College of Medicine in Cardiff, Keith Johnson of Charing Cross and Westminster Medical School in London and Pieter J. de Jong of the Lawrence Livermore (Calif.) National Laboratory – are now attempting to isolate and characterize the gene.

Myotonic dystrophy, the most common form of muscular dystrophy affecting adults, strikes roughly one in every 8,000 persons worldwide. Symptoms of the disorder – which usually emerges in adolescence or early adulthood – include muscle spasms and wasting, particularly in the head and neck. While mildly affected people may simply have difficulty unclenching a fist, those with more severe forms of myotonic dystrophy cannot walk and have difficulty swallowing. The disorder's other symptoms include cataracts, premature balding, shrunken ovaries or testicles, and mental retardation.

To uncover the genetic defect, the three research groups used enzymes to chop DNA taken from myotonic dystrophy patients into tiny pieces. After sorting the pieces by size on a gel, all three groups found that myotonic patients had longer DNA pieces than did healthy individuals. They also found that the affected children of people with the disorder had even longer pieces than their parents.

Myotonic dystrophy is only the third genetic disease that scientists have associated with longer-than-normal DNA segments. Last year, U.S. and Dutch researchers found that people with fragile X syndrome – the most common inherited cause of mental retardation – bear repetitive DNA segments in a gene they named *FMR*-1, for fragile X mental retardation-1 (SN: 6/8/91, p.359). Such enlarged genetic segments have also been discovered in spinal-bulbar muscular atrophy, a rare inherited muscle-wasting syndrome.

Myotonic dystrophy may be an example of "genetic imprinting," in which the same gene produces a different effect, depending on which parent provides the gene (SN: 5/20/89, p.312). Mothers with myotonic dystrophy tend to have babies severely affected by the disease from birth.

The new finding should "permit new approaches to understanding the molecular pathology [of myotonic dystrophy]," Johnson says. He adds that some medical laboratories can now use the same technique as his research team to tell whether the children of myotonic dystrophy patients will also suffer from the disease, and if so, how severely it may affect them.

The anticipated discovery of the gene disrupted in myotonic dystrophy may also lead to a treatment for the disorder, says Leon Charash, chairman of the medical advisory committee of the Muscular Dystrophy Association. He predicts that researchers will identify the gene underlying myotonic dystrophy "in the very, very near future . . . possibly within the next six months." – *C. Ezzell*

Light, chemicals modify silicon's glow

With the first reports of silicon luminescence not yet two years old, scientists have scrambled to modify and harness this property to make faster computers and new optoelectronic devices (SN: 12/14/91, p.399). Now chemists have discovered another way to exploit silicon's glow, while physicists and engineers report progress in controlling and understanding this property.

Light or electricity will make porous silicon emit light. But the addition of organic compounds to the surface of this silicon, made porous by the acid-etching, will temporarily change or stop that luminescence, says Michael J. Sailor, a chemist at the University of California, San Diego. Different solvents change the silicon's reddish luminescence in characteristic ways, he and his research team will report in the Feb. 26 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY.

"[Porous silicon] is a reversible chemical sensor," says Sailor, "and it's incredibly sensitive." For example, an etched wafer can distinguish benzene from toluene – similar molecules that differ by one carbon and two hydrogen atoms, adds Sailor.

In addition, Sailor and his San Diego colleague Vincent V. Doan have used light to create patterns of luminescence in a silicon wafer, they report in the Feb. 3 APPLIED PHYSICS LETTERS.

Scientists make silicon porous by placing it in acid and passing a low current across it. Doan and Sailor modified the process by projecting a high-contrast pattern – and, later, someone's picture – onto the silicon during etching.

Light creates a small current in silicon, and varying the current during etching alters the color of the luminescence. "We realized there was a way to direct the photochemistry," Sailor says. The light projected onto the silicon wafer adds to, or subtracts from, the current passing across the wafer in the acid bath, depending on the type of silicon used.

Where bright light hits phosphorus-doped silicon, red luminescence results; dim light leads to an orange glow; darkened parts do not glow at all. "You are not limited to black and white," Sailor says. "You have a range of colors that allow you to pack more information into this thing."

This approach is simpler than other lithographic techniques for patterning silicon chips, says Sailor. The 20-micron resolution Sailor and Doan achieved does not come close to the single-micron resolution possible in integrated circuits. But this technique could prove useful for connecting adjacent computer chips via optical fibers instead of copper, for faster computing, he notes.

Steven Shih and his colleagues at the University of Texas at Austin took a different approach to controlling luminescence in silicon samples. By exposing silicon wafers to oxygen and then heating them before etching, these electrical engineers changed the range of colors emitted, they report in the Feb. 3 APPLIED PHYSICS LETTERS. After etching, unoxidized silicon glows with a wide range of colors and looks red. Oxidation narrows that range, making the glow more orange, the Texas researchers note.

A face projected onto silicon during etching made a wafer glow in this image.

In addition, Michael A. Tischler, a physicist, and his colleagues at the IBM Thomas J. Watson Research Center in Yorktown Heights, N.Y., investigated why silicon's glow changes over time when the wafer is exposed to air. They put a wafer in a chamber and flowed nitrogen, hydrogen or oxygen over it. The first two gases had little effect, but oxygen in the presence of light caused the luminescence to fade by two orders of magnitude, they report in the Feb. 3 APPLIED PHYSICS LETTERS.

These results strengthen the idea that hydrogen – which links with silicon during etching – plays an important role in a wafer's optical properties, says Reuben T. Collins, a physicist who works with Tischler. Hydrogen's role is to tie up open-ended bonds – typically found in silicon – that could otherwise take up the extra energy that forms the basis for luminescence. That energy comes from the light or electrical current, which excites silicon's electrons. The electrons then give off light energy to calm down again.

Oxidation disrupts the connections between silicon atoms and leads to the recreation of open-ended bonds. These dangling bonds allow the electrons to return to their original state without emitting light, so the luminescence disappears, says Collins. – *E. Pennisi*