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TO ERR IS HUMAN; TO STUDY ERROR-MAKING IS COGNITIVE SCIENCE

Introduction: Error-collecting as a hobby and as a serious activity
For years, each of the authors has carried around a little notebook for the purpose of collecting and compiling all sorts of speech errors, action slips, and strange grammatical constructions; our collective files now contain many thousands of examples. The initial attraction of collecting such examples was, of course, that many errors are amusing and delightful examples of the vagaries of language and behavior. However, what began as a hobby for us became a more serious endeavor as we realized, as so many people have, that the study of speech errors and action slips can reveal a great deal about the hidden organization of the minds that produce them. In fact, the study of errors is a royal road to understanding how concepts are unconsciously organized and activated.

Psychologists have known for a long time that slips of the tongue can provide enlightening glimpses into the mechanisms of cognition. By studying such errors, one can learn much about the mind without doing any formal psychological experiments. And one advantage of using mistakes as one's window onto the mechanisms of mind is that there is an inexhaustible supply of fresh new data being produced all the time, all around us. In fact, speech errors of all kinds swarm in our linguistic environment like hordes of variegated insects waiting to be caught, labeled, and categorized. It is thus a pity that there are so few dedicated "entomologists" around to undertake a detailed classification and study of these fascinating bugs.

At times in the past, each of the authors has made informal efforts at encouraging friends to start noticing and writing down slips of the tongue and brain. The present compendium, however, is a more

concerted attempt to introduce readers to the various kinds of errors we collect and the categories we have adopted. We hope thereby to gain help in elucidating and validating our developing theories about the nature of concepts, and, of course, to accelerate the acquisition of interesting examples.

It should be noted that all of the examples presented below were collected from everyday life; none were invented. Most of those we selected for inclusion are humorous, but by no means are we interested only in errors that seem funny or strange. Many speech errors (and action slips) are quite subtle, and it requires a high degree of sensitivity to language (or behavior) to notice them at all.

On first thought, it might seem surprising that it takes practice to become a good collector of errors, but when one begins to try to identify and classify specific kinds of mistakes, one sees how hard it is to pinpoint or remember them amidst the constant swirl of language. Indeed, most speech errors go completely unnoticed by both speaker and hearer unless someone points them out. A typical listener hears just the *content* of the utterance without noticing that something has gone awry with its *form*. The reason for this is that most errors are not simply random intrusions of "noise" into an otherwise clear and unambiguous flow of communication; they are almost always intimately connected with the speaker's intended message, and reveal something of it. Rather than blatantly standing out from the rest of the utterance, a typical error blends in smoothly with it.

Not only can mistakes be communicative, but moreover, as we hope some of the examples below will show, it is surprisingly often a matter of perspective as to whether something should be categorized as an error or as a creative act. Both types of event result from just one process: the activation and interaction of images and concepts in the mind.

A general problem in the study of errors is the development of a clear and reasonably complete set of error types. Starting with a few well-known standard categories, we have made some headway, but our classification scheme is still somewhat *ad hoc* and unrefined. The set of categories we present in this essay is certainly not exhaustive, nor are there clear and well-defined boundaries between them. In fact, the very difficulty of adequately classifying these examples is itself a manifestation of the issues our research deals with — the inherent blurriness and overlap of concepts in the mind.

We are particularly interested in collecting examples in languages

other than English, since it is fascinating to see how the networks of associations and links between concepts in other languages can give rise to new types of errors that nonetheless reflect the same underlying error-making mechanisms as those that give rise to errors in English. Interestingly, upon presenting some of our favorite errors to speakers of other languages and asking if they have encountered similar phenomena, we have occasionally gotten responses such as, "Oh, we don't make those kinds of errors in our language." Such claims are certainly naive, and we hope that with exposure to examples in their own languages, speakers of other languages can begin to notice and collect for us interesting mistakes in their mother tongues. Unfortunately, our collection of non-English speech errors is at present quite minuscule.

We now present our error categories. Each category is first defined and then several examples of it are given. We begin with two famous types of speech error, even though they are not the most typical, and are by no means the most interesting to us.

Malapropisms

A malapropism is an inadvertent substitution of one word for another, usually engendered by a strong phonetic similarity. The term comes from "Mrs. Malaprop", the name of a character in Richard Sheridan's eighteenth-century play *The Rivals*; her main claim to fame is her propensity to produce this kind of speech error. The name "Malaprop" itself comes from the French term *mal à propos*, which simply means "inappropriate". Here are some examples:

"My father came from Scotland into the U.S. vis-à-vis Canada."
   ("via" was intended)

"I like a magazine with good, objectionable reporting."
   ("objective" was intended)

"That is up to the discrepancy of the individual."
   ("discretion" was intended)

"My wife and I took our kids to visit a wildlife refugee."
   ("refuge" was intended)

"This park covers the entire gambit of ages, from young to old."
   ("gamut" was intended)

There is general agreement among cognitive scientists that the mind is full of conceptual associations. If concepts are visualized as regions in the mind (or, perhaps more accurately, in "semantic space"), then a conceptual association would be an overlap of two such regions. Malapropisms show that one type of overlap can be *phonetic*. However, as the examples above show, in malapropisms, the erroneously retrieved word does not necessarily have a close *semantic* relationship to the desired word. By contrast, in many of the types of errors considered below, semantic overlap is of the essence.

The production of speech has often been explained in terms of a "speech chain" akin to a military chain of command. At the top are "high-level" processes — basically semantic and grammatical — which precede and set in motion various "lower-level" processes, which are basically concerned with phonetic articulation and intonation. Just as in a military organization, however, there are a number of distinct low-level ranks. The lowest level of all consists of the actual motor activity, and just above it is the level that contains the "raw commands" to the speech organs. To be sure, errors can be committed at any level, and the following section is concerned with phonetic errors that take place at a slightly lower level than do malapropisms.

Spoonerisms

The term "spoonerism", designating a swap of the initial sounds (usually consonants or consonant clusters) of two proximate words, comes from the name of the Reverend William A. Spooner of New College, Oxford, who had the reputation, deserved or not, for making many such errors in sermons and public speeches.

"tea and flick spray" *(flea and tick spray)*

"foon and spork" *(spoon and fork)*

"She was wearing a wed rig." *(a red wig)*

"You didn't hear a thingle sing I said." *(single thing)*

"When your tumb gets nongue" *(tongue gets numb)*

"That's so odd hack!" *(said about a kludgy computer program, meaning "ad hoc")*

It is interesting that native speakers of English, when they spooner-ize, almost always stay within the bounds of English phonetics. Thus, for instance, "spoon and fork" would never be spoonerized as "fpoon and sork". This indicates that an autonomous process in charge of phonetics alone is at work in the mind during speech production.

The phenomenon of spoonerisms, though limited in its strict form to phonetic transpositions, nonetheless illustrates one of the most uni-versal characteristics of error-making: the reversal of two units, whether they lie at a phonetic, semantic, grammatical, or even more abstract level. Even in American Sign Language, researchers have observed reversal errors analogous to spoonerisms. This is evidence that the phenomenon is not limited to brain-tongue coordination, but in fact crops up on many diverse levels of mental activity. We shall see this type of "generalized reversal" cropping up often in the rest of this essay.

Mixed metaphors and infelicitous metaphors

A mixed metaphor is an utterance containing two metaphors in quick succession (usually within a single sentence), which evoke imag-ery that in some way is incompatible, as in the following utterance:

"No matter which fork in the road we take, it's not going to be clear
      sailing."

An infelicitous metaphor is an utterance containing just a single meta-phor that evokes imagery that interacts with the context in an unin-tended manner.

British radio announcer: "Welcome to Israel, a mecca for tourists!"

For the announcer, the term "mecca" had no doubt lost its connection with the Islamic religion (i.e., it had become a dead metaphor), and thus the inappropriate mixture of imagery was not obvious. Since a given metaphor may be "deader" in one person's mind than in another's, the degree of infelicity of a metaphor may seem different to different people.

In most contexts, the specific imagery of a metaphor is so feebly activated that neither the speaker nor the listener "hears" the connota-tions of the imagery. However, in special cases, the normally nearly-dormant imagery can be strongly evoked—brought to the conscious level—by its resonance with certain concepts or images explicitly

mentioned in the surrounding context. Note that this implies that any time any metaphor is used, its metaphorical meaning is always at least to *some* degree activated in the unconscious minds of speaker and listener, for otherwise there would be no way for any cognitive (or subcognitive) mechanism to recognize potential clashes or resonances.

1. Mixed metaphors

"He's been floating on Cloud Nine, and then they pull the rug out from under him."

"The proposal is now cast in concrete — the only question is, will it fly?"

"I go down fighting, whereas you just pull in your horns and let yourself sink."

"They jumped on the bandwagon and swallowed it hook, line, and sinker."

"I have a lot of irons in the fire but I'm holding them close to my chest."

"I can't stand people who talk behind your back right under your nose."

An example in French:

"Le nouveau style s'est vite répandu aux quatre coins de l'Hexagone."
(*The literal meaning is: "The new style spread quickly to the four corners of the Hexagon." The French metaphor "aux quatre coins" — literally, "to the four corners" — means "everywhere", in the way the English phrase "to the four corners of the earth" means "everywhere in the world". Also, because France is shaped somewhat like a hexagon, it is often metaphorically called "l'Hexagone". Because they both involve geometric concepts, these two metaphors activate a listener's sensitivity to their literal meanings, at which point their conflicting imagery becomes obvious.*)

2. Infelicitous metaphors

"She can put makeup on till she's blue in the face — she's not going to hide those pockmarks."

"I always like to beef up these vegetarian dishes with a little broccoli."

Said while looking at a record album cover of a 1960s rock group:
"Look at them wearing those Nehru jackets like they're going out of style."

An example in Chinese:

"Jinjiu zhi shi, shang dei zhenzhuo."
> *(Literally, this means: "Prohibition is something we must sip and drink." In Chinese, "zhenzhuo" — "sip and drink" — is an idiom meaning "ponder carefully", and thus the intended meaning of the sentence is "Prohibition is something we must still ponder carefully." Usually, "zhenzhuo" is a dead metaphor — the listener does not visualize anyone drinking anything — but in this context, the image bubbles up (no pun intended) and resuscitates the metaphor, thus creating a conflict with the notion of prohibition.)*

The notion of spreading activation

There is general agreement in cognitive science that at any given moment in a particular person's mind, different concepts are *activated* to varying degrees. (At any given time, of course, most concepts are dormant, *i.e.*, have virtually no activation.) According to many current theories, this activation, somewhat like a liquid, "flows" from a highly activated concept to its associative neighbors. Certain kinds of errors provide strong evidence for such *spreading activation*.

Here is a typical example illustrating the idea. Try this simple experiment. Answer the following question as fast as you can:

<div align="center">What do cows drink?</div>

Almost everyone finds that the answer "milk" jumps to mind virtually instantaneously, even though it is clearly wrong. It is not hard to see why this occurs. For anyone in our culture, the concepts "cow" and "drink" are both near neighbors of the concept "milk", and since each of them has been activated by the question itself, some activation from each spreads to the concept "milk". As a consequence, "milk" is highly activated and the tongue, eager to answer rapidly, unquestioningly laps up what the mind proffers. Spreading activation thus provides a simple and elegant explanation of this error.

Spreading activation does much more than cause errors; in fact, it is "business as usual" in the mind. Consider the trivial question

What has four legs and barks?

"Dog" comes to everyone's mind almost immediately, and spreading activation would seem to be responsible. The concept of "four-leggedness" sends activation to a variety of concepts, including "dog", "cat", "horse", "table", "chair", and others. The additional stimulus of the concept "barking" sends strong activation to "dog", pushing it over the threshold of consciousness, and the word "dog" is uttered.

Consider now this variant of the question:

What has flippers and barks?

In this case, "flippers" activates "dolphin", "seal", "penguin", "pinball machine", "scuba diver", and other concepts (all to different degrees). Given this initial set of activations, the word "bark" now makes the concept "seal" pop into consciousness. It is worth pointing out that the concept "seal" does not even occur to most people in the first question, even though, according to any spreading-activation theory, it must have been activated at least lightly by that question. What mechanism other than the spreading of activation could account for this type of context-sensitive arousal of concepts? We give these very simple and unproblematic examples as a way of underscoring the fact that exactly the same mechanisms underlie errorful cognition as underlie error-free cognition.

Errors involving spreading activation

Many of the most interesting errors in our collection seem to be easily accounted for by simple or complex patterns of spreading activation. Here are some examples.

• One of us heard the name "Tom Hemingway" on the radio one morning, and suddenly noticed that an image of his acquaintance Tom Ernst had flashed into his mind, though he didn't know why. Upon reflection, he realized that the name "Tom Hemingway" must have activated "Ernest Hemingway" at the same time as it activated "Tom", and that a confluence of activation, spreading from both "Ernest" and "Tom", caused the memory of Tom Ernst to "wake up".

• A friend was up late one night doing his homework for a Yiddish class, and wanted to look up the word for "February" in his English-Yiddish dictionary. In his sleepy state, he found himself looking under 'B' instead of 'F'. Why? Well, it is clear that the word "February" is strongly linked to the notion of "second element in a series"; once that concept had been activated, he easily fell into searching under 'B', the second element in the alphabetic series.

• A common error in many people's speech is to say "read" for "write", or vice versa, as in "Not all the people who have read things I've read — I mean *written* — can put their finger on its meaning." Another example: "J'en ai lu — euh, c'est-à-dire, *écrit* — deux." (Literally, "I have read — ah, that is, *written* — two.") We have cited these two similar examples, one in English and one in French, to highlight the fact that, independent of the language being spoken, these two opposite concepts are quite likely to be interchanged in normal speech. Some readers may question whether "read" and "write" are truly opposites. What we mean by labeling them so is simply that, like "salt" and "pepper", "dog" and "cat", and many other pairs of concepts, they are conventionally placed in opposition to each other.

Mutual-substitution errors occur frequently — not just with "read" and "write", but in fact with any pair of opposites, such as "left" and "right", "wife" and "husband", "brother" and "sister", and so on. Spreading activation provides a simple explanation for this phenomenon. Opposite concepts are near neighbors in semantic space, which would imply that activation to one necessarily activates the other at least mildly. Other stray activation could easily "pump up" the activation of the unintended member of the pair to above the threshold for being uttered.

• Ernest wished to tell Mike that the only way he could distinguish him from their friend Bill was by the size of their beards. However, here is how it came out: "You don't have as big a bill — er, ha ha! — as big a *bird* — I mean *beard* — as Bill does." This droll utterance reveals a chain of spreading activation, some of whose links involve semantic proximity, others of which involve phonetic similarity. Ernest, realizing that his anticipatory substitution of the name "Bill" for "beard" conjured up the amusing image of Mike with a bird's beak, attempted to correct the error, but since the concept "bird" had now become so highly activated, it was easily conflated with the word "beard", thanks to their strong phonetic resemblance.

• A friend remarked, "My roommate really loves teaching her parakeet to talk. It's like in that movie version of *Pygmalion* — what was it called? 'Dr. Doolittle' or whatever." What she meant, of course, was *My Fair Lady*, not *Doctor Doolittle*. But this deceptively simple-seeming memory-retrieval error offers us a fascinating window onto the mental processes behind the utterance.

Behind this error lurks a surprising wealth of conceptual associations and overlaps, of which the following, we believe, are the main ones. *Pygmalion* brought up in the speaker's mind the character of Professor Higgins, but since she was referring to the movie, a strong image of Rex Harrison (who played Professor Higgins) no doubt came to her mind. However, Harrison also played Doctor Doolittle in the movie *Doctor Doolittle*, and the fact that Higgins' pupil was named "Eliza Doolittle" helped to reinforce that association. In addition, the plots of both movies have a striking conceptual similarity: each features a wizened authority figure (Doolittle the doctor, Higgins the professor) who has a special relationship through language to an inferior: Doctor Doolittle talks to his animal patients, while Professor Higgins teaches a Cockney flower-girl upper-class English. Finally, the main topic of the remark — teaching a parakeet to talk — is related not only to the plot of *Doctor Doolittle*, but also to the theme song "If I Could Talk to the Animals" from that movie.

All these associations, swimming together in the speaker's mind, were activated in a flash, and together they sent sufficient activation to the name "Doctor Doolittle" for it to be retrieved and uttered, without any conscious awareness on her part of what was going on. This example shows how an amazing confluence of factors, from superficial phonetic resemblance to deep conceptual similarity, can all enter into the retrieval of concepts. We have attempted to capture the main ones in the diagram opposite.

Unfortunately, such a diagram has the misleading feature of suggesting that there is a clean-cut dichotomy between concepts *directly connected* in someone's mind (*e.g.*, Rex Harrison and Professor Higgins), and concepts only *indirectly connected* (*e.g.*, Rex Harrison and *My Fair Lady*, through the intermediary concept of Professor Higgins). We do not claim to know what "direct" versus "indirect" conceptual connections in a mind are, although we believe there is probably a meaningful dichotomy somewhat along these lines. There is no easy way to correct this impression in the diagram, however, because whatever set of arrows we might choose, someone could object to it,
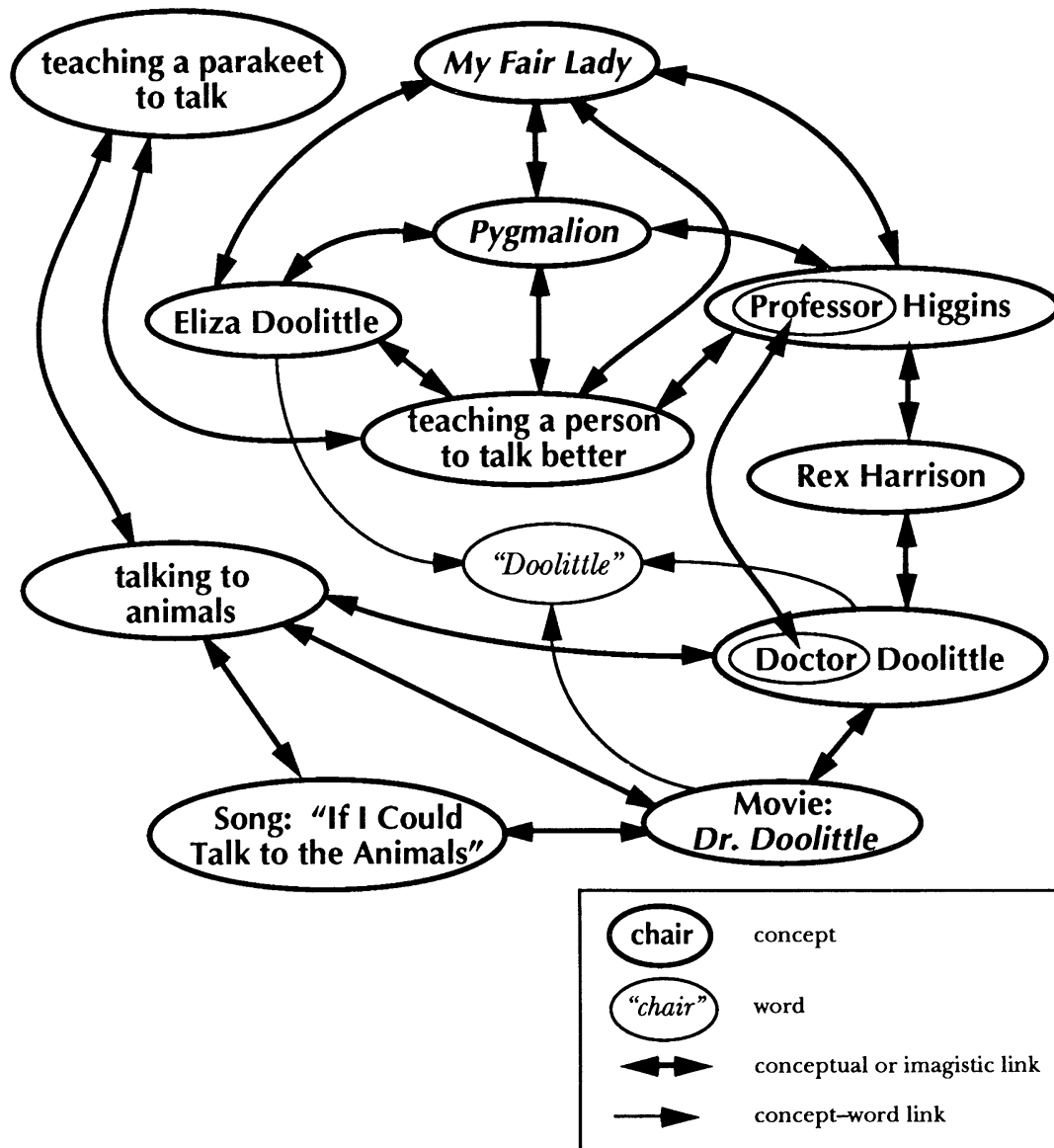
Diagram of the possible origins of the sentences, "My roommate really loves
teaching her parakeet to talk. It's like in that movie version of
Pygmalion — what was it called? 'Dr. Doolittle' or whatever."

saying, "How do you know *this* connection exists and *that* connection
doesn't?" Our reply is simply that we have used arrows to indicate
what we guess are the strongest conceptual associations (or the great-
est conceptual overlaps), without claiming that these are the only
ones, or that our choice coincides exactly with the set of direct concep-
tual connections.

Incidentally, one almost hesitates to call this example a mistake.
The same kinds of mechanisms as are used in creative analogies,

intentional puns, and insightful comparisons are all brought to bear in this "error". Indeed, we believe there is a continuum from mistakes and slips to novel ideas and insights. What in one context is an interesting slip of the tongue ("Reagan's policy toward Vietnam — I mean *Nicaragua. . .*") is in another context merely a straightforward analogy ("Nicaragua is another Vietnam"). They both involve the perception of some high-level similarity between two situations that are, at the level of specific details, completely different.

Malaphors

An extremely common form of speech error in which spreading activation plays the key role is that of "malaphors". English speakers, like the speakers of any language, have at their disposal an enormous repertoire of stock phrases, linguistic chunks, metaphors, idioms, clichés, proverbs, and colorful images from which to draw. These phrases float around in "semantic space", some clustered together in close proximity, others drifting isolated in the furthest reaches of linguistic limbo. Some share similar syntactic structure, others exploit a common pool of cultural myths and archetypes. Some have as key components words that, via homonymy, synonymy, antonymy, or any number of other types of associations, can link them to a host of other such phrases. Given the complexity of human experience and the time pressures of everyday speech, it is not surprising that often two or more of these phrases can bubble up in the mind and interact with each other in unexpected ways, as in the following example:

"That was a breath of relief"

in which "a breath of fresh air" and "a sigh of relief" were inadvertently spliced together by the speaker.

One can liken the production of a malaphor to someone who reaches into a cookie jar, grabs two cookies at once, and then, trying to pull both out at once through the narrow neck, breaks each of them in two. What emerges is a hybrid of two cookies. As far as real malaphors are concerned, often the two halves dovetail so seamlessly that we are unaware of having grabbed two different linguistic "cookies" or of having spliced them together.

We have borrowed the term "malaphor" — a blend of "malapropism" and "metaphor" — from the writer Lawrence Harrison, who coined it in a humorous article that he wrote for the *Washington Post* in 1976. Harrison, however, was not the first to notice the phenome-

non; for years prior to this, the linguist Gerald Cohen of the University of Missouri at Rolla had been collecting what he called "syntactic blends", and in 1975 he published the first of a series of long articles on them. For us, the term "malaphor" designates a seamless blending of two (or more) stock phrases (or even just words) into a single new phrase (or word). Malaphors are to be contrasted with mixed metaphors, in which each phrase remains intact and it is only their juxtaposition that is strange.

We have divided this section into two parts: one for malaphors involving stock phrases, and one for malaphors involving single words. After each entry we have indicated what we believe were the phrases contributing to the utterance at an unconscious level in the speaker's mind. However, it is impossible for anyone—even the speaker—to be entirely sure of the contributing factors in a malaphor, just as it is impossible for anyone to taste a richly spiced soup and to definitively enumerate all its ingredients.

We should point out that the origin of a malaphor is no greater a mystery than is the origin of any well-chosen word or phrase. How someone comes up with *le mot juste* in a given context is, if anything, a more opaque mystery, since the utterance is handed to listeners on a silver platter, as it were, pristine and flawless. By contrast, a malaphor, divulging, as it does, bits and pieces of the phrases that went into it, has the advantage of revealing some of its birth pangs. When a suitable word or phrase is effortlessly retrieved from memory, it is like a well-executed magic trick: it gives up no information about how it was carried out, and thus remains magical and impenetrable. In a malaphor, on the other hand, you see not only the miraculous appearance of a rabbit, but also perhaps a tip of the rabbit's ear protruding from underneath the table, a bit of glue, or a hint of a trap door in the tabletop.

1. Blends at the phrase level

"You hit the nail right on the nose."
  (A combination of "You hit the nail right on the head" and "That's right on the nose".)

"She really stuck her neck out on a limb."
  ("Stuck her neck out" and "went out on a limb".)

"We'll burn those bridges when we come to them."

("*We'll cross that bridge when we come to it*" and "*Burning our bridges behind us*".)

"We've got our hands cut out for us."
("*We've got our work cut out for us*" and "*We've got our hands full*".)

"We will pull no stops unturned."
(*Pull out all the stops; leave no stone unturned*)

"Party for two?"
(*A malaphor said occasionally by seating hosts in restaurants. A combination of "Party of two?" and "Table for two?"*)

"And then I saw his name in the paper, and two and two just clicked!"
(*I put two and two together; something just clicked*)

"The French turn down their noses at rosé wine."
(*turn up their noses; look down their noses at; turn something down*)

"Sagan just scratched the tip of the iceberg."
(*scratched the surface; the tip of the iceberg*)

"That's been a pet dream of mine for years."
(*dream; pet peeve; wet dream*)

"What was that phone call — wrong distance?"
(*long distance; wrong number*)

"When the clerks at the City Lights Bookstore saw poor poets walking out with books hidden under their arm, they would turn the other eye."
(*A combination of several phrases, certainly including "turn the other cheek" and "turn a blind eye", and possibly including "look the other way", "turn away", and perhaps more.*)

Here are two malaphors in French:

"Ça coute les yeux des fesses."
(*Literally, "It costs the eyes of your rear". This is a blending of two idioms: "Ça coute les yeux de la tête" [literally, "It costs the eyes of your head"] and "Ça coute la peau des fesses" ["It costs the skin of*

your rear"]. Both idioms are roughly equivalent to the English idiom "It costs an arm and a leg".)

"Il a réinventé la lune."
(Literally, "He has reinvented the moon". A combination of "Il a réinventé la roue" ["He has reinvented the wheel"] and "Il a redécouvert la lune" ["He has rediscovered the moon"].)

Here is a German malaphor:

"Da platzt mir der Hut!"
(Literally, "My hat is bursting". This is a mixture of the phrases "Da platzt mir der Kragen", which literally means "My collar is bursting", and "Da geht mir der Hut hoch", which literally means "My hat is rising high". Both are ways of saying, "I'm getting extremely angry".)

2. Blends at the word level

"This computer is completely kapunct."
(kaput; defunct)

"They abscammed with the money."
(absconded; scrammed; Abscam)

"I didn't like the insinuendos he was making."
(innuendos; insinuations)

"Does he have any other little quirkadilloes?"
(peccadilloes; quirks)

"He really flooped it up, didn't he?"
(flubbed it up; goofed it up; oops (?))

"Is this Buckminster Palace?"
(Buckingham Palace; Westminster Abbey; Buckminster Fuller)

"He's an easy-go-lucky fellow."
(happy-go-lucky; easy-going)

"I don't understand why the phone always has to ring at some un-god-awful hour."
(god-awful; ungodly)

"It was pretty upsettling."

(unsettling; upsetting)

"It's trinkling!"
   (drizzling; sprinkling; trickling; tinkling; drinking (?))

"I can't make these split-minute decisions."
   (split-second; last-minute)

"She had a nice aurora of perfume around her."
   (aroma; aura)

"Every time I come to that conclusion I balk off of it."
   (back off from; balk at; off of)

"All of these belong somewhere in this nether-nether-land."
   (Never-never land; the Netherlands; the word "nether" meaning "lower or under", as in "netherworld")

Incidentally, a year or so after this particular malaphor had been uttered, caught, and jotted down by one of the authors, the other author heard someone in a documentary film say, "You people are out somewhere in nether-nether-land". The phenomenon of multiple independent "invention" of malaphors was not new to us (for example, the phrase "I can't think of it off the top of my cuff" has been collected several times), but we were particularly struck that this seemingly one-of-a-kind malaphor had been re-created in a totally different context.

Before we leave the category of malaphors, let us examine a specific phrase-level malaphor in some detail, bringing to bear the notion of spreading activation. The actual utterance was the following:

"They didn't have much time for cooking during the Great Walk."

The speaker intended to refer to the famous so-called "Long March" of Mao Zedong and his Red Army, but was unable to retrieve that exact label. Instead she concocted a new and plausible-sounding label for it. What conceptual pressures might have accounted for this creative error? Below, we attempt to delineate the pressures and processes in very rough chronological order (with time proceeding vertically downwards). To be sure, our account is speculative, but we believe it is nonetheless quite plausible. Accompanying our explanations is the diagram opposite, which attempts to capture the most important components of our account.
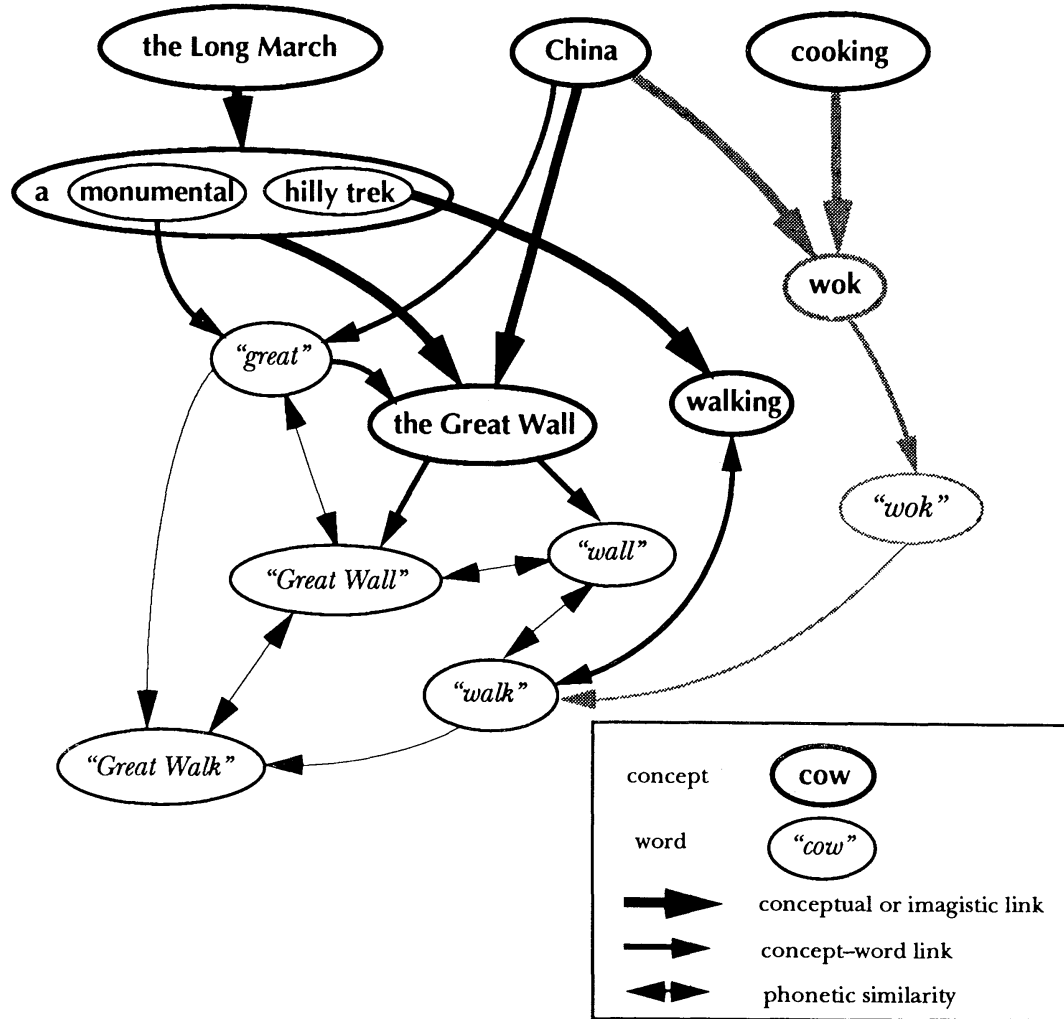
Diagram of the possible origins of the sentence, "They didn't have much time for cooking during the Great Walk."

At the outset, the speaker was entertaining a mental image of a monumental and arduous trek through China, knew it had a standard name, and wanted to retrieve it. She probably had a sense that the phrase she was groping for was an adjective-noun pair, in which the adjective had connotations of immensity. Given that "China" was strongly activated, the adjective "great" probably sprang quickly to mind, since it is commonly used in English translations from the Chinese (e.g., "Great Wall", "Great Leap Forward", "Great Proletarian Cultural Revolution", etc.). As for the noun, the image of trekking probably activated numerous words such as "trek", "walk", "trudge", "hike", "march", and so forth, all to different degrees. Given the fact that "great" was currently activated, the juxtaposition

of "great" and "walk" in "Great Walk" would have had a satisfying phonetic rightness about it, particularly thanks to the phrase's strong phonetic resonance with the extremely familiar adjective-noun phrase "Great Wall".

It is interesting to note that the route followed by Mao's army, which snaked for thousands of miles across China, is visually reminiscent of the Great Wall, which snakes in similar fashion over hill and dale for thousands of miles. This fact provides a second, and rather remarkable, plausible explanation for the retrieval of the phrase "Great Wall", an independent explanation that doesn't involve the component words "great" and "wall" at all. Given that "Great Wall" had been retrieved through this visual route, the same mechanisms as described above could have converted it into "Great Walk".

These two routes from the image of an arduous trek to the phrase "Great Walk" need not be considered rivals — both could have contributed in equal or differing amounts to the creation of "Great Walk". After all, the vast amount of neural circuitry in our brains certainly is capable of supporting much simultaneous activity.

As a final and somewhat speculative point, we might add that the concept of cooking, also activated from the start, could have contributed to the satisfying quality of the phrase "Great Walk" as follows. Just as simultaneous activations of "cow" and "drink" bring to mind "milk", so activations of "China" and "cooking" could tend to activate "wok", which, with its strong phonetic resemblance to "walk", would tend to add to the activation of the concept "walk", thus strengthening the feeling that the word "walk" is appropriate. The chronology here is not certain; in fact, the reverse might have taken place: simultaneous activations of "China", "cooking", and "walk" could have activated "wok", which would then tend to help lock in the phrase "Great Walk".

Mixed-modality errors

A mixed-modality error occurs when an action appropriate to one type of activity gets mechanically applied to another type of activity. Almost always, there is an understandable cause for the interchange — namely, the intended and performed actions are conceptually similar on an abstract level. Here are a few examples.

• A friend was reading a book while her boyfriend watched a television show. Since the remote-control channel-changer was next to her,

he asked if she would please change the channel. Rather than picking up the channel-changer and pressing the button, she found herself turning the page of her book instead.

• A post-office clerk, to the customer next in line: "Main Street Post Office!" (Having just answered a phone call, she was still in telephone-answering mode.)

• Art, seated in the back seat of a car, is carrying on a conversation with George, who is driving. George can't hear Art very well, so he instinctively reaches down to turn the volume up on the car radio. Note that George doesn't turn on his windshield wipers, say, or put on the turn signal. His reaction, though an error, is by no means random; in a not-too-different context, increasing the volume would be the best way of achieving his goal.

• Leah, who has a stiff neck, is walking down the sidewalk, and sees a blue Dodge pass by in the opposite direction. Could it have been her friend Erica? Rather than looking over her right shoulder, which would hurt, Leah tilts her head upward and a bit to the right, as if to look in her rear-view mirror. She has done what she would have done if she had been driving.

Capture errors

A capture error resembles a switching error in a railroad yard. It occurs when one action sequence smoothly switches over into another (usually more habitual) action sequence. What triggers the switching-over is the sharing of some particular action by the two sequences, and this allows the second to "capture" control from the first. An excellent example is provided by Donald Norman in his book *The Psychology of Everyday Things*: "I was using a copying machine, and I was counting the pages. I found myself counting '1, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, King. . .'. I had been playing cards recently."

The reminding process is so smooth in a capture error that there is often no obvious moment when the transition can be said to have occurred.

• Susan asks her husband Dan if she can use his bike. Dan keeps his keys (including the bike key) in his left pocket, but being distracted by some other matter, he reaches into his right pocket and pulls out his wallet instead of his keychain. Then, having been commandeered by

a familiar sequence of actions, he opens his wallet and asks Susan, "How much do you need?"

• One of the authors of this paper frequently adds a final 't' to words that end in "ough", as in "enought" or "throught", presumably having been "captured" by the high-frequency word "thought".

Here are two errors in writing that, though they resemble capture errors in some ways, are perhaps not quite members of this category. Nonetheless, they are of interest and fit in well here.

• A friend wanted to write the word "mu", the word for the Greek letter "μ", and found himself writing "mμ".

• The following sentence was typed by one of us: "Try to keep your opponen't attention focused on the wrong area." Here, as the writer approached the end of the word "opponent's", the awareness that an apostrophe was coming up grew steadily, but since many contractions in English end in "n't", the "nt" in "opponent" pulled him away from his intended course and caused the error.

Cannibalisms

A cannibalism is the "eating" of a word by an identical or similar word (or letter, etc.) just before or after it. Here are three spoken cannibalisms to illustrate the notion.

"Hey, look — an MIT shirt!"

"You have to either (a) have a job or (b) independently wealthy."

"This room is the best in the house, from the point of view."

In each of these examples, the phonetic identity of two distinct units caused the two to be collapsed into one. In the first case, the "tee" of "tee-shirt" was swallowed by the 'T' of "MIT". In the second, the verb "be" was swallowed by the letter 'b'. And in the final example, the speaker meant to say "from the point of view *of view*", but the short phrase "of view" got swallowed by a copy of itself.

Cannibalisms crop up surprisingly often in writing. One might think that turning high-level thoughts into writing would involve a rather straightforward descending hierarchy: a thought is translated into specific words, each of which is then translated into a sequence of abstract letter categories, which in turn are converted into sets of

instructions for specific letterforms, which finally are realized on paper by familiar muscle actions. However, cannibalisms reveal that an accurate account of the process of writing is much more involved. All these levels of representation seem to coexist simultaneously in the mind, and to be able — at least potentially — to interfere with each other, thus causing the suppression, for inappropriate reasons, of spoken or written units as small as an individual stroke inside a letter, and as large as an entire phrase inside a sentence.

For instance, one of us wanted to print the word "correct" in parentheses, and found he had printed "(orrect)" instead of "(correct)". The left parenthesis had "eaten" the letter "c", because of their similar shapes. Apparently, the just-drawn parenthesis was perceived as an abstract shape — a crescent — and this perception interfered with the arriving instructions to draw another crescent (the letter "c"), and in effect, it said to those instructions, "Stop! You've already been carried out! Turn around and go home!"

A similar cannibalism occurred when one of us printed "5 econds" instead of "5 seconds". Here, thanks to their visual similarity, the numeral "5" ate the letter "s", even though they fulfill totally different roles. We would guess that this error and the one before it would be exceedingly unlikely to occur in typing, since typing does not involve the lower-level motor activity of actually forming the letters' shapes.

We conclude this section with a series of cannibalisms all of which occurred in writing, and which illustrate the great variety of causes of cannibalisms.

"What is English about Englis humor?"

(A printing error in which the initial 'h' of "humor" cannibalized the final 'h' of "English". Since both units were members of the same alphabetic category (lowercase 'h'), this cannibalism is pretty straightforward.)

"Did you reach the Chines Embassy?"

(Here, an uppercase 'E' has eaten a lowercase 'e'. The unconscious sensation "I am about to write an 'E'" caused the cancellation of the instruction to write a lowercase 'e'. Here it was not the letters' physical shapes that were confused, but their more abstract alphabetic category membership.)

"Mail RS" was printed (instead of "Mail IRS").

(Here, the similar shapes of lowercase 'l' and uppercase 'I' were sufficient to cause confusion, and a subsequent cancellation of the instruction to print the 'I'. Thus, in constrast to the previous two examples, only pure shape — not alphabetic category membership — counts here.)

"His face was shave clean" was printed (instead of "shaved clean").
(Here, the motor-level awareness that 'cl' contains the same strokes as a 'd' percolates upwards to cancel the downcoming instructions to print a 'd'. What is particularly interesting is that the 'cl', though not yet printed, nonetheless was strong enough to cancel the 'd', much as in the "Chines Embassy" example, the anticipation of the 'E' was strong enough to cancel the 'e'.)

"2-D sign" was printed (instead of "2-D design").
(Interestingly, even though this error occurred in printing, its cause was neither alphabetic category membership (as in the "Chines Embassy" example) nor geometrical shape (as in the "Mail RS" and "shave clean" examples), but phonetic *resemblance of the two units.)*

"} pacing too wide" was printed (instead of "} spacing too wide").
(Here, the 's' in "spacing" was eaten by the lower half of the preceding bracket, which is geometrically similar to an 's'. As in the "shave clean" example, motor activity resulted in the cancellation of the production of the target letter. There, two letters added up to cancel one, whereas here, half a symbol sufficed to cancel a full letter.)

In sum, cannibalisms reveal to us that in the process of writing and speaking, many diverse levels of representation are being attended to simultaneously on an unconscious level; it is only when an error occurs that this fact becomes evident.

Greasy spoonerisms

The term "greasy spoonerism" is somewhat misleading because the speech errors it designates are really not spoonerisms at all. The name comes from an example that was for a long time our canonical one:

"They like to eat at greasier spoons than I do."

"Greasy spoon" means "a restaurant that serves cheap (and often

greasy) food" (*i.e.*, a place where the spoons are likely to be somewhat greasy). "Greasy spoon" is a chunked term — a single lexical unit despite its two constituent words — and from a semantic point of view, the word "greasy" inside it has lost its adjectival quality. It is thus inappropriate to intensify it as one would an ordinary adjective, and yet the speaker did so anyway. This is a specific example of a general phenomenon that is surprisingly common. When intensification of a phrase is called for, speakers have a natural tendency to take the lazy route, and to modify whatever word or subunit in the phrase seems intrinsically "the most easily modifiable". Sometimes this leads to humorous, awkward, or nonsensical phrases, and these are what we call "greasy spoonerisms".

"There are bound to be some really big wigs there."

"She has an eagler eye than I do."

"The point is to weed out even pie-er in the sky ideas."

"I thought I detected a little tongue-in-cheekiness in the article."

"This incredibly hard saleswoman at Macy's harangued me for two hours."

"What they were saying was such *small* talk."

"There's an even shorter cut through here."

"ICED TEASPOONS" *(sign in a cafeteria)*

"He's still a brand-newborn."

"Let him enjoy his little babyhood."

"I'm a fairly new comer to Ann Arbor."

"This is a very greasy spoonerism." *(a self-referential greasy spoonerism)*

Note that many greasy spoonerisms can also be categorized as cannibalisms. For instance, "a brand-newborn" can be regarded as one instance of "new" eating another (in this view, the correct utterance would have been "a brand-new newborn"), and "an even shorter cut" can be regarded as shorthand for "an even shorter shortcut". It is unclear how to categorize such errors definitively.

The line between greasy spoonerisms and perfectly acceptable utterances is very blurry. The following examples help to make this clear:

"I do mathematical physics — *very* mathematical physics."
(In the phrase "mathematical physics", the adjective gives every appearance of being a normal adjective, yet it is really more like the word "European" in "European history". It would sound ridiculous to say, "I do very European history" in trying to stress one's sole involvement with the history of Europe.)

"Star Warriors" (the title of a book about Strategic Defense Initiative researchers)
(The average person may not see anything peculiar in this title, no more than in a term such as "cognitive scientist" or "high-energy physicist", but the "greasiness" of these phrases becomes clear if one imagines referring to a researcher specializing in the history of science as a "history of scientist"! And if this seems too greasy to ever be uttered, think of the standard term "Christian Scientist", which is almost as "greasy".)

"Paul has a very sweet tooth."
(Once again, "sweet" seems like an ordinary adjective, but is part of a stock chunk. Two proper or "pure" ways of saying this would be "Paul has a genuine sweet tooth" or "Paul really has a sweet tooth".)

"We need to buy some very hot sauce."
(The "un-greasy" way of saying this would be "We need to buy some very hot hot sauce", since "hot sauce" is a stock phrase, and strictly speaking, the adjective inside it should not be modified. This is another example where the categories "greasy spoonerism" and "cannibalism" overlap.)

"It only happens once in a blue, blue moon."
(Although one can never be sure of the origin of any such phrase, it is possible to speculate that the speaker may have subliminally scouted out the more obvious greasy spoonerism "once in a very blue moon", and unconsciously have rejected it as too strange, thus making way for a rival construction that was nonetheless just as "greasy".)

A variant on the greasy-spoonerism theme occurs when one attempts to intensify a metaphor as a whole by modifying a selected part of it and in the process undermines the literal meaning of the metaphor.

"They feared they might have gone out on too big a limb."
(The intended meaning, of course, is "They feared they might have taken too great a risk", but the phrase "too big a limb" is not, strictly speaking, appropriate, since the larger the limb, the less likely it is to break if one goes out on it.)

"You should take his advice with a very big grain of salt."
(The phrase "with a grain of salt" is a direct translation of the Latin "cum grano salis", and indicates that one is gingerly taking a small bite of something rather than swallowing it whole, i.e., taking it with reservations. The phrase "with a very big grain of salt" thus undermines the intent of the speaker.)

"They waited until the eleventh hour of the eleventh minute of the eleventh day."
(Meaning "They waited till the very last instant". Emphasis of the number eleven, however, is totally inappropriate when one is dealing in time-units of minutes or days. Note also that "the eleventh hour of the eleventh minute" makes no sense, an hour being much longer than a minute, rather than the reverse.)

"That's the quickest wonton soup I've ever seen anyone eat."
(Though there is no stock phrase in this sentence, a similar modification is taking place. The easiest phrase to modify — "wonton soup" — is targeted for modification by a lazy sentence-generating mechanism. The path of least resistance is being followed.)

"No matter how good they are, players in the All-Star Game get up a little tight."
(The intention, "a little uptight", was subverted by the erroneous perception of "tight" as a separable component of "uptight", leading to the erroneous conclusion that "a little" could intervene between the two components "up" and "tight".)

Productivity and creativity
As our final category, we present a linguistic phenomenon that at first glance seems to have more to do with creativity than with error-

making, but which, we will see, is closely connected with errors — a fact that we feel has important and provocative implications.

Linguists use the term "productivity" to denote extensions or variations of existing terms or phrases. For instance, the word "hamburger" has been gradually extended to include such variants as "cheeseburger", "fishburger", "pineappleburger", "tofu-burger", and scads more.

Exploiting productivity is a favorite technique of Madison Avenue and the business world. For example, from "extravaganza" we get "ski-vaganza"; from "panorama" we get "car-orama", "funorama", and many others. "Automat" leads to "laundromat" and "photomat", while "cavalcade" leads to "motorcade" and "tractorcade". "Hotel" generalizes to "motel", which is further generalized to "boatel" and "Budgetel". The gawky name "La Nailtique" was fashioned after "boutique". And let's not forget "marathon", which has given rise to "telethon", "sellathon", "walkathon", "walk-a-dog-a-thon" (really!), "teeter-totter-thon", and on and on-a-thon.

Nor is this phenomenon restricted to advertising. The term "alcoholic" has spawned many imitators, such as "workaholic", "chocoholic", "milkaholic", "sexaholic", and more. After the Watergate scandal, it seemed natural to dub virtually every political scandal with a moniker ending in "gate", such as "Contragate", "Underwatergate", and others.

Such phrases, which sound like they come from the pages of *Time* magazine, were clearly dreamt up consciously by people searching for catchy labels. Despite the somewhat formulaic nature of some of these coinages, few people would dispute that there was some degree of creativity involved in their production. However, consider this casual remark made by a mother to her husband:

"I'm going into the back yard, so could you keep an ear on Danny?"

Is the spontaneously coined phrase "to keep an ear on" an example of linguistic productivity (a cute extension of "to keep an eye on"), or is it an error? Even though the phrase is a novel one, it bubbled up unconsciously in the speaker's mind, and entered unchecked into the stream of speech. At the time, it felt like the most natural way of saying what she meant.

Here are a few other cases of unpremeditated linguistic productivity that we feel are on the borderline between error and creative speech acts:

"My mother is a bit hard of seeing."

"Zen is a dogma, just like Marxism or capitalism or what-name-you."

"I guess there's a power outage or something that is unabling her to answer."

"I lost to that chess program because I blundered, not because it out-subtled me."

In each of these cases, there was no deliberate intention to come up with a novel usage; the speaker simply blurted the phrase out. At other times, though, speakers searching for *le mot juste* will more consciously concoct playful usages, such as this one:

"I can necker myself into it."

The speaker meant, approximately, "I can force-flip my mental state into seeing it that way". In a real sense, the speaker had no more control over this phrase than did the speakers of earlier examples. The only difference was that he caught it before he uttered it, and then consciously chose not to censor it — to let it emerge. Here are two other phrases that probably were slightly more intentional than those in the previous list:

"I won't comment — I won't take eitherbody's side."

"You take that situation and you duplicate it and triplicate it and domino-effect it all over the place, and you got a real mess."

Does a person who comes up with a phrase of this sort have to be consciously aware of its novelty for it to be counted as a creative speech act? In all the examples in this section, a phrase has been concocted that fills a gap in the set of words and stock phrases at the disposal of the speaker — what we might call a "lacuna in semantic space". As the "Doctor Doolittle" example so clearly showed, any situation activates a whole region of semantic space — a plethora of tightly associated concepts and words, many of which compete to be uttered. But it is often the case that there is no clear winner in the competition, and some conscious or unconscious splicing-together or "tweaking" of already-existing structures may then take place — thus we get malaphors and cases of productivity.

Why are some people highly fecund sources of speech errors, while others seem nearly barren? Stated this way, the question has an ironic

flavor, implying that careful speakers are dull and lackluster while sloppy speakers are imaginative and creative. But is this true? Are people who are more likely to make strange *wrong* connections more inclined to make interesting *creative* connections? Are some minds "tuned" in this direction more than others?

When a writer is paid $50 an hour to come up with cute examples of productivity in an advertising agency, we call it creative; when, say, an irritated shopper in a long check-out line comes out with such a phrase, we call it an error. But is the distinction so clear?

Conclusion

As we said at the outset, the repertoire of error types presented here does not claim to be anywhere close to complete. Lack of space unfortunately prevents us from showing many other fascinating varieties of errors, but even if we were to include all the types that we have collected and documented, that would but scratch the surface of the vast subject of error-making. We hope in a future paper to expound on some of the types of errors omitted from this essay.

We cannot stress too highly the fact that the mechanisms revealed by errors are operative at all times in the mind. Most often these cognitive mechanisms result in perfectly acceptable actions and utterances. There is nothing wrong with the mechanisms themselves. The usual comment someone makes after committing a glaring speech error — "Oh, I don't know what's wrong with me today" — represents a misunderstanding of mental function. The daily stream of words — from the most mundane sentences to eloquent novel turns of phrase to the wildest outbursts of visionary poetry — all are engendered by the same mechanisms. Appropriate words and eloquent phrases are produced by the exact same cognitive mechanisms that give rise to malapropisms and malaphors; similarly, the kinds of thought processes that lie behind perfectly sensible actions are also susceptible to mixed-modality and capture errors; likewise, speech errors are often caught and corrected midstream by the very same unconscious cognitive agents as are responsible for cannibalisms and spoonerisms; and so on and so forth.

A grammar establishes a sharp distinction between "grammatical" and "ungrammatical" utterances. Many current models of error-making, if not most, are something like "extended grammars" — that is, grammars featuring extra grammatical rules specifically devised to account for various types of observed errors. The problem with such

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models is that they do not in any sense do away with the sharp distinction between "grammatical" and "ungrammatical" utterances—they simply give new meaning to the term "grammatical", without in any way softening the boundary line. But when an error is encountered that deviates from the permissible pathways in such an extended grammar, more rules must be invented in order to account for it—thus one obtains a second-order grammar representing a type of "super-ungrammaticality". But what happens when still other "forbidden" utterances crop up? Does one continue to invent third-order grammars, fourth-order grammars, and so on, *ad infinitum*? A hierarchy of grammars simply will not bring us any closer to a powerful and genuine theory of error-making. The reason is aptly summed up in the memorable remark of American linguist Edward Sapir: "All grammars leak."

An appealing quality of models of mental function based on spreading activation is the way in which, by relying on mechanisms quite different from explicit grammars, they circumvent this deep problem. The idea that activation simply is higher in one place than another (thus causing X to be said rather than Y) allows errors of virtually any imaginable type to be explained, without requiring an explicit grammatical rule for each different type.

It seems fundamentally unsatisfying to attempt to capture what seems essentially *fluid* in a set of rigid grammatical rules. By contrast, spreading-activation models, which feature "leakage" among concepts as an intrinsic ingredient, seem much more likely to be able to account for the fluid nature of error-making and indeed, of human cognition in general.

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Greg Huber not only collected some of the most interesting errors presented above, but also came up with some of them. As Greg is one of the most

creative people we know, his slips have reinforced our belief that error-making and creativity are linked.

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