4

CLEAVING THE AIR

Ever since I nearly missed a trip some years ago when an alarm clock failed to go off, I've set *two* alarms the night before a flight, one on my personal digital assistant (PDA) and the other on the clock radio in my bedroom or hotel. Since I find the chime of the PDA to be less rude an awakening than the honking of an alarm clock, I set the PDA to go off a minute before the clock. For many mornings, then, over a span of years, I have experienced the chime of the PDA followed a number of seconds later by the blare of the clock. And according to a well-known theory of the perception of causation associated with the philosopher David Hume, I should think that the chime *causes* the blare.[1]

Of course I think nothing of the sort. The cause of the clock's noise-making, I firmly believe, was my fiddling with the buttons before I went to sleep. I think this despite the fact that the interval between cause and effect can vary between eight hours and three, despite the fact that the alarm doesn't always go off (since there are so many things that can go wrong in setting a digital alarm clock), and despite the fact that I have only the vaguest idea of how a digital clock works (I think it has something to do with charges in silicon chips).

Yet despite the tenuous connection between twiddled buttons and blaring alarms (and the more immediate connection between the PDA's chime and the clock's alarm), my conviction of the true cause remains unwavering. That's why, when the alarm clock fails to go off, I don't shake my PDA or hold it up to the light but instead think back to my interaction with the

clock the night before. Maybe I'm not smart enough to set a digital alarm clock (I failed to notice the P.M. light, or confused the A and B alarms, or set the alarm to MUSIC but left the radio dial between stations). Maybe the designers of the clock are not smart enough to make an appliance that a typical person can set. Maybe a part of the clock—a wire or chip inside it—is burned out. Maybe the clock's workings were addled by cosmic rays, or gremlins, or the moon rising in Sagittarius. But somehow, I feel sure, the happenings in the clock have *some* intelligible cause, which is to be found not in whatever happens to precede them but in some force or mechanism with causal powers.

People assume that the world has a causal texture—that its events can be explained by the world's very nature, rather than being just one damn thing after another. They also assume that things are laid out in space and time. "Time is nature's way to keep everything from happening at once," according to a graffito, and "Space is nature's way to keep everything from happening to *me*."[2] But in people's minds, time and space are much more than that. They seem to have an existence even when there are no events to keep apart; they are *media* in which the objects and events of our experience must be situated—and not just real objects and events, but imagined ones too.

The human imagination is a wondrous concocter. We can visualize unicorns and centaurs, people who are faster than a speeding bullet, and a brotherhood of man sharing all the world. But there are many things we *can't* imagine, at least not in the form of a mental image.[3] It's impossible to visualize an apple next to a lemon with neither one to the right, just noncommittally "next to" each other (though of course we can *talk about* that arrangement, as I just did). And as with Alice's comment on the Cheshire Cat (that she had often seen a cat without a grin, but never a grin without a cat), we can't imagine an object that is symmetrical or triangular but that does not otherwise have a particular shape (in the case of a triangle, equilateral or isosceles or scalene).[4] We know that elephants are big and gray, take up space, and are at a particular location at any given time. But while I can imagine an elephant that isn't big and isn't gray, I cannot imagine an elephant that doesn't take up space or isn't located somewhere (even if I have it floating around in my mind's eye, it is *somewhere* at every moment).[5] In the old joke, a tourist seeking directions is told by a local, "You can't get there from here." We laugh because we know that it's in the nature of space

that all its locations are connected. And as the cognitive psychologist Roger Shepard has noted, people often wish that they had an office with additional space, so they would have more places to put their books. But they never wish they had an office with additional *dimensions*, so they would have more ways to *arrange* their books. Continuous three-dimensional space is an ever-present matrix in which the objects of our imagination must be located.

Our mind's eye is also sentenced to live in a world of time. Just as we can imagine an empty space devoid of objects but cannot imagine a set of objects that aren't located in space, we can imagine a stretch of time in which nothing happens but cannot imagine an event that doesn't unfold in time or take place at a given time. We can imagine time slowing down, speeding up, going backwards, or stopping altogether, but we can't imagine time having two or three dimensions. In fact, it's not even clear that we do imagine time slowing down or stopping so much as we *simulate* those possibilities by imagining things moving at half throttle, or halting in freeze-frame, while time marches on as usual.

You might wonder whether these features of our experience come from the design of the mind or from the nature of the perceptible universe. After all, the world exists in three dimensions, unfolds in time, and obeys causal laws (at least on the scales detectable by our sense organs), and perhaps the mind simply reflects its observable surroundings. But there is a crucial difference between space, time, and causality as they are represented in our minds and as they exist in reality. Our intuitions of these entities are riddled with paradoxes and inconsistencies. But *reality* can't be riddled with paradoxes and inconsistencies; reality just *is*.

Take space. It has to be either finite or infinite, yet neither possibility sits well with our intuitions. When I try to imagine a finite universe, I get Marcel Marceau miming an invisible wall with his hands. Or, after reading about manifolds in books on physics, I see ants creeping over a sphere, or people trapped in a huge inner tube unaware of the expanse around them. But in all these cases the volume is stubbornly suspended in a larger space, which shouldn't be there at all, but which my mind's eye can't help but peek at.

An infinite universe might seem more congenial, since the mind's eye can fly through space indefinitely, with new expanses always materializing in the nick of time. But an infinite space, too, has disturbing implications.

Would an infinite amount of space have an infinite amount of matter in it? It's not just possible but likely: physicists have recently discovered that at large scales matter is distributed evenly throughout observable space.[6] That raises the possibility that an infinite space would be studded with an infinite number of universes. Since a given set of elementary particles can be in only a finite number of states and positions, there are only a finite number of possible arrangements of matter in a given volume. Combined with an even distribution of matter through space, this would imply that there are only so many possible universes, which would in turn mean that universes would repeat themselves in an infinite multiverse. If so, then about 10 to the 10^{28} meters away there is an exact replica of you reading an exact replica of this book, and somewhere else a replica of you that decided to put it down, and in still another universe one that is named Murray, and in yet another a replica with a hair sticking out—indeed, an infinite number of doppelgängers in their doppelgänger universes. This seems too much to stomach, yet it is an implication of the apparently innocuous intuition that space and matter go on forever.

Time, too, doesn't want to be either finite or infinite. It's hard to conceive of time coming into existence with the Big Bang, since we are apt to cheat and imagine a primeval empty space in which a little cosmic time bomb sits waiting to explode. Nor can we fathom an empty time stretching indefinitely in the past before it. At best we can rewind a blank and silent videotape, let the tape play for a moment, then rewind it some more, and so on, never really encompassing an infinity of pastness. Nor can we make sense of what time would mean in the absence of matter and energy. Nothing in that nothingness could distinguish one moment from the next, so we would have no way of understanding why the Big Bang went off at the moment it did go off, as opposed to a few trillion years earlier or later or never. Not to mention the disturbing possibility that if time goes on forever, a rerun of every possible event that has happened will happen again an infinite number of times, a cosmic version of *Groundhog Day*.

As with space and time, the causal grid that we imagine connecting all events cannot stand up to too much scrutiny. I set the alarm, causing it to go off later. But who set *me*, causing me to set the alarm? On the one hand, I can consider myself a heap of clockwork, the neurons in my brain impinging on one another like tiny gears and springs. Yet when I make an uncoerced decision it certainly *feels* like I'm choosing whichever option I want,

Would an infinite amount of space have an infinite amount of matter in it? It's not just possible but likely: physicists have recently discovered that at large scales matter is distributed evenly throughout observable space.[6] That raises the possibility that an infinite space would be studded with an infinite number of universes. Since a given set of elementary particles can be in only a finite number of states and positions, there are only a finite number of possible arrangements of matter in a given volume. Combined with an even distribution of matter through space, this would imply that there are only so many possible universes, which would in turn mean that universes would repeat themselves in an infinite multiverse. If so, then about 10 to the 10^{28} meters away there is an exact replica of you reading an exact replica of this book, and somewhere else a replica of you that decided to put it down, and in still another universe one that is named Murray, and in yet another a replica with a hair sticking out—indeed, an infinite number of doppelgängers in their doppelgänger universes. This seems too much to stomach, yet it is an implication of the apparently innocuous intuition that space and matter go on forever.

Time, too, doesn't want to be either finite or infinite. It's hard to conceive of time coming into existence with the Big Bang, since we are apt to cheat and imagine a primeval empty space in which a little cosmic time bomb sits waiting to explode. Nor can we fathom an empty time stretching indefinitely in the past before it. At best we can rewind a blank and silent videotape, let the tape play for a moment, then rewind it some more, and so on, never really encompassing an infinity of pastness. Nor can we make sense of what time would mean in the absence of matter and energy. Nothing in that nothingness could distinguish one moment from the next, so we would have no way of understanding why the Big Bang went off at the moment it did go off, as opposed to a few trillion years earlier or later or never. Not to mention the disturbing possibility that if time goes on forever, a rerun of every possible event that has happened will happen again an infinite number of times, a cosmic version of *Groundhog Day*.

As with space and time, the causal grid that we imagine connecting all events cannot stand up to too much scrutiny. I set the alarm, causing it to go off later. But who set *me*, causing me to set the alarm? On the one hand, I can consider myself a heap of clockwork, the neurons in my brain impinging on one another like tiny gears and springs. Yet when I make an uncoerced decision it certainly *feels* like I'm choosing whichever option I want,

rather than being the helpless housing of a chain of machinery. Nor can a bystander predict any but the most banal of my choices. On the other hand, I can make no sense of a free will that mysteriously ups and does things without a prior trigger or spark. How does it work? If it's truly random, how can it make choices that are sensible in context? And how can we hold it responsible for its choices if they occurred by chance? But if its choices do respond to the context, including our contingencies of moral credit and blame, in what sense is it truly free?

Space, time, causality. We can't think without them, yet we can't make sense of them. These ruminations on the infrastructure of our experience are not, of course, original; I have taken them (with some twists and embellishments) from the German philosopher Immanuel Kant (1724–1804).[7] Kant said he was awakened from his "dogmatic slumber" by reading Hume, particularly his skeptical probing of causality. Hume wrote that we have no justification for our belief that one event must follow another in the world. All we have is an *expectation* that one will follow the other, based on similar experiences in the past. In accord with the rest of his associationist psychology, Hume suggested that a causal intuition is just a habit stamped into the mind when we repeatedly observe one event and notice that another often follows it. One problem for Hume's account is why observers don't think that one alarm causes the other after hearing the sequence repeatedly. But the problem that roused Kant was that it can't explain our conviction that causes and effects are explicable by lawful forces that govern our universe. As William James put it in a later century, Hume's observer lived in "a world of mere WITHNESS, of which the parts were only strung together by the conjunction 'and.' "[8]

Real observers, Kant concluded, must live in a world of whatness, whereness, whenness, and becauseness, imposed by the way that a mind such as ours can grasp reality. Our experiences unfold in a medium of space and time, which isn't *abstracted* from our sensory experiences (the way a pigeon can abstract the concept of redness when it is trained to peck at a red figure regardless of its shape or size) but rather organizes our sensory experiences in the first place. We are not just a passive audience to these experiences but interpret them as instances of general laws couched in logical and scientific concepts like "and," "or," "not," "all," "some," "necessary," "possible," "cause," "effect," "substance," and "attribute" (the last two pertaining to our concept of matter, such as the ability to conceive of a melting ice cube

and the puddle it turns into as the same stuff). These concepts must arise from our innate constitution, because nothing in our sensory experience compels us to think them. Observe as many falling apples as you want; nothing forces you to posit that they are objects tugged by universal gravitation, rather than your just sitting back and enjoying the spectacle like the patterns in a kaleidoscope. You can stare at a cow till the proverbial cows come home; nothing you observe will ever compel you to think "It's not a giraffe" or "All cows are mammals" or "At least one kind of animal eats grass" or "It must have had a mother" or "It can't be the cow that died last week."

Though space, time, and causality (together with logic and substance) organize our world, the paradoxes that infect these concepts—space and time being neither finite nor infinite, choices being neither caused nor uncaused—prove they are not part of the self-consistent world but part of our not-necessarily-consistent minds. There *is* a world, to be sure; it impinges on our sense organs, filling our minds with sensory content and thereby preventing our thoughts from being hallucinations. But since we grasp the world only through the structures of our minds, we can't, wrote Kant, truly know the world in itself. All in all, it's not a bad bargain. Though we can never directly know the world, it's not as if one could know the world without *some* kind of mind, and the minds we are stuck with harmonize with the world well enough for science to be possible. Newton, for example, wrote that in his theory "absolute, true and mathematical time, of itself, and from its own nature flows equally without relation to anything," and that "absolute space, in its own nature, without relation to anything external, remains always similar and immovable."[9] For Kant these are the mind's supports for negotiating reality, and it is futile to try to think without them or around them. He chides us with an analogy: "The light dove, cleaving the air in her free flight, and feeling its resistance, might imagine that its flight would be still easier in empty space."

This chapter is about space, time, causality, and substance as they are represented in language, in the mind, and in reality. I have framed the chapter with ideas based on Kant because the conceptual scaffolding that he said organizes our experience is also conspicuous in the organization of language. One could imagine a hypothetical language whose constructions were dedicated to kinds of sensory experience, like sights and sounds, to the

major players in human ecology, like plants, animals, tools, and kin, or to human obsessions, like food, exchange, or sex. But real languages appear to be organized by Kantian abstract categories. We see them in the basic parts of speech: substance in nouns, space in prepositions, causality in verbs, time in verbs and in markers for tense. We saw them (in chapter 2) in the way that verbs enter constructions, which are selective about how something moves, whether it is a substance or an object, whether an event is instantaneous or protracted, and who or what caused it. And we see them in the everyday metaphors that pervade our language and reasoning, as when we say the price of gas can *rise and fall* like a balloon, when we try to count the events of 9/11 like sticks of butter, when we say that two cities can be *an hour apart* as if they were alarm clocks, and when we talk of Sonia *forcing Adam to be nice* or even *forcing herself to be nice* as if she were closing a jammed drawer. So even when our thoughts seem to be engaged in pure levitation, we find them cleaving the air, getting their traction from the invisible yet omnipresent conceptions of space, substance, time, and causality. To understand human nature, we need to take a good look at those conceptions.

This is not to say that Kant himself is a reliable guide to our current understanding of the nature of thought and its relation to the world. Many philosophers today believe that Kant's rejection of the possibility of knowing the world in itself is obscure, and most physicists dispute his blurring of the mind's experience of time and space with our scientific understanding of time and space.[10] Contrary to everyday experience, our best physics holds that space is not a rigid Euclidean framework, but is warped by objects, may be curved and bounded, is riddled with black holes and possibly wormholes, has eleven or more dimensions, and measures out differently depending on one's reference frame.[11] Time is not the steady dynamic flow of our experience but the fourth dimension of a static space-time, or perhaps the solution to a connect-the-dots game in a multiverse of all possible universes, each linked to the one that "succeeds" it like the next frame in a movie.[12] In all of these cases our best scientific understanding of time and space is wildly out of line with the mind's inclinations. Many physicists say that space and time, in the sense of empty media into which objects and events are slotted, don't exist at all, any more than something called "the alphabet" exists above and beyond the twenty-six letters that make up the alphabet.[13]

Also, Kant was a famously murky writer, and even today the experts disagree on whether he was making claims about the mind of *Homo sapiens* or giving specifications for a generic rational knower. I can't see how he could not be making claims about our minds, at least implicitly, and at least one Kant scholar, Patricia Kitcher, has argued that Kant was not just a great philosopher but an ambitious and prescient cognitive psychologist.[14] But whether Kant actually meant the ideas that today are often associated with his name, or only inspired them, at least two of those ideas are invaluable in making sense of the mind.

Kant tried to forge a synthesis of empiricism and rationalism which, in rough outline, works well in today's nature-nurture debate. The mind is not a mere associator of sensory impressions (as in the empiricism of his day and the connectionism of ours), nor does it come equipped with actual knowledge about the contents of the world (as in some versions of the rationalism of his day and in the Extreme Nativism of ours). What the innate apparatus of the mind contributes is a set of abstract conceptual frameworks that organize our experience—space, time, substance, causation, number, and logic (today we might add other domains like living things, other minds, and language). But each of these is an empty form that must be filled in by actual instances provided by the senses or the imagination. As Kant put it, his treatise "admits absolutely no divinely implanted or innate *representations*. . . . There must, however, be a ground in the subject which makes it possible for these representations to originate in this and no other manner. . . . This ground is at least innate."[15] Kant's version of nativism, with abstract organizing frameworks but not actual knowledge built in to the mind, is the version that is most viable today, and can be found, for example, in Chomskyan linguistics, evolutionary psychology, and the approach to cognitive development called domain specificity.[16] One could go so far as to say that Kant foresaw the shape of a solution to the nature-nurture debate: characterize the organization of experience, whatever it is, that makes useful learning possible.[17]

Also strikingly modern is Kant's characterization of space and time as media in which sensations are arrayed. Logically speaking, the visual field can be characterized as a large database of specks and lines, with each entry specifying a color, a brightness, a position, an orientation, and a depth. But psychologically speaking, position in space turns out to be very different.[18] Space is an ever-present medium into which visual content is placed, not

just one of several entries in an object's database record. Recall the thought experiments on what we can visualize, like a horse's body with a man's trunk, and what we cannot, like a man and a horse standing next to each other with neither on the left.[19] Location is not just a mandatory feature of an object in the mind's eye but also the main attribute the mind uses to individuate and count objects. For example, we see this array as three objects—one that is striped in the leftmost position, one that is gray in the rightmost position, and one that is both striped and gray in the middle position:

Theoretically, we *could* have seen the array as two objects: one that is striped and in the left and center positions, and one that is gray and in the center and right positions. But we don't see it in that manner, because the mind does not use color or surface marking as pegs to differentiate objects the way it uses location in space. Similarly, we can focus our spotlight of attention on a region in space, even an empty one, as when a basketball player, staring into his opponent's eyes, cocks an internal spotlight of attention to an empty place on the floor where he expects a teammate to appear. But experiments show that we have much more difficulty tuning our attention to all the patches of a given color or surface marking wherever they may be found.[20] Even the primary visual areas in the brain show the special organizing function of space. Each patch of cortical real estate is dedicated to a fixed spot in the visual field, and contours in the world are represented as contours across the surface of the brain, at least on a large scale.[21] Time also has a presence in the mind that is more than just any old attribute of an experience. Neuroscientists have found biological clocks ticking in the brains of organisms as simple as fruit flies. And just as we see stuff that is connected in space as an object, we see stuff that is connected in time as a motion, such as a trajectory or gesture, or, in the case of sound, as a melody or stretch of speech.[22]

So there is a model of space and time in human perception and imagination, and various models of space and time in reality (as it is characterized by the best physics of the day). But in the course of this chapter we shall see that the model of space and time expressed in *language* is unlike any of them. For starters, language is not an analogue medium but a digital one. Though we experience space as continuous and three-dimensional, and time as continuous and inexorably flowing, there is nothing three-dimensional or flowing about expressions for space and time in language, which are staccato strings of sounds. To preview the simplest of the examples we will meet, objects are located as *near* or *far,* events in the past tense or the present tense, with nothing to indicate the precise measurements of a yardstick or stopwatch. Also, the semantics of language pick out disembodied *aspects* of reality and combine and comment on them. I was able to describe in words the arrangements that you couldn't visualize, using expressions like *next to* and *symmetrical* which are agnostic about exactly how matter fills space. I can also describe an event without committing myself to a moment in time using a tenseless phrase like *for Bill to leave*. The selectivity of semantics allows our minds to swing through a universe of abstract concepts that is unanchored in the perceptual media for space and time that organize our immediate experience. Presumably this is the mental currency allowing modern scientists and mathematicians to describe space and time in utterly unintuitive ways.

As we shall see, the models of space and time (and substance and causality) embedded in language are foreign to physics and logic, the benchmarks commonly used by philosophers and psychologists to assess our cognitive performance. Nor are our cognitive models simply readouts of our sense organs or our neural clocks. They *are,* though, readouts of major aspects of human nature. Each of these modes of understanding has been shaped for distinctively human purposes, and they allow us to carve substance, space, time, and causality at the joints that matter most to our physical and social goals. Though Kant did not anticipate that our fundamental categories of understanding might be warped by their origin in what he called "the crooked timber of humanity," the peculiarly human versions of these categories organize our lives in far-reaching ways. They determine the kinds of entities we count and keep track of, the compartments into which we sort people and things, the way we manipulate the physical environment to our advantage, and the way we ascribe moral responsibility to people for their

actions. For these reasons, the eccentric conceptions of substance, space, time, and causality with which we cleave the air propel not just our abstract cogitation but the daily course of our lives—our commerce, our politics, our legal disputes, even our humor.

GRINDING, PACKAGING, AND PIGEONHOLING: THOUGHTS ABOUT SUBSTANCE

Space, time, and causality, as important as they are in relating our thoughts to one another, are abstract frameworks, seldom consciously pondered except by philosophers and physicists. What we consciously think about are the actual entities that live in space and time and impinge on one another. And the most basic entities in our thoughts are the ones named by nouns—our concepts of people, things, and stuff. Nouns are the easiest words to identify across languages, are usually the first words learned by babies, and are the labels of the most stable and best-understood human concepts.[23] But for all that apparent simplicity, a look at the meanings of nouns leads us down another rabbit hole. Nouns are not mere pointers to hunks of matter in the world. When a human mind apprehends a person, an object, or a substance, it can construe it in very different ways, and this suppleness carries over to our thoughts about more vaporous entities.

The best way to appreciate what nouns mean is to begin with some examples that seem to mean nothing at all. Think about these sentences (many collected by the linguist Anna Wierzbicka):[24]

> Boys will be boys.
> A deal is a deal.
> What difference does it make what kind you get? Coffee is coffee.
> A man is a man, tho' he have but a hose upon his head.
> Let bygones be bygones.
> A woman is only a woman, but a good cigar is a smoke.
> Que será, será; whatever will be, will be.
> East is East and West is West, and never the twain shall meet.
> You must remember this: a kiss is just a kiss, a smile is just a smile.

Let Poland be Poland.
A horse is a horse, of course, of course.

There is a joke about a woman who goes to see a divorce lawyer. He asks her, "How old are you?" "Eighty-two," she says. He continues, "And how old is your husband?" "Eighty-five," she answers. "And how long have you been married?" "Fifty-seven years." The lawyer can hardly believe it: "But why do you want a divorce now?" The woman says, "Because enough is enough!"

In their literal forms, these sentences look like empty tautologies, but of course they are not. Any speaker knows what they mean: a reminder that some entity has the essential qualities of its kind, despite one's hopes or forgetfulness to the contrary. "Boys will be boys" means that it's in the nature of young men to do things that are pointless, reckless, or tasteless. I last heard it when students on the men's rowing team sculpted a giant penis out of snow in the middle of Harvard Yard.

Since sayings composed from the X-is-X formula are not circular, the first X and the second X must mean different things. Sometimes a noun refers to something, serving as a pointer to an entity in the world that the hearer must identify. At other times a noun indicates a class or kind, characterized by a definition or stereotype. This distinction, between referring and predicating, is basic to language. A name, like *Canada* or *Luciano Pavarotti*, quintessentially refers to something, though names can be converted into category labels in expressions like *Every producer is searching for another Pavarotti*. Isolated nouns like *boy* and *coffee* are, by default, categories or kinds (boys in general, coffee in general), though they can be turned into referring expressions when they are plugged into phrases, like *that boy* or *the coffee grown in Brazil*. A basic sentence—perhaps a basic thought—refers to something in the subject and says something about its properties in the predicate.

In this book I have been insisting that the meanings distinguished by grammar single out major kinds of human thoughts and thus have real consequences in our lives, consequences that people care about, fight over, and pay for. Names for things are a prime example. We have already seen that the semantics of proper nouns animates the literary question of what we would mean by *William Shakespeare* if someone else turned out to have written his plays, and the practical question of how you would get your

identity back if someone stole all your identifying information. Here are three other slices of life in which nouns matter.

The distinction between predicating and referring can be given a price. The most successful new corporation in this century so far is Google, which made its fortune by actually *selling noun phrases*. The problem with earlier Internet portals was that no one knew how to make money from them: users hated the banner ads and seldom clicked through to the advertisers. There is a saying in advertising that half of every ad budget is wasted, but no one knows which half—most people who see an ad have no interest in the product or service. The Google guys, Larry Page and Sergey Brin, had the brainstorm that the words people type into a search engine are an excellent clue to the kinds of things they might buy, making a search engine a good matchmaker for buyers and sellers. So together with the results of an untainted Web search, Google displays a few commercially sponsored sites relevant to the search term at the edges of the screen. Companies pay for this privilege by bidding in a continuous auction for the terms most likely to send eyeballs to their site. As a connoisseur of plurals, I was intrigued to learn that they cost more than singulars. *Digital camera* can be bought for seventy-five cents a click, whereas *digital cameras* fetches a dollar and eight cents. The advertisers know that the plural is more likely to be typed by people who are planning to *buy* a digital camera, though they don't know why.[25] The reason is that a bare noun like *digital camera* is generic, and is likely to be typed by someone who wants to know how they work. A plural like *digital cameras* is more likely to be referential, and typed by someone who wants to know about the kinds that are out there and how to get one.

A more aggressive use of corporate linguistics can be found in companies that are victims of their own success and need to reclaim the names of products that have come to be used generically as common nouns (the nouns are sometimes called "generonyms," and their transition from proper noun to common noun "genericide"). Few people realize that *zipper, aspirin, escalator, granola, yo-yo,* and *linoleum* used to be trademarked names for the products of particular companies. Today, the fear of genericide haunts the proprietors of *Kleenex, Baggies, Xerox, Walkman, Plexiglas,* and *Rollerblade,* who worry about competitors being able to steal the names (and the reputation they have earned) for their own products. Writers who use the names as verbs, as common nouns, or in lowercase type may find

themselves at the receiving end of a stern cease-and-desist letter. I suggest that they reply in the manner of Dave Barry:

> I want to apologize in a sincerely legal manner to Jockey International Inc., which manufactures Jockey brand wearing apparel. Recently, I received a certified letter from Charlotte Shapiro, a Jockey brand corporation attorney, noting that, in a column concerning the issue of whether or not you can eat your underwear, I had incorrectly used the official Jockey brand name in the following sentence: "Waiter, are these Jockeys fresh?"
>
> Ms. Shapiro points out that the word "Jockey" is an official trademark, not a generic word for underwear, and it must be used "as an adjective followed by the common name for the product." Thus, my sentence should, legally, have read: "Waiter, there's a fly in these Jockeys!" . . .
>
> I have nothing but the deepest respect for the Jockey corporation and its huge legal department. So just in case I may have misused or maligned any brand names in this column, let me conclude with this formal statement of apology to Nike, Craftsman, Kellogg's, Styrofoam, Baggies, Michael Jordan, and any other giant corporate entity I may have offended: I'm really sorry, OK? So don't get your Jockeys in a knot.[26]

It's not just the owners of trademarks that get their Jockeys in a knot when they hear a cherished referent identified with a common noun. People take even greater umbrage when they hear *themselves* labeled with a common noun. The reason is that a noun predicate appears to pigeonhole them with the stereotype of a category rather than referring to them as an individual who happens to possess a trait. Logicians would be hard-pressed to specify the difference, but psychologically it matters a great deal. You can innocuously describe someone's hair as *blond, brunette,* or *red* (adjectives), but it's a trickier business to refer to the whole person, particularly a woman, as *a blonde, a brunette,* or *a redhead* (nouns). The terms seem to reduce the woman to a sexually attractive physical feature, and to typecast her, according to old stereotypes, as flighty, sophisticated, or hot-tempered.[27] Since metonyms derogate and hypernyms elevate (see chapter 2), nowadays we refer to someone as *a woman with blond hair* rather than as *a blonde,* unless

the conversation was specifically about hair. An increased regard to the dignity of the individual has also led to the retirement of nouns for people with infirmities such as *cripple, hunchback, deaf-mute, mongoloid, leper,* and even *diabetic.* And today there is a movement in psychiatry to avoid calling someone *a schizophrenic* or *an alcoholic* and instead to refer to him or her as *a person with schizophrenia* or *a person with alcoholism.* A sensitivity to the typecasting power of nouns led the director and medical scholar Jonathan Miller to speak for many people of his ethnicity when he said, "I'm not a Jew. I'm Jew-*ish.* I don't go the whole hog."

It's still safe to refer to ordinary objects and substances with common nouns, and as we do so we display another kind of mental agility. At first glance, the conceptual distinction between an object and a substance seems to be captured in the linguistic distinction between a count noun and a mass noun.[28] Count nouns like *apple* and *pebble* tend to be used for bounded hunks of matter; mass nouns like *applesauce* and *gravel* tend to be used for substances without their own boundaries. The two kinds of noun are sharply distinguished by the grammar of English. We can enumerate and pluralize count nouns (*two pebbles*) but not mass nouns (**two gravels*). When we refer to quantities, we have to use different quantifying words: *a pebble* is fine, but **a gravel* is not; we talk about *many pebbles* but not **many gravel,* and we talk about *much gravel* but not **much pebble* or **much pebbles.* And mass nouns can appear in public naked—*Gravel is expensive; I like gravel*—whereas count nouns generally cannot—**Pebble is expensive; *I like pebble.*

An important clue to the mental model of matter behind mass nouns is that in some ways they act like plurals of count nouns. They share some of their quantifiers (*more applesauce, more pebbles*), their ability to appear naked in a sentence (*I like applesauce; I like pebbles*), and their ability to appear with spatial words like *all over,* as in *Applesauce was all over the floor* and *Pebbles were all over the floor* (compare **A rock was all over the floor*).[29] The overlap in grammar reflects a similarity in the way we conceive of substances (the things typically labeled with mass nouns) and multitudes (the things typically labeled with plurals), which together may be called aggregates.[30] Substances and multitudes both lack intrinsic boundaries, and can spill out into any shape. They can coalesce: put some pebbles together with

some pebbles and you still get pebbles; put some applesauce together with some applesauce and you stil get applesauce. And they can be divided: half a load of pebbles is still pebbles; half a bowl of applesauce is still applesauce. None of this is true of the typical referent of a count noun, like a horse. No one is in doubt as to the boundary where a horse leaves off and the air around it begins, and when you put two horses together, or cut a horse in half, the result is not a horse—a point that, when applied to babies, is essential to the story about the wisdom of Solomon.

Where a plural differs from a mass noun is that it is conceived as a set of *individuals,* which can be identified and counted. This gives us a taxonomy of everything there is in the physical world.[31] A singular count noun like *pebble* stands for something that is bounded (delineated by a fixed shape) and not made up of individuals. A plural like *pebbles* stands for something that is unbounded and made up of individuals. A mass noun like *applesauce* stands for something that is neither bounded nor made up of individuals. All this suggests that our basic ideas about matter are not the concepts "count" and "mass" but the mini-concepts "bounded" and "made up of individuals." If so, we should see a fourth possibility: things that are both bounded *and* composed of individuals. We do indeed. These are collective nouns such as *committee, bouquet, rock band,* and those twee words for groups of animals that schoolchildren are forced to memorize but that no one ever uses, like *a gaggle of geese* and *an exaltation of larks.*

It may seem as if count and mass nouns are simply labels for hunks and goo, but that underestimates both our language and our minds. Within a language, it's often unpredictable whether a kind of matter is referred to with a count or a mass noun. We have *noodles* (count) but *macaroni* (mass), *beans* (count) but *rice* (mass), and both *hairs* and *hair,* leading Richard Lederer to ask in *Crazy English* why a man with hair on his head has more hair than a man with hairs on his head.[32] The choices differ somewhat from language to language—*spaghetti* is mass in English and count in Italian—and across historical periods of the same language. English speakers used to eat a substance called *pease,* as in the nursery rhyme *Pease porridge hot, Pease porridge cold.* But some grammatically zealous listener in the mists of history misanalyzed it as the plural form *peas,* from which it was a short step to *pea,* the count noun we use today. (The mathematical linguist John Lambek once speculated that a grain of rice will someday be called a *rouse.*) People who have learned English as adults have terrible trouble with all this.

My grandfather used to say that he combed his hairs, which is what one does in Yiddish, French, and many other languages.

Presumably the reason that languages often make arbitrary choices about the counthood or masshood of a kind of matter is that the mind can construe an aggregate either as a multitude of individuals or as a continuous substance. After all, when you grind rock into smaller and smaller pieces, from boulders to rocks to pebbles to gravel to sand to dust, there is a gray area in which people can construe the aggregate either as a collection of small things or as a continuous medium, depending on how close they stand, how recently they renewed the prescription for their eyeglasses, and perhaps even their personality (as in the person who can't see the forest for the trees). In that gray area, a language (or, more precisely, past speakers of the language) decides on a word-by-word basis which construal it forces upon current speakers when they use a word.

It's not just nouns that care about boundedness and individuals; verbs do, too. As we saw in chapter 2, verbs like *pour* require aggregates, like water or pebbles; verbs like *smear* and *streak* apply to substances; and verbs like *scatter* and *collect* apply to multitudes. This is because the concept of an action depends on the number and kind of things it affects, as in the difference between *eat* and *drink, throw* and *scatter, murder* and *massacre.* (The biologist Jean Rostand once remarked, "Kill one man, and you are a murderer. Kill millions of men, and you are a conqueror. Kill them all, and you are a god.")[33] The choices can differ among languages and even dialects, such as American and British English. I am always momentarily startled when my British editor offers to *collect* me at the hotel, as if he thinks of me as a bunch of smithereens.

The mind's power to construe matter as countable units or amorphous stuff is not just exercised at the intermediate settings of a rock grinder. *Anything* can be construed in these two different ways. We can always look at a cup (count) but think about the plastic composing it (mass), or look at some ice cream (mass) and think of the shape it assumes, such as a scoop or a bar (count). With many kinds of matter, previous speakers of the language have been considerate enough to bequeath us a distinct word for each construal. We have *butter* (mass) and *pat* (count), *gold* (mass) and *ingot* (count), even *shit* (mass) and *turd* (count)—a case in which taboo words adhere to the grammar of the rest of the language. As we shall see in chapter 7, not all of our profanity is so fastidious.

With all these examples of a language forcing speakers to construe an item as an individual thing or as continuous stuff when they use a word in a sentence, one might wonder whether our ability to *think about* matter in those ways depends on having first mastered the count-mass distinction—a version of Linguistic Determinism advanced by the logician W. V. O. Quine. The psychologists Nancy Soja, Susan Carey, and Elizabeth Spelke devised an experiment to find out. They presented two-year-olds (an age at which children show no signs of distinguishing count and mass nouns in their speech) with either an unfamiliar object, such as a copper plumbing tee, or a curved glob of an unfamiliar substance, such as pink hair gel.[34] They taught each child a word for the item by saying, "This is my tulver"—a sentence frame that is noncommittal about whether the noun is count or mass. Then they showed the toddlers two items—one of the same shape but a different substance, the other of the same substance but a different shape—and asked them to "point to the tulver." The question was whether the children treated what we construe as the object differently from what we construe as the substance without the benefit of clues from the English language.

Here is what happened. When the children had originally been shown what we think of as an object, like the copper tee, they pointed to an object of the same shape but a different substance, such as a plastic plumbing tee, not to the same substance with a different shape, namely a pile of copper bits. But when they had originally been shown what we think of as a substance, like the hair gel, they pointed to the same substance regardless of its shape, such as three smears of hair gel, and not to the same shape of a different substance, such an identically curved glob of hand cream. So well before children know how the English language distinguishes individual objects from portions of a substance, they distinguish them on their own, and generalize words for them accordingly. Names for solids with a noteworthy shape are taken to apply to objects of that kind; names for nonsolids with an arbitrary shape are taken to apply to substances of that kind.

Not only is a language unnecessary for inculcating in children the distinction between objects and substances, but it doesn't have a stranglehold on how its speakers construe matter when they are adults. Speakers can defy a language's stipulations by mentally packaging the referents of mass nouns (*I'll have two beers*) or by grinding the referents of count nouns (*There was cat all over the driveway*).[35] People also package mass nouns

into kinds, as when they refer to different *woods* (like oak, pine, and mahogany) or *creams* (like Pond's, Nivea, and Vaseline—whoops, Pond's™ Cold Cream, Nivea™ Creme, and Vaseline™ Intensive Care™ Lotion). As we saw in chapter 3, this packaging and grinding is not without consequences: *We labeled the bloods,* for example, while common among medical workers, sounds odd to everyone else, and using *cat* as a mass noun for cat flesh is insensitive to the dignity of animals. But the fact that it can be done at all shows that the language doesn't dictate the construals available to the minds of speakers.

The intuitive materials-science behind the count-mass distinction assumes a Play-Doh world in which objects are molded out of a substance: rocks are made of rock, glasses are made of glass, beers are made of beer, cats are made of cat. The model breaks down when an object can't be construed as having been formed from a scoop of material. A television isn't made out of something called *television,* so we can't say that a steamroller left television all over the road. The distinction also breaks down when we put a substance under a powerful enough microscope. We use the word *rice* to refer to a cup of it, a grain of it, or even a fragment of a grain of it, but as we zoom closer and closer we reach a point at which we aren't seeing *rice* anymore (presumably there are no rice molecules, or rice atoms, or rice quarks). Perhaps if humans could see the crystals, fibers, cells, and atoms making up matter, we would never have developed a count-mass distinction in the first place. Practitioners of homeopathy, in which a substance is diluted so many times that (according to chemists) not a molecule remains, can be accused of taking the mental model of matter behind mass nouns far too seriously.

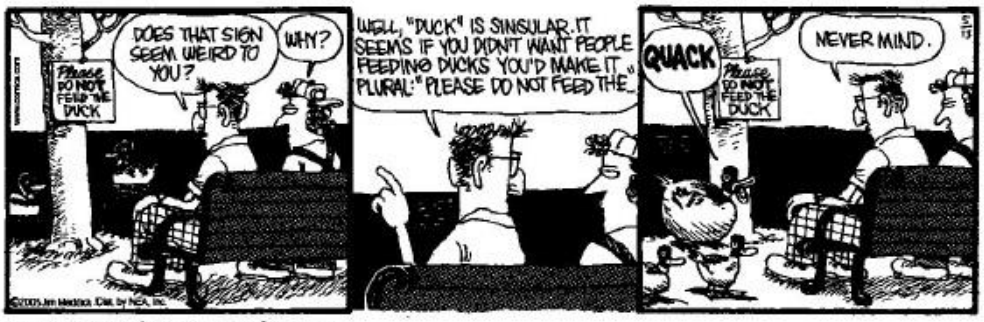
The count-mass distinction in our minds is not just unfettered by the object-substance distinction in the world; it is unfettered by the physical world altogether. It is best thought of as a cognitive lens or attitude by which the mind can construe almost anything as a bounded, countable item or as a boundariless, continuous medium. We see this in a distinctive kind of mass noun that does what count nouns usually do, namely, refer to bounded lumps of matter like chairs and apples. These are mass hypernyms (superordinates) such as *furniture, fruit, clothing, mail, toast,* and *cutlery.* Though they don't refer to a substance—chairs and tables aren't made of out of some ingredient called "furniture," nor are postcards and letters stamped out of a substance called "mail"—the words can't refer directly to the

individual objects they stand for, either. They require a special classifier noun, as in a *stick* of furniture, an *article* of clothing, or the general-purpose classifier *piece:*

As Dennis will discover, a *piece of toast* (or mail or clothing or fruit or furniture) is not a piece at all. But we need to use *piece* as a classifier to bite off a chunk of fruithood or furniturehood or toasthood for us to identify and count (just as we use classifiers to bite off chunks of substances, as in *a sheet of paper, a blade of grass,* or *a stick of wood*). In English, mass nouns for objects tend to apply to classes of things that are heterogeneous in size and shape but are often acted upon collectively, like furniture in a van, fruit in a basket, clothes in a suitcase, or mail in a sack. But in some languages, like Chinese, *all* nouns behave like mass nouns, standing for the concept itself rather than for separate incarnations of it, and speakers may not count or pluralize them without the use of a classifier, as in "two tools of hammer" or "three rods of pen."

If count nouns and mass nouns can be applied to just about anything, why do languages bother with them? One reason is that they allow us to agree on how to isolate, count, and measure things. Imagine that someone asked you to "count everything in this room." What exactly would you count? The chairs? The chair legs? The colors? The walls? Should you add "1" for the room itself? The task is meaningless until some kind of unit is specified, and that's what count nouns do (it's no coincidence that they are

called "count" nouns). Nor can you compare amounts without committing yourself to a count or a mass term. If Sally has one big stone and Jenny three much smaller stones, who has more? Again, the question by itself is unanswerable; it depends on whether you mean "more stone" or "more stones." Even four-year-olds know that these questions call for different answers (according to an experiment by the psychologists David Barner and Jesse Snedeker),[36] and an understanding of the difference in how to quantify matter is essential to our getting the joke in this cartoon:



Monty © United Feature Syndicate, Inc.

For the same reason, the simple judgment of whether two things are "the same" depends on our agreeing on the same *what*—a cup and a pile of cup shards can be the same *ceramic,* though they are not the same *cup*. The count-mass distinction, then, helps us agree on which individuals we treat as mental entities to be tallied and tracked, and which we treat as mere incarnations of a category.

If the count and mass nouns are cognitive attitudes rather than reflexes to kinds of matter, we should see them applied to entities that are not made of matter at all. Indeed we do. The count-mass distinction pops up in many ghostly realms of thought populated by things that don't have mass or take up space. We distinguish discrete *opinions* (count) from continuous *advice* (mass), *stories* from *fiction, facts* from *knowledge, holes* from *space, songs* from *music, naps* from *sleep, falsehoods* from *bullshit*.

Is the ability to construe abstract entities the way we construe things and stuff a late achievement of the mature mind, the result of extensive exposure to abstract count and mass nouns? The psychologist Paul Bloom has shown that the answer seems to be no: it comes naturally to children as young as three.[37] When kids hear a rapid string of chimes and are told, "These are feps—there are really a lot of feps here" (count noun), and are then asked to "make a fep" with a stick and a bell, they are likely to ring it once. When they

are told, "This is fep—there is really a lot of fep here" (mass noun), and are then asked to "make fep," they are more likely to ring it multiple times. This corresponds exactly to what they did when the words referred to a physical aggregate, like lentils—they respond to *give a fep* with one lentil, and *give fep* with a handful. So children distinguish count nouns from mass nouns in the same way whether they refer to evanescent events or to physical objects (a feat of mental agility that, we shall see, underlies the semantics of time). Other experiments have shown that children can count other entities that aren't discrete objects, including collections, lobes, actions, holes, and puddles.[38]

So while our ability to think about things and stuff is surely rooted in our perception of lumps and gunk in the physical world, we easily extend it to the world of ideas. As a result we can publicly identify, track, and tally the contents of our consciousness, no matter how airy. Indeed, the ability to quantify the incorporeal is a signature of mental life. How do I love thee? Let me count the *ways*. Ten Jews, eleven *opinions*. There must be fifty *ways* to leave your lover. How many *times* must a man look up, before he can see the sky? Four be the *things* I'd been better without: love, curiosity, freckles, and doubt.[39] And of course, how many *events* took place in New York on the morning of September 11, 2001?

[End of Chapter Section]