locked chamber had worked for months to build a map that was maximally advantageous to Republican interests. Among them was Joseph Handrick, no newcomer to this game. Since his teenage years, he told an interviewer, "every big decision in my life was made with the backdrop of wanting to run for the state assembly." He made his first run for the assembly seat in his up-north district as a twenty-year-old college junior. In an unusually data-driven campaign for the mid-1980s, he worked out a precinct-by-precinct chart to identify where the popular Democratic incumbent had been overperforming the local partisan lean, and targeted those voters with a strong ideological campaign on taxes and Native American fishing rights. (He was against both.) The conventional wisdom was that the popular incumbent couldn't be beaten by a college kid with a spreadsheet, and the conventional wisdom was right. But the race made Handrick an up-and-comer in state Republican politics, and he later served three terms in the assembly. By 2011 he was out of elected office and consulting for Wisconsin legislators. "What I like about campaigns more than anything," Handrick once said, "is the planning of strategy and development of the game plan." In the back room of the law firm, he was deep in the part of politics he liked best.

The map team classified maps as "assertive" when they helped Re-

* Or almost along party lines: Samantha Kerkman of Randall was the lone Republican in the state legislature to vote against it.

publicans a lot, and "aggressive" when they helped Republicans even more than that. They named each map by combining that adjective with the name of the person who drew it. The map they finally went with, the one still in use in 2018, was one of Joseph Handrick's. They called it "Joe Aggressive."

Here's how aggressive Joe Aggressive was. Keith Gaddie, an Oklahoma political science professor brought in to consult, estimated that Republicans would typically maintain a 54–45 majority in the assembly even in an election where their statewide share of the vote dipped to 48%. The Republicans would have to be losing statewide by a 54–46 margin before Democrats would pick up a majority of seats.

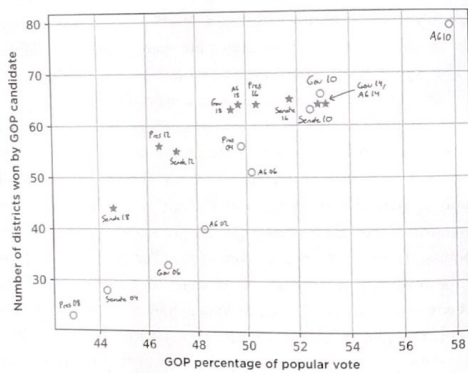
There's a back-of-the-envelope way to check how Gaddie's work held up, seven years on. If you rank the ninety-nine Wisconsin districts by how well Scott Walker did there in 2018, the one in the middle is Assembly District 55, in Winnebago County, about halfway between Madison and Green Bay. Walker got 54.5% of the vote there,* about four points ahead of his popular vote share. Forty-nine districts were better for Walker, and forty-nine were worse; in the language of statistics, we say that District 55 is the *median* among the districts. If a Democrat wins District 55, there's a pretty good chance the party wins the forty-nine districts more Democratic than that, and thus secures a majority; and the same goes for the Republican. The bellwether status of District 55 isn't just hypothetical; in the statewide elections held in Wisconsin since this map was drawn, the candidate who won District 55 has won a majority of districts in every single case.

How good a year would Democrats need to have in order to scrape out a victory in AD55? In 2018, a year where the two gubernatorial candidates got almost the same number of votes, Scott Walker won that district by 9 points. So you might estimate that for Democrats to break even in District 55, they'd need to come out ahead by 9 percentage points statewide, winning 54.5–45.5—just about the same figure Gaddie came up with when the maps were drawn. This is just a rule of thumb, not a precise prediction about future elections, but it gives some

* 54.5% of the combined Republican and Democratic vote, that is, for simplicity I'm going to throw out votes for smaller parties (sorry, Libertarians) and use the two-party share.

sense of the headwind Democrats face in their quest for an assembly majority with the current district boundaries.

Another way to see the effect of the Act 43 map is to compare it to the one that came before it, which was drawn by an exasperated federal district court in 2002 after it found "unredeemable flaws" in all sixteen of the maps proposed to it by interested actors on both sides.



What you're looking at here is a list of November statewide elections held in Wisconsin between 2002 and 2018.* The horizontal axis shows the share of the statewide vote the Republican candidate got, and the vertical axis shows how many of the ninety-nine assembly districts gave the Republican more votes than the Democrat.

The circles are elections held under the court-drawn 2002 map, and the stars are Joe Aggressive elections. Notice anything? In 2004, John Kerry barely edged George W. Bush in Wisconsin's presidential race, getting 50.2% of the two-party vote; Bush won in fifty-six assembly districts. In a similarly close election in 2006, Republican J. B. Van Hol-

* Not every single one; I took out a 2006 Senate blowout and the somewhat weird 2002 gubernatorial election, in which the younger brother of the former Republican governor ran as a Libertarian and got 10% of the vote.

len beat out Kathleen Falk to become Wisconsin's attorney general; he won fifty-one of the assembly districts. Those are the two circles near the middle of the plot. Republican Ron Johnson, in his 2010 senate race, did better, getting 52.4% of the vote against incumbent Russ Feingold and winning in sixty-three assembly districts.

Starting in 2012, things look different. Donald Trump in 2016 and Scott Walker in 2018 were in nearly tied elections, just like Bush and van Hollen; but where those two Republicans came out ahead in fifty-six and fifty-one districts, Trump and Walker both won in sixty-three out of ninety-nine, the same number Ron Johnson got under the court-drawn map while solidly beating his Democratic opponent. In 2012, the first year of the Act 43 maps, Republican Mitt Romney won 46.5% of the two-party vote but won fifty-six of the ninety-nine districts; Democrat Tammy Baldwin got 52.9% of the vote in her Senate race and won just forty-four districts. When Baldwin ran for reelection in 2018, she did a lot better, thumping challenger Leah Vukmir by 11 points. She won in fifty-five districts; a majority, to be sure, but in 2004, when Russ Feingold won his Senate race for the Democrats by the same margin, he won in seventy-one out of ninety-nine districts on the old map.

That's a lot of words to make a point the picture already does. The stars float high above the circles, which means the same electoral facts now translate into many more Republican seats than they did ten years ago. Nothing suddenly changed in Wisconsin politics between 2010 and 2012. The difference is the maps.

Tad Ottman, another of the locked-away mapmakers, told the Republican caucus, "The maps we pass will determine who's here 10 years from now. . . . We have an opportunity and an obligation to draw these maps that Republicans haven't had in decades." The language is telling. Not just an opportunity, but an *obligation*. The implication here is that the first duty of a political party is to protect its own interests against the whims of a potentially hostile electorate. The practice of drawing district lines to secure advantage for yourself or your co-partisans is called *gerrymandering*, and it's the way you end up with a swing state like Wisconsin where Republicans enjoy a bigger legislative lower-house majority than they do in more conservative states like Iowa and Kentucky.

Is that fair?

Short answer: no.

The long answer is going to require some geometry.

ARTIFICIAL DISTINCTIONS AND SYLLOGISTIC SUBTLETIES

Democratic governments are founded on the principle that every citizen's views are to be represented in the decision-making of the state. Like all good principles, this is easy to state, difficult to make precise, and almost impossible to implement in a fully satisfying way.

For one thing, modern governments are *big*. Even a modestly sized city is large enough that it would be impractical for every decision about zoning, school curriculum, public transport, and taxes to be put to a public plebiscite. There are workarounds. For criminal cases, we pick twelve people's names out of a hat and let them decide. For much of the day-to-day management of cities and states, decisions are made within government agencies with only occasional and indirect input from voters. But when it comes to legislation, the basic infrastructure of government action, we use the system of elected representatives, in which a small group of legislators is elected by the people at large and commissioned to speak on their behalf.

How to choose those representatives? That's where the details start to matter. And there are a lot of ways the details can look. Voters in the Philippines cast a vote for as many as twelve candidates, and the top twelve vote-getters overall join the Senate. In Israel, each political party makes a list of proposed legislators, and voters choose a party, not an individual candidate. Then each party occupies seats in the Knesset according to its proportion of the popular vote, going down the party list until they hit their appointed number. But the most common way to set this up is the way the United States does; you divide the population into predefined districts, and each district chooses a representative.

In the U.S., districts are drawn geographically. But it doesn't have to

be that way. In New Zealand, Māori people have their own electoral districts, which are superimposed on the general districts; Māori voters have the choice in each election whether to vote in the Māori or the general district containing their residence. Or the partition might have no geographic aspect at all. In Hong Kong, there's a seat in the legislative council only teachers and school administrators can vote for, one of thirty-five seats elected by so-called functional constituencies. The Centuriate Assembly of the Roman Republic had constituencies separated by wealth bracket. In the upper house of the Oireachtas in Ireland, there's a three-seat constituency consisting of students and graduates of Trinity College Dublin, and another for alumni of the National University of Ireland. Jews have their own seat in the Parliament of Iran.

As an American, and thus someone trained to think of the American way as the one and only way, I find it agreeably freeing to think about the different ways we could divvy up the U.S. voting public. What if our state legislative districts, instead of geographic regions, were age bands of equal size? With whom do I have more political priorities and values in common: an elderly retiree who lives ten miles from me, or a fellow forty-nine-year-old, who has about as much life left to plan for as I do, who likely has kids around the same age, but who happens to live across the state? Would legislators have to "live" in their chronological district? (If so, that would neatly solve the problem of lazy incumbents staying in office forever by dint of inertia; unless representatives were spaced extremely evenly by birth date, the progression of time would regularly pit incumbents against each other as they aged through the brackets.)

The U.S. states are, at least formally, semiautonomous governments, each with its particular interests. The districts within states, on the other hand, are patches of land without much meaning. Nobody in the Second Congressional District of Wisconsin, where I live, wears a WI-2 sweatshirt, or could recognize the district from its silhouette. As for my state legislative district, I had to look it up to be sure I had the number right. Those districts have to be determined somehow, despite lacking any inherent political identity. Somebody has to cut up the state into

segments. This process, called *districting*, is technical and time consuming, and involves spreadsheets and maps. It does not make good television and it has not traditionally drawn much public attention.

That has now changed. It has changed because we now understand something we didn't really grasp before, a fact that is both mathematical and political: the way you cut up the state into districts has an enormous effect on who ends up in the statehouse making laws. Which means the people with the scissors have enormous power over who gets elected. And who wields the power scissors? In most states, it's the legislators themselves. The voters are supposed to choose their representatives, but in many cases, the representatives are choosing their voters.

To some extent, it's obvious that the district-drawers have a lot of power. If I'm in complete control of the districting of Wisconsin, with the power to partition the population any way I wish, I can just find a cabal of like-minded people, declare each one of them to be their own district, and then create one more district consisting of everybody else. My handpicked candidates vote for themselves and then rule the legislature with at most one potential voice of opposition. Democracy!

That's plainly not fair. Certainly the people of Wisconsin, with the exception of the cabal itself, would be right to feel themselves unrepresented in the decision making of the state. It's also ridiculous; no democratic government would ever be run this way! Except, of course, the ones that are. In England, for example, there were "rotten boroughs" that persisted for centuries, duly electing members to Parliament despite having dwindled to near emptiness. The town of Dunwich, once as big as London, fell into the North Sea bit by bit and was largely abandoned by the seventeenth century, but continued to send two members to the House of Commons until it was dissolved by Whig prime minister Earl Grey (admit it, you thought he invented tea) in the Reform Act of 1832. By that time Dunwich was down to thirty-two voters. And that wasn't the rottenest of the rotten boroughs! Old Sarum had once been a thriving cathedral town, but lost its reason for being when the new Salisbury Cathedral was erected; the town was emptied out and its buildings demolished for scrap in 1322. And yet, for five hundred years,

Old Sarum had two MPs, chosen by whatever wealthy family held title to the stony, unpopulated hill. Even Edmund Burke, generally a friend to tradition, complained of the need for reform: "The representatives, more in number than the constituents, only serve to inform us that this was once a place of trade . . . though now you can only trace the streets by the color of the corn, and its sole manufacture is in members of Parliament."

Things were more rational over here in the colonies, but only just. There were no rotten boroughs, but nonetheless, some Americans were more represented than others. Thomas Jefferson complained about the unequal sizes of legislative districts in Virginia, insisting that "a government is republican in proportion as every member composing it has his equal voice in the direction of its concerns." Well into the twentieth century, the city of Baltimore was limited to 24 of the 101 seats in the Maryland House of Delegates, even though Baltimoreans made up half the population of the state. Maryland attorney general (and Baltimore native) Isaac Lobe Straus begged for a change in the constitution that would give Baltimore equal representation, quoting Jefferson and Burke and then really going for it: "Will some one explain, upon what principle of justice or ethics or law or politics or philosophy or literature or religion or medicine or physics or anatomy or aesthetics or art, a man in Kent County is entitled to twenty-nine times the representation that a man in Baltimore City is entitled to?"

(Lest I leave you with the impression that Straus was a principled tribune of democracy, he went on in the very same 1907 speech to recommend a further amendment that would require a literacy test for voting, with the goal of mitigating "the evil of an unthinking suffrage wielded by a large body of illiterate and irresponsible voters in this State, who became voters as a consequence of the war between the Northern and Southern States, and not only not through any act of the people of Maryland, but in the teeth of their solemn rejection of the amendment to the Federal Constitution under which the persons in question vote." For any readers unfamiliar with the customary code words of American politics used here, he means Black people.)

The era of unequal representation came to an end in America only in 1964, when the Supreme Court threw out the Alabama state legislative districts, in the case of *Reynolds v. Sims*. Alabama law apportioned representatives by county; the formula in force awarded a single state senator to the 15,417 residents of Lowndes County, and the same to Jefferson County, which contained the city of Birmingham and had a population of more than 600,000. W. McLean Pitts, arguing in Alabama's defense, warned that overturning the district maps would mean "the larger, dense-populated counties would have a stranglehold on the Alabama Legislature on a one man, one vote basis, and the people in the rural areas would not have any say so in their own government." The court saw it differently, writing in an 8-1 decision that Alabama had violated the Fourteenth Amendment by depriving voters in the larger counties of the "equal protection" of the laws governing the vote.

The requirement of equal representation means we can't stop gerrymandering by forbidding governments from futzing with the district boundaries. The futzing is mandatory. People move from place to place, the old die and the young reproduce, some regions bulge as others wither, and so the boundaries that are constitutional when drawn become unconstitutional when the next census rolls in. That's why the years that end in 0 matter so very much.

The W. McLean Pitts principle—"Why should the people of Birmingham have more power over the law just because there are more of them?"—sounds funny to modern ears, but in a real way Americans still live by it. Each state has two senators, whether it's tiny Wyoming or vast California. This has been controversial from the beginning. Alexander Hamilton complained in *Federalist* #22:

Every idea of proportion and every rule of fair representation conspire to condemn a principle, which gives to Rhode Island an equal weight in the scale of power with Massachusetts, or Connecticut, or New York; and to Delaware an equal voice in the national deliberations with Pennsylvania, or Virginia, or North Carolina. Its operation contradicts the fundamental maxim of republican government, which requires that the sense of the majority

should prevail. . . . It may happen that this majority of States is a small minority of the people of America; and two thirds of the people of America could not long be persuaded, upon the credit of artificial distinctions and syllogistic subtleties, to submit their interests to the management and disposal of one third.*

History has dehypotheticalized Hamilton's angry worry; the twenty-six smallest states, whose fifty-two representatives make up a majority of the Senate, speak for just 18% of the population.¹

It's not just the Senate. Each state, however small, gets at least three votes in the Electoral College, which ultimately decides the presidency. Wyoming's 579,000 people—about as many as live in greater Chattanooga—share three electoral votes among them, which means each electoral vote represents about 193,000 Wyomingites. California has almost 40 million people, so each of its fifty-five electoral votes stands for more than 700,000 Californians.

This is, as your constitutional-originalist friends probably often remind you, by design. The idea that the president should be chosen by the majority of the national vote seems rather natural to most Americans today, even to those who see reasons to support the Electoral College system. But there was little appetite among the founders for the idea. James Madison was a notable exception, and even he supported a national popular vote only because he thought all the other options were worse. Small states worried that only a candidate from a populous state would have a chance. Southerners (Madison excepted) didn't like the fact that a national election would blunt their hard-won "three-fifths compromise," which allowed them to derive extra representation in Congress from the large, enslaved, and disenfranchised Black population. In a national popular majority system, your state gains no power from people unless you let them vote.

* Technically, Hamilton is venting about the Articles of Confederation here, not the senatorial allocation in the just-drafted Constitution, but he spoke similarly during the arguments over that document, asking: "[I]s it our interest in modifying this general government to sacrifice individual rights to the preservation of the rights of an artificial being, called states?"
¹ Eighteen percent of the population of the fifty states, that is. The percentage is even lower if you count Americans residing in Washington, D.C., Puerto Rico, or other U.S. territorial possessions, who have no representation in the Senate at all.

The manner of electing the president was a source of rancorous division, and it dragged on and on through the long constitutional summer of 1787. Plan after plan was brought up and voted down. Elbridge Gerry of Massachusetts suggested that the governors should choose, each with a vote weighted by their state's population; that idea was soundly rejected. So were proposals that the president be selected by state legislatures, or by Congress, or by a committee of fifteen members of Congress chosen at random. The main body of the group was unable to agree, finally punting the decision about election of the president and some other persistent points of dissent to a group of eleven unlucky members called the Committee on Unfinished Parts. The system we eventually arrived at shouldn't be thought of as a brilliant encapsulation of the founders' wisdom; it was a compromise reluctantly and wearily arrived at, nobody having been able to come up with anything better. If you have ever sat in a long meeting as day care pickup got nearer and nearer, knowing you couldn't go home until the meeting produced a policy document everyone there could make themselves grudgingly sign, you have a pretty good idea of how the Electoral College came to be.

Even if you're on board with the representational inequities baked into the Electoral College, you'd better be aware that they've gotten a lot more intense since the framers' time. In the 1790 census, the largest state, Virginia, had eleven times the population of the smallest, Rhode Island. Right now, the ratio between Wyoming's population and California's is about 68. Would the constitutional convention have been game to assign Rhode Island so much power to appoint senators and electors if it had been six times smaller than it was?

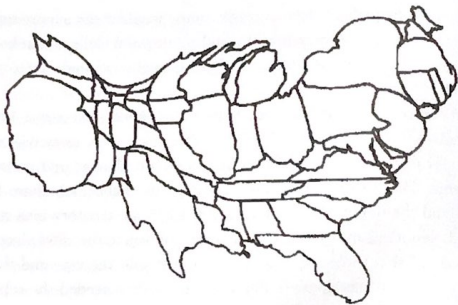
Perhaps the simplest way of diluting the inequality of the Electoral College would be to increase the size of the House of Representatives. There were 435 representatives in 1912 and there are 435 representatives today, in a country more than three times as large. The number of electors in each state is the number of representatives *and* senators from each state. If the House had 1,000 members, 120 of them would be from California, and 2 from Wyoming. So California would have 122 electoral votes, one for every 324,000 Californians, while Wyoming would have 4, one for every 144,500 people in Wyoming; still unequal,

but not as unequal as before. A bigger House would mean a more representative House of Representatives, and an Electoral College that better represented the people voting, without changing a single jot of the founders' plan.

As extreme as electoral inequity is now, it's been even worse. When Nevada was admitted to the Union in 1864, it had only forty thousand or so inhabitants; the state of New York was more than a hundred times as large! That vast difference didn't happen by chance. Abraham Lincoln and the Republicans had hustled the Nevada territory into statehood, despite its meager population, in the run-up to the 1864 election; concerned that three major candidates might split the vote and throw the election to the House of Representatives, they needed the reliably Republican Nevadans to have a voice there, disproportionate though it was to their actual numbers. Nevada became a state with weeks to spare before the election, and dutifully cast its votes for Honest But Also Shrewd When He Needed To Be Abe. Nevada eventually got bigger, but it took a while. In 1900, it was still just 1/171 the size of New York, and its Senate delegation had sent just one Democrat to Washington for just one term in the state's thirty-six years of existence.

Disproportions like this can be obscured by the fact that some small states look big. Politicians of a GOP bent are fond of displaying maps of the United States that show a sea of Republican red from almost-coast to almost-coast, with the Democratic strongholds of California and the Northeast a minor blue fringe along the shoreline. From this point of view, it hardly seems unfair that Wyoming has two senators—look how *much* Wyoming there is!

But this, of course, is an artifact of the way we draw the map. Senators represent people, not acres. We've already encountered the "too much Greenland" problem—standard maps like the Mercator projection distort areas, making some regions look bigger than the space they actually take up on the globe. What if there was a map that assigned each state an amount of space according to its *population* instead of its area, more accurately rendering the people the Senate is supposed to represent? Geometry can do that. This kind of map is called a cartogram:



The cartogram makes plain how much of the U.S. population, even today, is in the original thirteen colonies of the East, and how narrow a wasp waist the Great Plains really is.

A voter in Pennsylvania may have less influence in the presidential election than one in New Hampshire, but they have infinity times as much as an American who lives in Puerto Rico or the Northern Marianas or Guam. (The civic-minded Guamanians, despite not being granted any electoral votes, hold presidential primaries and a presidential election every year anyway; in 2016, they got a turnout of 69%, better than all but three U.S. states.)

You might think of the Senate and Electoral College as a kind of standardized test, a quantifiable proxy for whatever we think of as the popular will. Like any standardized test, it roughly measures the thing it's supposed to; but it can be gamed, and the longer it persists in fixed form, the better people get at gaming it, getting more and more accustomed all the while to thinking of the test itself as the thing that really matters. Sometimes I imagine a distant future where whole regions of the United States, ravaged by climate change and unchecked pollution, are inhabited solely by a handful of cyborg-people aged a hundred and up, kept in stasis in purified-air boxes and roused into consciousness by their machine parts once every even-numbered year, just long enough to

mark a ballot for the congressional representatives the Constitution guarantees them. And there will still be opinion pieces in the newspapers praising the founders' keen insight in designing a system of self-government that has served us so well, and for so long.

The states are mostly fixed in place now; we are not ever going to replace them with some highly rationalized machine-drawn division of the nation into equal-sized chunks where Wyoming and greater Chattanooga have the same say in lawmaking. There will continue to be some much smaller than the others. By contrast, legislative districts, post-*Reynolds*, are all roughly the same size. That blunts the power of the district-drawers, preventing them from brazenly creating rotten boroughs to preserve their power. But it does not eliminate it. Chief Justice Earl Warren, in his majority opinion in *Reynolds*, wrote: "Indiscriminate districting, without any regard for political subdivision or natural or historical boundary lines, may be little more than an open invitation to partisan gerrymandering."

So it has proved. There are many flavors of mischief available to legislators who—if you'll allow me a redundancy—are strongly motivated to advance the interests of their political faction. Let's see how this works in the state of Crayola.

WHO RULES CRAYOLA?

In the great state of Crayola two parties vie for power, the Oranges and the Purples. The state has a lean: 60% of the one million voters there support the Purple Party. Crayola has ten legislative districts, each one of which sends a senator to fulfill government's solemn duties at the statehouse in Chromopolis.

Here are four ways the voters could be divided into those ten districts:

	OPTION 1		OPTION 2		OPTION 3		OPTION 4	
	Purple	Orange	Purple	Orange	Purple	Orange	Purple	Orange
District 1	75,000	25,000	45,000	55,000	80,000	20,000	60,000	40,000
District 2	75,000	25,000	45,000	55,000	70,000	30,000	60,000	40,000
District 3	75,000	25,000	45,000	55,000	70,000	30,000	60,000	40,000
District 4	75,000	25,000	45,000	55,000	70,000	30,000	60,000	40,000
District 5	75,000	25,000	45,000	55,000	65,000	35,000	60,000	40,000
District 6	75,000	25,000	45,000	55,000	65,000	35,000	60,000	40,000
District 7	35,000	65,000	85,000	15,000	55,000	45,000	60,000	40,000
District 8	35,000	65,000	85,000	15,000	45,000	55,000	60,000	40,000
District 9	40,000	60,000	80,000	20,000	40,000	60,000	60,000	40,000
District 10	40,000	60,000	80,000	20,000	40,000	60,000	60,000	40,000

All four of these districtings split Crayola up into equal-sized districts with 100,000 voters each. In all four, the columns add up to 600,000 Purple voters and 400,000 supporters of Orange. But the legislatures they produce are wildly different. In the first map, Purple wins six seats and Orange four. In the second, Orange takes over the majority, with six out of the ten seats. In the third, Purple holds the majority seven seats to three. And in the final map, Orange is completely shut out, and Purple makes the laws without a dissenting voice to be heard in the chamber.

Which one is fair?

That's not a rhetorical question. Actually think about it for a minute! There's no sense in reading dozens of pages about a difficult social problem until you've reflected on what goal you think we're trying to achieve.

A minute goes by . . .

There's no obvious answer, as I hope you can see. I give a lot of talks about districting, and I always ask this question, and I get all kinds of answers. Almost always, a majority of people like Option 1 the best.

Most people pick as the fairest choice Option 2, where Orange holds the majority despite being decidedly in the minority of the population. But I once talked to a group of Unitarians who thought Option 4 was clearly the worst, because one party was deprived entirely of its right to participate. And the Unitarians are far from alone in this view.

Is this even a math question? It's not *not* a math question. But there's a legal strand, a political strand, and a philosophical strand, too, and there's no way to unwind these from each other. There's a long and unimpressive tradition of mathematicians approaching the problem of districting as an exercise in pure geometry, asking questions like "How can we cut up Wisconsin along perfectly straight lines such that the resulting polygonal regions have equal population?" You can do that—but you *shouldn't*, because you'll get districts that have nothing to do with the real political facts on the ground. Those districts might have agreeable geometric properties, but they'll cut cities and neighborhoods in half, and cross county lines, which, in Wisconsin and many other states, is a constitutional no-no unless you have to do it to make the districts equal in population.

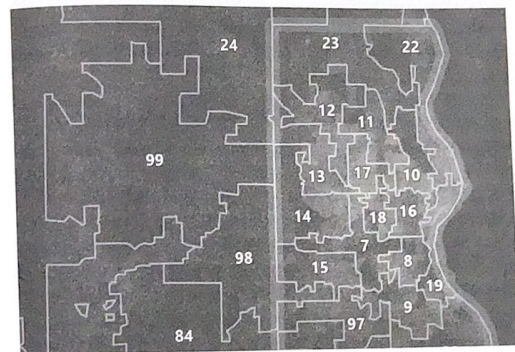
On the other hand, when lawyers and politicians think about redistricting while neglecting the mathematical strand, the result of their work will be no better; and that, by and large, is exactly how these issues have been addressed until recently. To get districting right, there's no alternative to digging into the numbers and shapes.

Looking at those numbers for the four districtings of Crayola makes the basic quantitative principle of gerrymandering perfectly clear. If you get to draw the district lines, you want your opponents' voters packed into a few districts where they predominate. Best of all is if you can get that done by drawing those enemy voters out of formerly competitive adjacent districts, giving your party the advantage there. As for your own voters, you want them carefully allocated in a larger number of districts where they make up a reasonably safe majority. That's what happens in Option 2: the majority of the Purple vote is crunched into the four districts where Orange doesn't have a chance, while the other six districts lean Orange by a solid margin of 55–45.

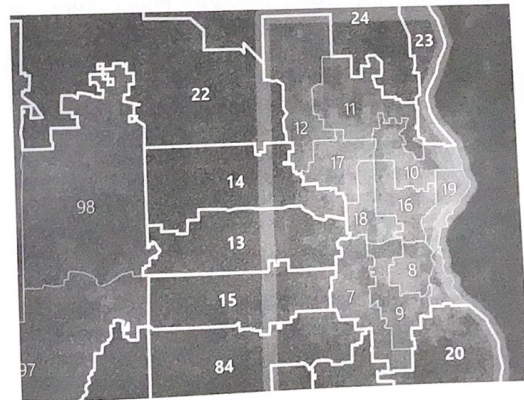
It's also what happens in Wisconsin. The line between Waukesha County and Milwaukee County is one of the state's sturdiest political boundaries. When you drive east from Madison to see a Brewers game in an election year, the signs in the yards instantly snap from Republican red to Democratic blue as you cross 124th Street. Until 2010, the assembly district lines largely stopped where the counties did, with reliably Republican districts to the west in Waukesha County and Democratic-leaning ones making up Milwaukee County. The map enacted in 2011 changes all that.

The 13th, 14th, 15th, 22nd, and 84th Districts, among others, now dip across the county line to mix Democratic voters—but not *too* many—in with the Republican wards of Waukesha.* Those five districts have been represented by Republicans from the time of their creation through 2018, when Robyn Vining, a former pastor and official 2017 Wisconsin Mother of the Year, won the 14th District for Democrats by

* Didn't I just say the Wisconsin constitution doesn't allow you to break county lines? Well, yes; but so far, court challenges to this map have gone through the federal courts, which don't address potential violations of the state constitution.



2001 Map



2011 Map

less than half a percent.* The number of districts located entirely within Milwaukee County dropped from eighteen in the old map to just thirteen. Democrats hold eleven of those assembly districts, and ten of those are so uncompetitive that Republicans didn't even field a candidate in 2018.

Politics, as the saying goes, ain't beanbag, and from one point of view, there's no unfairness to be found here. Legislating is a game where whoever's ahead gets to change the rules on the fly, and there's no right or wrong, just winning and losing. But most people see something to be leery of in the practice of gerrymandering, and some of those people are federal judges. Wisconsin's districts were the subject of court challenges almost from the moment Scott Walker signed them into law. Two of the districts were modified by judges in 2012 to make the map less hostile to Hispanic voters in Milwaukee, in a decision that starts out, "There was once a time when Wisconsin was famous for its courtesy and its tradition of good government," and which describes the map-drawers' claims that they worked without partisan bias as "almost laughable." Then, in 2016, a three-judge panel of the U.S. District Court for the Western District of Wisconsin threw out the whole map as a specimen of political gerrymandering in violation of the U.S. Constitution. That decision was appealed and made its way to the U.S. Supreme Court, which had long labored to find a reasonable legal standard for how much partisan gerrymandering was too much. What happened after that was a collision of math, politics, law, and motivated reasoning whose implications American politics is still absorbing.

"A MINORITY RULE IS ESTABLISHED"

If you know anything about gerrymandering, it is probably this pair of facts, which are glommed together right there in the name: first, that it was invented by Elbridge Gerry, who as governor participated in a dis-

* Added in proof: One more, the 13th, was flipped by Democrats in November 2020. The statewide presidential vote was almost exactly even, as the Walker-Evers race had been, and Republicans maintained a 61–39 assembly majority.

tricting of Massachusetts designed to assist the Democratic-Republicans in fending off the Federalists in the 1812 election; and second, that it involves districts drawn with bizarrely sinuous boundaries, like the "salamander"-shaped district in Massachusetts that a cartoonist immortalized as the "Gerry-mander."

Both these facts are wrong. First of all, gerrymandering in America goes back well before the word and well before Gerry. According to Elmer Cummings Griffith's definitive study, his 1907 PhD dissertation in history at the University of Chicago, the practice dates back at least as far as the colonial assembly of Pennsylvania in 1709. And in early America, the most notorious example of politically motivated district making was carried out by Patrick Henry—"Give me liberty or give me death" Patrick Henry, whose pro-liberty attitude was tempered by his desire to maintain iron control over the Virginia legislature. Henry was a bitter opponent of the new U.S. Constitution, and was determined to keep one of its chief architects, James Madison, out of Congress in the 1788 election. At Henry's direction, Madison's home county was placed in a district with five counties that were seen as anticonstitutional, which Henry hoped would vote for Madison's opponent, James Monroe. Just how unfair this district was is disputed to the present day, but there's no question Madison and his allies felt Henry was playing dirty. Madison didn't get the easy path to Congress he'd hoped for, instead having to return home from New York to campaign for weeks throughout the district. He had a bad case of hemorrhoids that made travel difficult, and picked up frostbite on his face debating Monroe outdoors in January in front of a crowd of Lutherans. Gerrymander or no gerrymander, Madison prevailed, in part by winning his home base of Orange County by 216 votes to 9.

So by the time Gerry gerrymandered, it was no innovation, but an established political technology. (Stigler's Law strikes again!) By 1891, the practice, intertwined with other colors of electoral shenanigans, was so severe as to move President Benjamin Harrison* to warn in his State of the Union address:

* Who won a decisive majority of the Electoral College in 1888 while losing the popular vote, for what it's worth.