in Milwaukee and George Carman of the Salk Institute has used similar methods to map human visual areas. And DeYoe says "we get pretty much the same topography and mapping" as Sereno's group.

Despite the striking similarity between the human and monkey visual areas, the studies also revealed salient differences. The human areas are shifted in position along the brain's surface and are larger than their monkey-brain counterparts. Specifically, the centers of the human areas are expanded, with more neurons devoted to processing images at the center of a person's gaze. That suggests humans place a premium on getting detailed information from whatever they are looking at, a trait, Sereno notes, that "would be quite helpful for things like reading."

The methods pioneered by the Sereno and DeYoe groups may help answer a hot question: Do functions that are uniquely human, such as the recognition of written words, take place in areas unique to human brains or in areas present in monkey brains that have taken on new functions in humans? Sereno thinks his data suggest an answer for at least one case. His team's study places the human version of a visual area called V4, known in monkeys to discern form and color, very close to an area that PET studies have linked to word recognition. "That [word recognition] area could in part be V4," says Sereno. But Richard Frackowiak of Hammersmith Hospital in London, who has done PET studies of word recognition, draws the opposite conclusion from Sereno's data—namely, that the word recognition area is separate from V4 and uniquely human. That ambiguity, says Van Essen, may arise from "comparing analyses with different techniques and different individuals."

Washington University neuroscientist Steven Petersen, who does brain mapping with PET, says that the final resolution of ambiguous cases such as this may come from new experiments that first use fMRI to "map out the regions [in an individual subject], then bring the person back and have them do a bunch of word-recognition and color-discrimination tasks" to place those functions directly on that person's individual map. For this and other questions, adds Van Essen, "we now have the tools right at hand for a much more refined set of analyses." And with those tools, researchers will find that their window into the brain has achieved a new level of clarity.

–Marcia Barinaga

MEASUREMENT STANDARDS

Keeping the Kilo From Gaining Weight

The French are known for their finesse in many areas of life, and British physicists are finding that the reputation holds in the arcane realm of weights and measures as well. For years, a specialist named Georges Girard labored unrecognized at the heart of the international metric system at the Bureau International des Poids et Mesures (BIPM) near Paris, keeping the standard kilogram from picking up contaminants—and hence weight. His tools: nothing more than a chamois cloth, a bottle of cleaning fluid, and that old je ne sais quoi. Now Girard has retired, and Martin Seah and Peter Cumpson at the U.K.'s National Physical Laboratory in Teddington near London are hoping that a regimen of ozone and ultraviolet light can match his deftness in keeping the standard kilogram, well—standard.

The curators of the kilogram, a platinum-iridium cylinder kept at the BIPM, say they are eager to test the British scheme. For the moment, they are still trying to keep the kilogram clean by hand-polishing it. But as the keepers of the only standard of measurement still based on an object rather than on a fundamental physical quantity—time, for example, is set by a specific frequency of radiation—they are eager to find ways to maintain the standard that rely more on science and less on one man's skillful fingers.

Thought to have been made in the early 1880s by a Paris instrument-maker, the 4-centimeter-high, 4-centimeter-wide cylinder is the prototype for reference kilograms in national laboratories throughout the world. These standard kilograms—exact copies of the French original—ultimately tie all mass-measuring systems back to the BIPM standard. But over the last decade or so, improved balances have shown that the reference kilogram and its duplicates vary in weight. "We have been measuring the differences between these apparently similar artifacts, and we see they are drifting apart," says Terry Quinn, director of the BIPM. The weight of a freshly minted copy of the standard mass, says Cumpson, "increases by tens of micrograms in the first few weeks after manufacture."

The explanation for this unwanted weight gain, say Seah and Cumpson, is contaminants accumulating on the metal surface. Through spectroscopic analysis of the surface of replica kilograms, they have found that the platinum-iridium alloy picks up hydrocarbons from air pollution and other sources,

That special touch. Georges Girard uses a chamois cloth to polish contamination from the surface of a standard kilogram replica.

along with mercury vapor from laboratory instruments. Every so often, explains Cumpson, an instrument breaks, releasing "a very subtle presence of mercury—well below health and safety levels—but enough to adsorb onto the surface of the reference kilogram."

Girard was able to keep the hydrocarbon buildup in check by rubbing the surface with a chamois cloth dipped in a mixture of ultrapure ethanol and ether; a hand-directed steam jet then removed any residue. The cleaned mass "returned to [within] a few micrograms of where it was originally," says Cumpson. "He used just the right degree of abrasion to remove the carbonaceous contamination without removing metal."

Cumpson believes that Girard's technique probably didn't remove the mercury, which worked its way into the grain structure of the metal. Still, it was better than any other standards laboratory could manage, even though a videotape of Girard at work polishing the kilogram was circulated among them. Scientists from the U.S. National Institute of Standards and Technology and the Physikalisch-Technische Bundesanstalt, the German standards institute, even flew to Paris to watch him up close and personal, but to no avail. "It's almost impossible to get the right degree of pressure," says Cumpson.

Now, with Girard's retirement 2 years ago, the BIPM faces the same dilemma. But Cumpson and Seah think they've come up with an answer: Expose the kilogram to ozone and ultraviolet light to oxidize the hydrocarbon contaminants, freeing them to diffuse away into thin air. "The technique looks very promising," says Cumpson. "There's no contact with the mass at all, and the concentrations we use are low," so there's little risk of oxidizing and damaging the kilogram itself.

BIPM Director Quinn is intrigued. "We shall be working with them to assess what they've found," he says. He also hopes to try out the cleaning technique on some of the laboratory's own platinum-iridium test objects. But the laboratory isn't rushing into anything. "We may not know exactly how the old process works," he says, "but we don't want to change until we know how to do it better."

–Sally Croft

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