Seeing Through Maps

Many Ways to See the World

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"An ingenious way of looking at the world"

Howard Zinn, bestselling author, A People's History of the United States

ONE The Multiple Truths of the Mappable World

Two People, Two Feet Apart

What is the truth? It seems so simple. But when we try to put it into words, it turns out to be much more complex.

Our dictionary says that truth is: "Conformity to knowledge, fact, actuality, or logic." That seems to help until we try to say what "knowledge" is. Or "facts."

"Truth is most commonly used to mean correspondence with facts or with what actually occurred," our dictionary goes on. But when the police officer asks "What happened?" at the scene of even the simplest fender-bender, the officer seldom hears just one story. If facts were straightforward, we wouldn't need juries to determine them.

The truth can seem awfully slippery at times.

At other times, good sense rebels against such an idea. Of course the truth exists! "We *did* have lunch last Thursday." It is a simple fact.

But is it?

We *did* have lunch last Thursday.

Of course we sat in different chairs and they were sort of angled to the table. Because of this one of us looked at the other against a background of geraniums in coffee cans and birds at a feeder in the dogwood tree; the other against a background of the house next door and thunderhead clouds in the summer sky above it. What at first appears to be one thing—the two of us having lunch—dissolves into two different scenes. Even at a single moment in the meal different things are going on. Sometimes they are so different we can see that the other person's eyes have drifted from the table. Ward has moved his eyes to something going on in the tree behind Denis, or Denis has moved his eyes to something happening in the driveway behind Ward. We have to reorient ourselves to the reality of the other by turning our chairs to face each other more squarely.

Sometimes one of us sees something the other misses completely: a bird at the feeder (gone by the time the other turns), or a kid maneuvering on a skateboard (and the other turns, but he is too late). Then one

person's experience of lunch includes that event. The other's doesn't.

These differences in the experience of lunch result from a space less than than a foot or two between our chairs and a difference in orientation of maybe 90˚. We can add to this our different backgrounds, different professions, different styles of thinking, and all the rest. Then, despite everything we share, it becomes hard to say—even of this simple meal—precisely and unanimously what was what. This is true even *in the moment*, much less in the mind, or in the memory a day, a week, a month later or even longer.

But, we *did* have lunch together!

Sure, okay, if that's all you want to say: we had lunch.

There may *be* something we can call the truth if we keep it so simple it doesn't really matter.

Two Peoples, a World Apart

Two people, two feet apart. What if they had been two peoples a world apart? What if they had been inhabitants of the U.S.A and Iraq contemplating the U.S. bombing of Baghdad?

If all we can say of the truth is that bombs fell on a city we might as well say nothing. Because it is not about that. That's *past*. It is about now and tomorrow. It is about who (if anyone) will pay for what happened. It is about what was really going on, and if this was a sign, what was it a sign of, and is it reasonable to have bombs? It is about what life means if it can end this way. It is about stuff like that.

"It's hot out here," one says.

"It sure is," says the other.

"It's from global warming," says the first, "too many cars."

"Hogwash!" says the second.

It was easy to agree about it being hot, but attributing the heat to the cars implies a course of corrective action. That raises the stakes. Suddenly it is a matter of perception. Is it *really* hotter than it used to be? Or is this a *perspective* effect? If it is hotter, is this *usual* or *unusual*? If unusual, did *people* cause it? If we did, *what* can we do about it now?

Going back to our first example, you might ask, "Well, what about someone across the street watching the two of you having lunch? Wouldn't they have an *objective* view? What about the UN perspective on the bombing? What does *science* have to say about global warming?"

And, yes, each has its truth too, but there are three truths now instead of two. Three truths . . . *or more*. The UN scarcely speaks in a single voice, and in the case of science speaking about global warming we're talking about dozens and dozens of truths.

How many can we stand?

How do we act if we don't know what's true? Isn't life hard enough already without adding to it the uncertainty of there being many truths?

Frankly, life is hard enough already without pretending it is so simple there is only a single truth.

Maps Are Descriptions Too

What does this have to do with maps?

Maps are descriptions of the way things are. They are a lot like the answers people give police at the

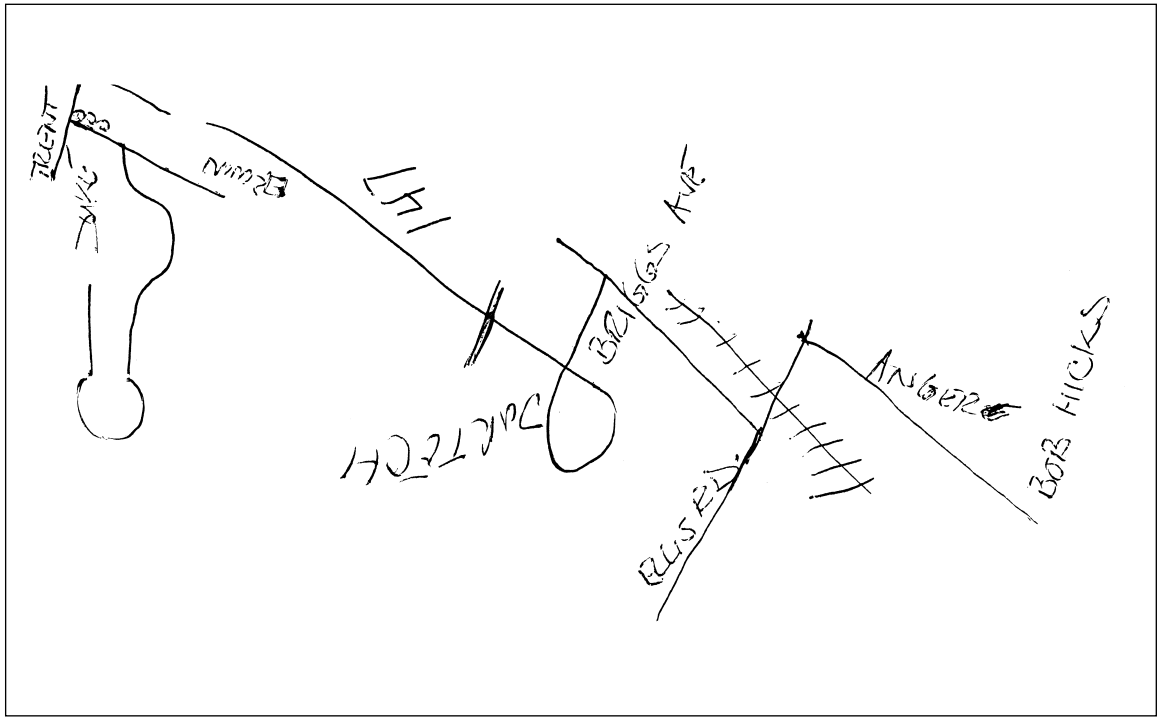

Figure 1. ***We were lost. A security guard at Duke University in Durham, North Carolina, drew this map of the best way to get from Duke to Angier Avenue. (1993).***

scene of an accident. Questions of truth are never far away.

We can ask the same things about maps that we ask about any description. How true? How complete? How accurate? How precise?

The answers depend on our purposes, or what we need the description for.

Figure 1 is the map a guard made to show us how to get from Duke University, in Durham, North Carolina, to an auto repair shop on Angier Avenue. It brings institutions (Duke, Durham Tech), roads (NC 147, Briggs Avenue), and landmarks (a bridge, the railroad tracks) together to form a sequence of instructions: "Get off 147 at the Briggs Avenue exit just past Durham Tech," is what the map says, "and where Briggs dead ends, turn right . . . "

Is it true? As a matter of fact, it got us exactly where we wanted to go, so it was true enough. It need not have been true. The guard could have been irritated by our presence and drawn a map intended to mislead us. (People have been known to do such things.) Or the guard could simply have been mistaken about which street went where.

Is his map complete? It is complete *enough*. It is not a complete map of Durham. It is not even a complete map of Durham streets. But it included everything we needed to know to get from Duke to Angier Ave.

How accurate is it? Again, it is accurate enough for the purpose. As a matter of fact, Angier Avenue *doesn't* "T" into Ellis Road. It crosses it. But this didn't matter if we were following the map.

Is it precise? Not very. On one part of the map an inch equals a couple of hundred yards. On another it equals a couple of miles. But again, it was precise enough for us!

The guard's map perfectly fulfilled its purpose. The guard managed this by selecting from everything he knew about Durham only what was necessary to his purpose: to guide us where we wanted to go.

All Maps Are Selective

Every map is a purposeful selection from everything that is known, bent to the mapmaker's ends. Every map serves a purpose. Every map advances an interest.

This is easy to see in a map like the one we have been looking at, which was drawn with the special purpose of helping us visualize instructions: "It's kind of complicated," the guard had said as he put pen to paper. It is not so easy to see the purpose in an ordinary map of the world like our next example.

A world map like the one in Figure 2 seems to have no special purpose. Or it may seem to be ready to serve any purpose you might bring to it. For this reason such maps are often called "general purpose maps" in an effort to differentiate them from "special purpose maps" like the one the guard drew. But as we will see, there are no general purpose maps. Every map serves a specific purpose. Every map advances an interest.

We should have put "world map" in quotation marks. Although this is how we talk about maps like this (we *call* them "world maps"), this is no more a map of the world than the guard's was a map of Durham.

How else to call such a map? No other name is quite as convenient, and everyone calls it a world map, so we will too. But, as we do, we're going to keep in mind that a great deal is missing. *Often what's missing is a clue to the purpose the map is serving.*

In this case, both of the earth's poles are missing. Much of Antarctica is missing too. So are all signs of relief: there are no mountains, valleys or plains, either on the land or beneath the sea. There is no atmosphere. Certainly there are no clouds. For that matter there is no sign of life, either vegetable or animal. There is no sign of human life either, no countries, no Cairo, New York or Mexico City, no Great Wall of China.

It is hardly, in other words, the world. So what is it?

At first thought it may seem to be a map of land and water. But when you think about it, too much water

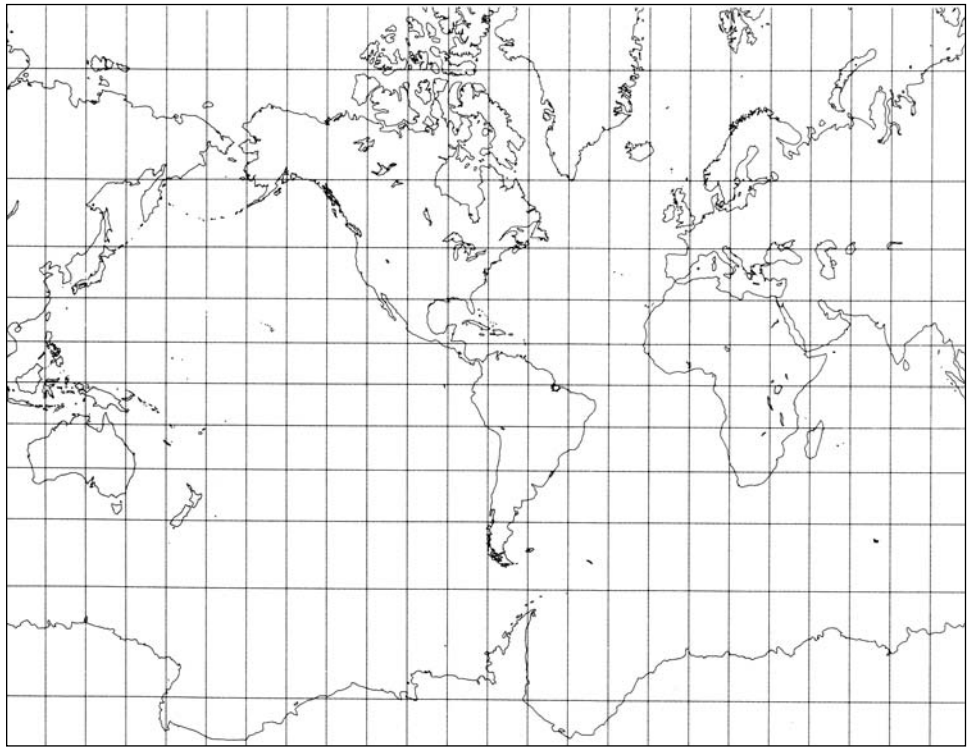

Figure 2. ***This is a modern outline reconstruction of the 1569 map on which Gerardus Mercator introduced his famous projection. Notice the way the rectangles forming the grid get longer and longer as you move toward the North and South Poles. A redrawn version of his actual map is on page 6.***

lies on the land in the form of ice for this to be a map of water. There are literally thousands of tons of water in the ice that lies over Antarctica and Greenland. Tons of water exist in the atmosphere too. So it is not a map of land and water. The map has to be about something else.

As with the truth, the subject of the map seems simple. But when you try to put it into words, it turns out to be complex. In fact, the map is not at all what it seems. Even in its updated form (see page 4) the map is actually still a piece of history. It reminds us that when it was made, people crossed oceans in sailing ships. A good description of this map's subject would be, "Places where ships will float and places where they won't." This still isn't *quite* right. Even modern icebreakers get stuck in the solid ice of the Arctic Ocean. Sailing ships never got into that ice at all.

All Maps Have a Purpose

The sailable world is what this map is paying attention to. It is a map for a world of sailors. It should not surprise us, then, that the way the map shows the world reflects the interests of sailors too. Figure 3 shows a modern redrawing of the map Gerardus Mercator made in 1569. He called his map "A New and Enlarged Description of the Earth With Corrections for Use in Navigation." His title was very precise about the map's purpose, and right over North America he engraved a long description of how he made it.

We will have much more to say about this map further on. What's important here—where we are concerned with the *purposes* maps serve—is what Mercator's map was *for*. The map made it possible for sailors to draw a straight line to their destination and sail along it. Any straight line drawn on Mercator's map is a line of constant compass bearing. You'd draw a line to your destination, set your compass to the bearing of the line, follow it and, making allowances for winds and tides, get where you wanted to go.

Mercator's work was not appreciated immediately. For one thing, the map was too different at a time when sailors put a great deal of faith in tradition. For another, the map was too small to be of much practical use. It wasn't until the ideas behind Mercator's map became understood and accepted, and until the map was redrawn as a series of regional sea ***charts***, that his work became popular.

CHART: A chart is a map designed for navigation. There are coastal charts, harbor charts, nautical charts for use at sea, and aeronautical charts for flying.

In the 18th century when world travel became more common, so did the use of Mercator's map. In that increasingly scientific age the map's technical practicality gave it great authority. It was in the 18th century that Mercator's map began to be seen as *the* world map, essentially because it was *the* map of the seaman, *the* map of the navigator, *the* map of the professional world traveler. As Western nations made themselves into colonial powers, Mercator's map of the world came to be seen as an important icon of Western superiority (more on this is found in Chapter 3, page 32).

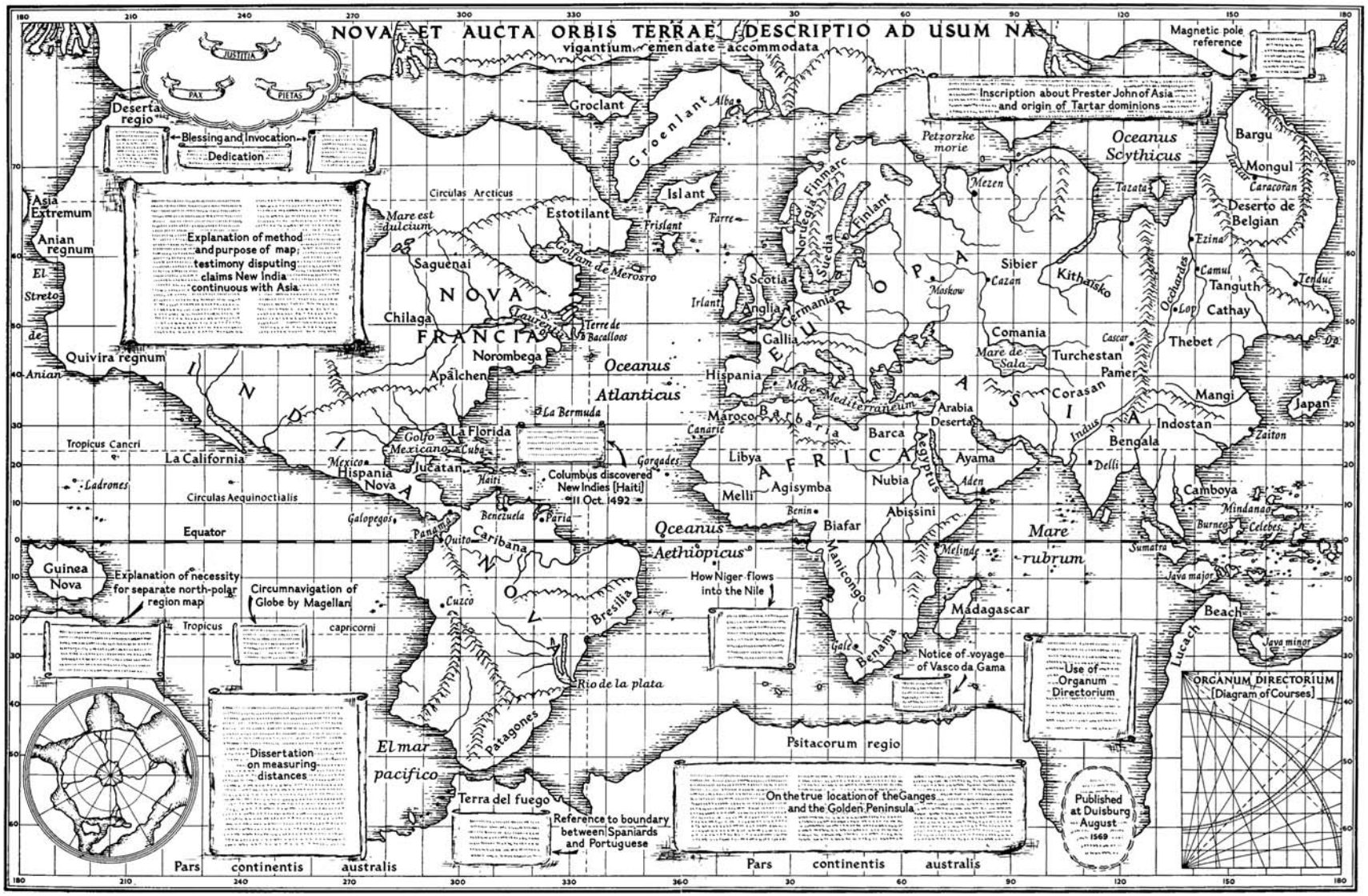

Figure 3. ***This is a redrawing of the map Gerardus Mercator published in 1569 to present his new projection. The original is too hard to reproduce. The title reads, in English, 'A New and Enlarged Description of the Earth With Corrections for Use in Navigation.' Its intended use could not be more clearly spelled out.***

A Map's Quality Is Related To Its Purpose

The Mercator as an icon of Western superiority is something else we will have much to say about further on. Here, our point is that this famous, popular, and apparently "general purpose" map of the world turns out to have been created to serve a very special purpose, one almost as special as the purpose served by the security guard's map. In fact, both maps have similar purposes. Both are about helping you get where you want to go.

How "true" is the Mercator? Many people think it is not very true. To see what they are talking about, do this: hold the modern version of the Mercator up to a globe. It is obvious there that Mexico is larger than Alaska, but on the Mercator it looks as though Alaska is three times the size of Mexico. On the globe you can see that Africa is significantly larger than North America, but on the Mercator it is the other way around. On the globe South America can be seen to be almost twice as large as Europe, but on the Mercator Europe seems to be larger than South America.

The proportions of places on the globe are *not* the proportions shown on the Mercator. On the Mercator, places closer to the north and south poles are proportionally larger—often much larger—than places closer to the equator.

How should we think about this? Our dictionary says that to distort something is "to twist out of a proper or natural relation of parts," and in this simple, straightforward sense Mercator's map distorts the sizes of places on the globe. But the dictionary goes on to say that to distort is "to cast false light on, alter misleadingly, misrepresent." In this second sense, the "twisting out of a proper relation" is intended to *mislead*. The problem is that these two senses of "distort" are often confused.

Does the Mercator mislead? It so happens that it is *impossible* to make compass bearings straight lines on

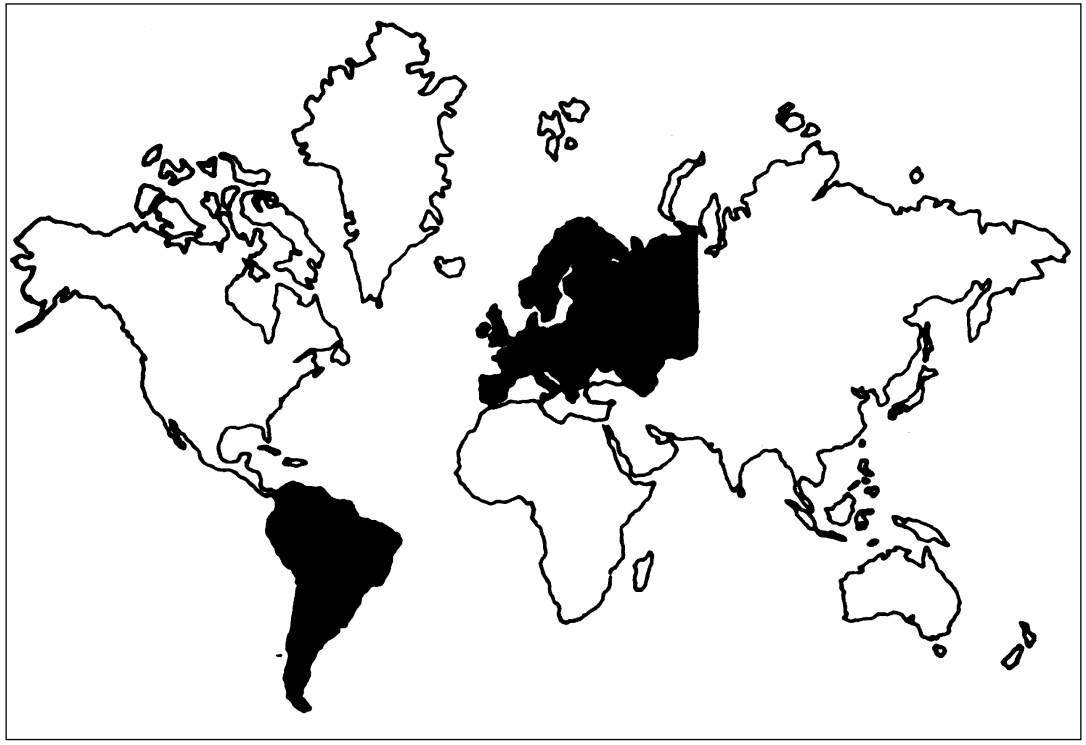

Figure 4. ***The Mercator projection makes Europe look larger than South America. In fact, Europe has only 3.8 million square miles and there are 6.9 million square miles in South America. Of course, the projection was never designed to facilitate the comparison of areas.***

a map that also gives places their proper proportions. To show the one, the other *has to be* "twisted out of a proper relation of parts." No map can show both of these things together.

To show one truth you have to distort another. This is one good reason we need so many truths.

In our case this is because a world map is a flat image of a curved surface. There simply is *no way* to "squash" the globe into a plane without losing something "true" about the globe. Think about the way you can run your finger around and around the globe. You can't do this on the Mercator simply because of its edges. This is a crude illustration, but it gets to the heart of the matter: the map is not the globe.

What this means is that every map is a *view* of the globe. From this perspective, different maps are much like the different views the two of us had of our lunch together; different because we were focused on different but equally valid things. Different maps are like telling a story, but from different points of view.

Another way of saying this is that different maps show different selections from what is available, in a medium where you cannot show everything at once. What was true about the map the guard at Duke made is true about all maps: *all maps are selections from everything that is known, bent to the mapmaker's purpose.*

Because it was not part of Mercator's purpose to give the proper proportions of places on the globe, it is not fair to imply that his map intends to cast a false light on, or misleadingly alter them. The loss of proportionality was an *unavoidable consequence* of Mercator's purpose to make compass bearings straight lines. This loss of proportionality, most serious in the infrequently traveled polar regions, was of no practical importance for sailing, just as the lack of proportionality in distances on the guard's map was of no practical importance for us.

Furthermore, when the Mercator was applied in a series of regional sea charts as intended, the distortion was greatly reduced. *Mercator's purpose was to help sailors plot their courses across the ocean, and for that purpose his map worked.*

It still does.

As people require more than one truth, so sailing requires more than a single view of the world. As useful as the Mercator is, it could not be used for navigation by itself. No single map could ever suffice. For one thing, no map of the world could ever be sufficiently detailed for the careful sailing required to take a ship along a coast, or in and out of a harbor. For that purpose navigators had lockers filled with local charts. For another thing, no navigator could use the Mercator to plot his *shortest* route. For that purpose he needed a map that shows ***great circles*** as straight lines.

Showing great circles as straight lines is another thing maps can do—but *not* a map that makes compass bearings straight lines, or that gives areas their proper proportions. This is another example of the fact that all maps are selections from everything that is known, bent to the mapmaker's purpose. Like telling a story from different points of view, each purpose requires a different map.

GREAT CIRCLE: This is any line that, like the equator, divides a sphere into two equal halves. The shortest distance between any two points on a sphere is part of a great circle.

What *is* a great circle? It is any line that divides a sphere into two equal halves. The *equator* is a great circle. It divides the globe into northern and southern hemispheres. While the shortest distance between two points on a plane is a straight line, the shortest distance between two points on a sphere is part of a great circle. This is just another of those differences between planes and spheres that complicates the world of maps.

You may already know about great circle *routes*. Take another look at a globe. If you were to fly from New York to Beijing would you head east over the Atlantic, Europe and all of Asia? Or west across the U.S. and the Pacific? Or would you fly north, more or less over the pole?

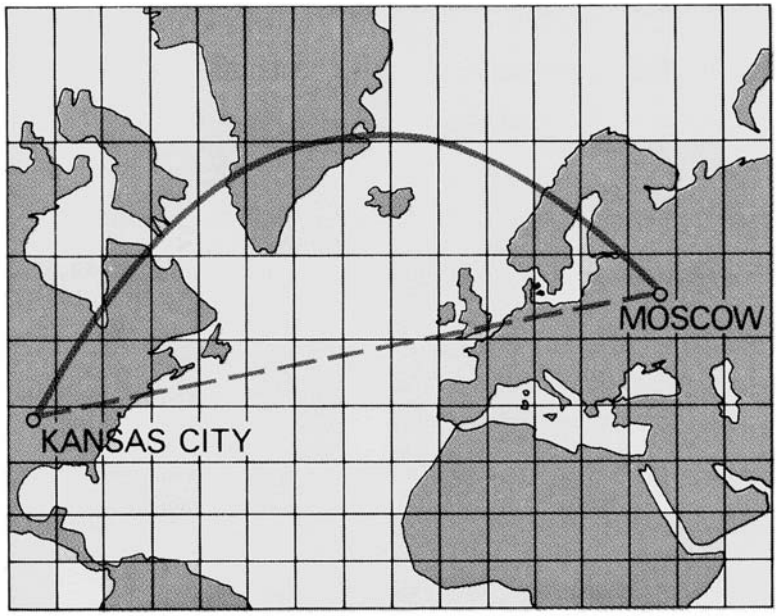

Figure 5. ***Mercator's projection showing the line of constant compass bearing (straight) and the great circle route (curved) between Kansas City and Moscow. Although it shows up as longer on this projection, the great circle route is shorter on the globe. A composite line composed of little short lines of constant compass bearing would then be fitted to the great circle route. These are what a pilot would follow.***

As you can see (and, if you want to make sure, you can use a piece of thread or string to measure it), the shortest route (by far!) goes close to the North pole. This is a great circle route, a segment of a circle which, if it were continued, would circle the globe and, like the equator, divide it in two.

As you can also see, flying along the great circle route from New York to Beijing would require constantly changing your bearing. First you would be flying approximately north, then west, then south.

The way navigators work is to plot their route on a map that shows great circle routes as straight lines. They can do this on a kind of map called ***gnomonic***. Such maps do not have a lot of other useful characteristics, so they are not used much. Since great circles are almost straight on ***Lambert conformal conic*** maps, these are increasingly used for this purpose, especially for aeronautical charts.

Having laid out their route on such a map, the pilots transfer it to a Mercator. Here they approximate the route with a chain of straight line segments. They then fly along these segments which, since they are straight lines on a Mercator, are lines of constant compass

GNOMONIC: A kind of map that shows great circles as straight lines.

LAMBERT CONFORMAL CONIC: A kind of map on which great circles are close enough to straight lines to make it useful for aeronautical charts.

bearing. This is similar to how ships navigate, too. Of course today this is all done by computers.

To Repeat: A Map's Quality Is a Function of Its Purpose

Would it be fair to say Mercator's world map *lied* because it lacked detail about the coasts and harbors?

Not really. If you want to show the world's 197 million square miles on a chart that's twelve feet square, some details are going to be left out. It is like telling a story. If someone wants it told in 60 seconds, the details that would make it last an hour have to go. You just hit the main points. This isn't lying. (It is not incompleteness, either.) When mapmakers just hit the main points, ignoring, say, all the tiny twists and turns of a coastline, they call it ***generalization***.

GENERALIZATION: When mapmakers smooth out coastlines or take the kinks out of rivers to give the general idea, as when they are showing the whole Mississippi or the whole East Coast of North America.

Similarly, Mercator's failure to give places their proper proportions doesn't amount to lying, nor is it fair to think about it as inaccurate. The changes in proportionality are smooth, continuous and predictable. They are necessary consequences of the manipulations Mercator had to carry out in order to make compass bearings straight lines.

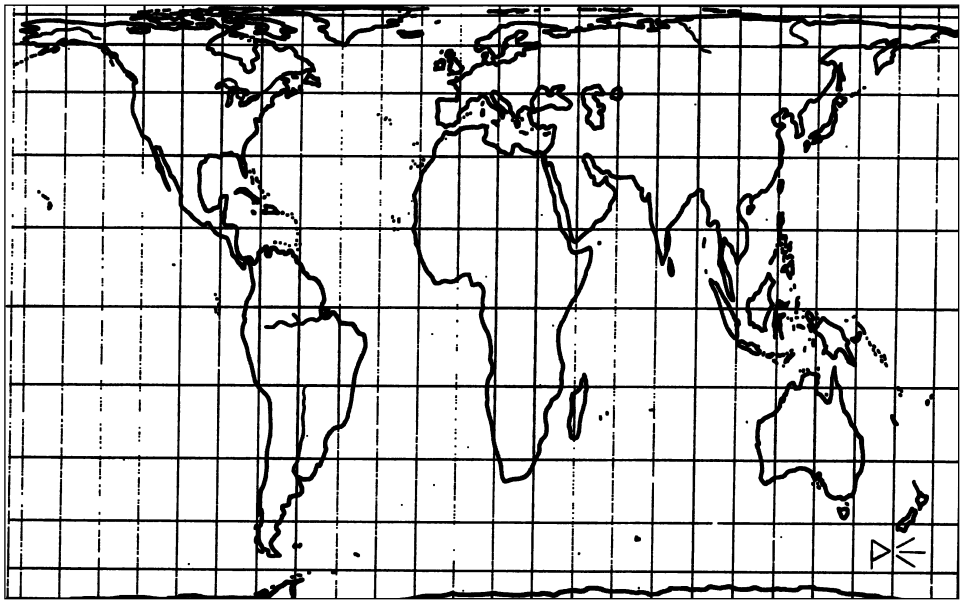

Figure 6. ***What a different world this seems to be. This is a projection of the world that gives areas their true relative size. You can easily see how much larger South America is than Europe. On the other hand, compass bearings are not straight on this map. Maps really are like points of view.***

To make all this clearer, take a look at the map above. What a different world!

This is called the Peters map, named for Arno Peters who introduced it in 1974. Unlike Mercator, whose purpose was to help sailors, Peters' purpose was to help the rest of us. Peters believed that widespread use of Mercator maps for purposes that had nothing to do with navigation built up in our minds a seriously distorted image of the world.

It is fair to say Peters was especially concerned about our image of Africa and the countries close to the equator that were given short-shrift as a conse-

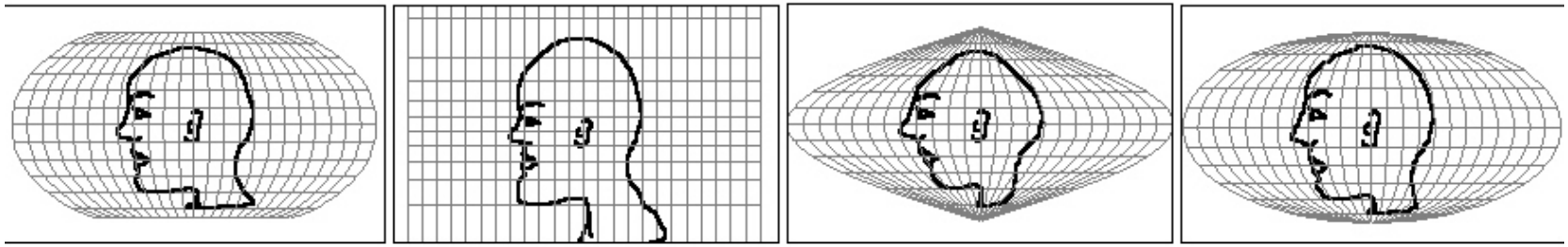

Figure 7. ***A head drawn on one projection (Robinson's) has been transferred to the Mercator (center left) and a sinusoidal (center right) and finally to a Mollweide (far right). The 'natural' profile could have been drawn on any of these and then plotted on the others. This is just a way of getting a sense of what different projections do.***

quence of the Mercator projection. On a Mercator the former Soviet Union is much larger than Africa. Since size can often imply importance, wouldn't people looking at such a map imagine that the Soviet Union was much more important than Africa?

Africa is actually about the same size as the former Soviet Union and the United States combined. Africa is *substantially larger* than the United States and the current Russia. If size were what mattered, Africa would rank second in importance only to Asia. Europe would compete with Australia for last place. There is no question that the Peters makes this much more evident than the Mercator.

Which map is right?

They're both right. They're just "right" about different things. But again, they're both "wrong," too.

Try this exercise! Focus on the shapes of the continents. First hold the Peters up next to a globe. Is Africa really so tall and skinny? Is Alaska so stringy? The shapes on the Peters are precisely as distorted as sizes on the Mercator. Good shape, what mapmakers call ***conformality***, is one of the things Peters had to sacrifice to keep the areas of places in proper proportion.

On the other hand, the Mercator is said to show true shapes. This is something we will have more to say about later on, but if you compare shapes on the Mercator with those on the globe you will see that if shapes are true, they are true in a very peculiar way.

CONFORMALITY: This is the ability of a map to preserve angular relationships as they exist on the globe. What this means is that the map can show shapes the way they are. A conformal map cannot show areas at their true size.

In fact, shapes are only locally true on the Mercator. That is, shapes are true in this little spot here and in that little spot there. Because sizes change so drastically, when you look at something as large as a continent you have one small true shape toward the equator (say Mexico), and another small true shape near the North pole (say Alaska), but the latter is so many times larger

than the former, that when you put them together, the shape of North America as a whole is not right.

It's as if you were to draw a picture of someone's face, and you got the shape of the chin right, and you got the shape of the forehead right, but you made the forehead ten times larger than the chin. Then even though every part was right, the shape of the whole face would seem to be wrong.

Shapes get truer and truer the more you zoom in on the Mercator. This is why the Mercator is so widely used today for mapping small areas in great detail.

Each Map Has Its Own Point of View

So which map should you use?

You should use the map that best serves your purpose. Only when you are given a map's purpose can the map's rightness—its truth—be assessed.

If you're flying across the ocean, the Mercator is going to be useful, but if you're trying to compare the relative size of places you will want to use the Peters. If you're trying to find your way from Duke to Angier Avenue, neither will be the slightest help.

We need a local point of view to get across town. We need a comparative perspective to get sizes right. We need the point of view of a compass to fly across the ocean.

Every map takes a point of view. No map can show everything at once, any more than the two of us could see the same things at the same time at our lunch together. At the very least, if we were to see each other, we couldn't see ourselves! Besides, sometimes one of us was in the kitchen getting the coffee, or visiting the bathroom. Then our experiences of the meal were sharply divided. One of us might ask, "Remember that bird a while ago that—" and the other will say, "No, I was in the kitchen getting the coffee, but you told me about it." Yet we did have lunch together.

The map that is, as it were, getting the coffee (making compass bearings straight) can't be sitting on the porch taking in the scene (showing places in their proper proportions). Yet there is only one planet.

It takes many different eyes to see it all, and many different maps to show it. That this is a strength, not a weakness, is what the rest of this book is about.

To figure out what's left off a map:

One important clue is to look at what is at the center. Sometimes what is not important to the mapmaker is put off to the edges, or left out altogether. Ask questions like:

- What would a sociologist, anthropologist or psychologist include on this map?
- To what extent does the map reflect commercial interests (like showing restaurants and gas stations) or highlight recreational and aesthetic information (like hiking trails and vistas)?
- What can I discern about the self-interest of the mapmaker and/or those who commissioned the work? How do you suppose that self-interest or agenda may have influenced choices of what to include or omit?

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Do you know...?

- Which image shows population sizes ?
- Which images show how big each country is ?
- Which image shows that "North" isn't the same as "up"?
- Which images convey the idea of "Spaceship Earth" ?
- Which image was created to help navigators ?
- Which images have been criticised the most?

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flip the cover to find the answers.

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