while preserving Wiles' original line of reasoning. Alternatively, someone may completely rework the argument, using some of Wiles' ideas in a different way.

"Or [Fermat's last theorem] could be proved from some completely different perspective," Ribet says.

At the same time, despite the gap and the complexity of the approach, Wiles' work has already inspired several mathematical efforts on related questions. "Any time there's a major achievement like this, it changes what people work on and how they think about things," Ribet says.

"Mathematically, he's made a major breakthrough in the subject," Sarnak adds.

But the final step toward Fermat's last theorem remains untrodden. Quoted in the June SCIENTIFIC AMERICAN, veteran mathematician André Weil of the Institute for Advanced Study said, "[T]o some extent, proving Fermat's theorem is like climbing Everest. If a man wants to climb Everest and falls short of it by 100 yards, he has not climbed Everest."

"People are now even more convinced than they were that Fermat's last theorem is true and ought to be proved," Ribet says. "Probably, someone is going to prove it. The question is how long that is going to take." *– I. Peterson*

A quicker, cooler bleach for whiter whites?

Those darn stains. One tries bleaching them out. And rubbing them out. But, as some soap companies warn, one still ends up with a ring around the collar.

In the United Kingdom, this subject has become a matter of frothy debate. Two large detergent companies, Unilever Corp. and Procter & Gamble, have come to blows over a new product that claims to bleach clothes more quickly and thoroughly – and at lower temperatures – than comparable agents, while causing less harm to the environment.

The detergent in question, marketed by Unilever as Persil Power in the United Kingdom and as Omo Power in Europe, contains new manganese-based catalysts.

But the rub lies in Procter & Gamble's contention that under certain conditions the new product can damage fabric. In fact, after Unilever took Procter & Gamble to court for making "untruthful and misleading statements," Procter & Gamble came back with research reports from six European institutes showing damaged fabric allegedly caused by laundering with Persil Power.

Accompanying "evidence" included photos of men's boxer shorts in tatters and a statement that certain dyes, combined with the catalysts, can accelerate fabric damage and cause "holes well within the expected lifetime of the garment."

Unilever subsequently produced its own studies showing "no physical damage" to items laundered 15 to 25 times with the new agent.

Coincidentally, a research report by Ronald Hage, a chemist at the Unilever Research Laboratorium in Vlaardingen, the Netherlands, and his colleagues appears in the June 23 NATURE. Hage reveals some details about the new manganese complexes. The compounds, his group contends, "act as highly effective catalysts for the bleaching of stains by hydrogen peroxide at low temperatures."

Launderers have long used hydrogen peroxide to bleach fabrics – though it works well only in hot water, above 140°F. The new catalysts – derived from either 1,4,7-trimethyl-1,4,7-triazacyclononane or triazacyclononane ligands – improve bleaching mainly by enhancing hydrogen peroxide's effectiveness in cooler water.

To demonstrate this, the Unilever chemists soaked tea-stained cloth for half an hour in various solutions, with and without the additives, at 104°F. With the additives, they report, stains came out faster and more completely than without them.

"The fundamental problem in bleaching textiles," says Alan E. Comyns, a chemist and consultant in Chester, England, "is how to oxidize the color without oxidizing, and thereby weakening, the cloth. Both the color and the cloth are organic materials, and a powerful oxidant will attack both."

Many of today's fabrics require cooler water for laundering, and many of today's consumers want to save energy in washing, says Comyns.

Since the 19th century, chemists have investigated the interactions between hydrogen peroxide, transition-metal ions, and organic materials. More recently, detergent companies have searched far and wide for "selective organic oxidants" that satisfy "a plethora of practical requirements – performance, toxicology, environmental acceptability, and cost," Comyns says. "Unilever now claims to have found such a system."

The truth, ultimately, will come out in the wash. *– R. Lipkin*

Genetic test for colon cancer under way

Just 6 months after two separate research teams announced the chromosomal home of MSH2, the first gene discovered for one common form of colon cancer (SN: 12/11/93, p.388), Richard Fishel has even better news: a bioassay that will tell high-risk individuals if they are likely to develop the inherited disease.

Fishel, a member of one of the MSH2 teams, is a molecular biochemist at the University of Vermont Medical School in Burlington. He announced the new test last week at the General Motors Cancer Research Foundation Scientific Conference held at the National Institutes of Health in Bethesda, Md. The new test, or bioassay, is intended for people at risk of hereditary nonpolyposis colorectal cancer (HNPCC), one of the most commonly inherited cancers in humans.

The same genetic defect can also contribute to cancers other than that of the colon: ovarian, uterine, endometrial, lung, stomach, and others.

"We now have the unparalleled opportunity to help 23,000 Americans yearly who develop cancer as a result of inheriting a defective MSH2 or MLH1 gene," Fishel says. Both these genes can contribute to HNPCC, he points out. His group now links a third, as-yet-unreported gene to colon cancer. All three were originally discovered in yeast cells and affect DNA production.

In healthy yeast cells, a repair protein called MSH2 fixes glitches in the genetic alphabet, Fishel says, a process akin to a computer's spell-checker. When the gene that controls MSH2 is defective, there's nothing to check DNA "spelling," thus creating faulty DNA full of "spelling errors." Fishel points out that his team is ahead of the cancer game because of 20 years of basic research done with yeast. "We already knew how these genes functioned."

Currently, there exists a blood test that determines only the presence of a genetic alteration. However, Fishel says, his bioassay can determine the presence of a *functional* alteration, which has shown – in "the handful of families" he's worked with so far – to predict cancer.

"We might encourage predisposed individuals to alter their lifestyle," Fishel says. "High-fiber, low-fat diet."

High-risk individuals who don't carry the functional mutations can breathe easier. "Those individuals don't have to be screened by colonoscopies every year, don't have to be encouraged to alter their lifestyle. They basically can lead normal lives, and that reduces health care costs," Fishel adds.

Though the bioassay results are preliminary, they are also promising. Says Richard Kolodner, a researcher at the Dana-Farber Cancer Institute in Boston who worked with Fishel on the MSH2 gene: "The data that have come along... are convincing enough that companies that do commercial testing are starting to work on developing tests.... And that's happened in a year."

"Combining genetic diagnostics with bioassays," says Fishel, "is the wave of the future." *– G. Marino*