Vince Capozzi
Product Manager
Schott Corporation,
Yonkers/NY

Andy R. Winkler
Schott Corporation,
Yonkers/NY

Thomas Kloss
Sales
Special Float Glass
Schott Jenaer Glas, Jena

Reaching for the

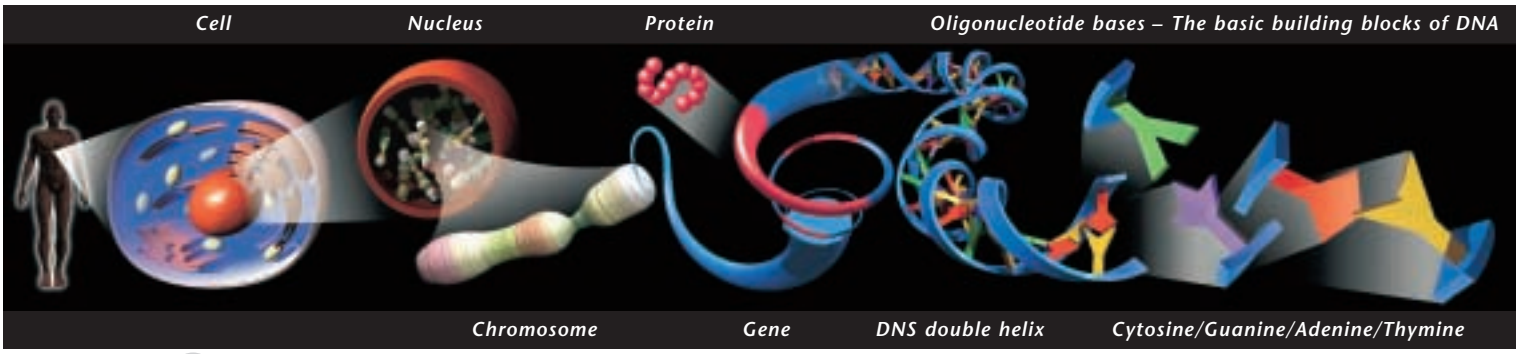
In Biotech labs Schott "Borofloat" is playing a role in the decoding of the human genome.

Researchers in modern gene laboratories have come a massive step closer to discovering the secret of human life. American expert Craig Venter announced on June 26, 2000 that the human genetic code had finally been mapped. The important thing now is to direct the flood of data available along the right tracks and to draw benefits from it for the good of humankind.

Why does a giraffe have a longer neck than a duck? How is it determined that a tortoise lives for over 100 years while some flies only live one day? What determines the color of our eyes? The answer lies in the genome or genetic code. All living things consist basically of four molecules: adenine, cytosine, guanine, and thymine. A genetic sequence is formed by 3.2 billion of these molecules. The only thing that makes us different from apes or even amoebas, is our genetic sequence.

A gene is an instruction, which tells the body what to do at a certain time. When should the zygote split? When should a baby get his first tooth? When should a person stop growing?

The code of life



GENES

The chemical and physical properties of "Borofloat" twin-set plates make them ideal receptacles for a 200 micrometer thick interlayer in gel electrophoresis.

DNA sequencing with electrophoresis

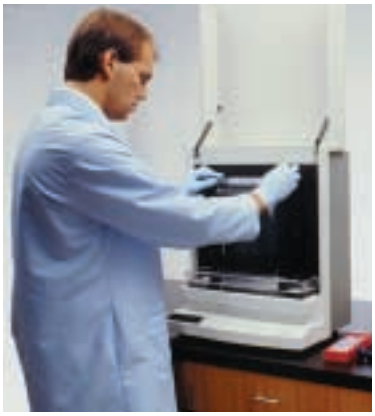
How can we read this code to understand which person is likely to suffer from a disease instead of another? The answer has been found through a laboratory process called electrophoresis. Electrophoresis uses an electric field to force charged molecules to migrate through a special gel. Smaller particles move freely, while larger ones are slowed down or totally blocked. After successful electrophoresis, the molecules have been separated. Molecules of identical sizes and properties are accumulated at the same spot on the sample plate.

DNA sequencing is one example of today's electrophoresis applications. Sequencing begins when a stretch of DNA is broken into many fragments of different sizes. The fragments are copied thousands of times using the polymerase chain reaction, or PCR. The PCR adds a fluorescent tag to the final unit in each fragment. Then the fragments are dropped into a gel strip under an electric field, which separates the fragments according to their size. A laser causes them to glow in a specific color allowing a computer to reconstruct the DNA piece. In order to decode the human genome, this process has to be repeated millions of times.

With its laboratory glasses, Schott has contributed to the rapid progress in the biotechnology sector.

During the 1990s Schott supplied "Borofloat" glass for use as electrophoresis matrix gel slides to all of the primary equipment manufacturers in the US.

These twin-sets consist of two pieces of processed glass, each 5 millimeters thick and around 30 x 60 centimeters. In all 25,000 square meters were delivered over a few years.

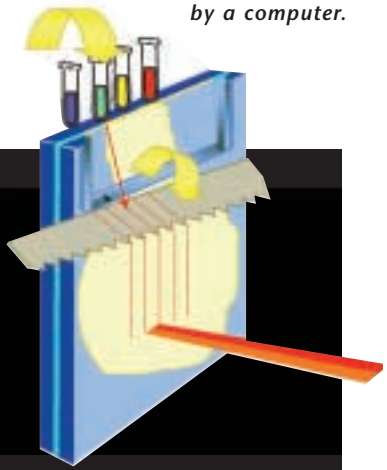


Because of the low background fluorescence of the special glass used, sparkling scans and DNA fragment visualizations can be produced.

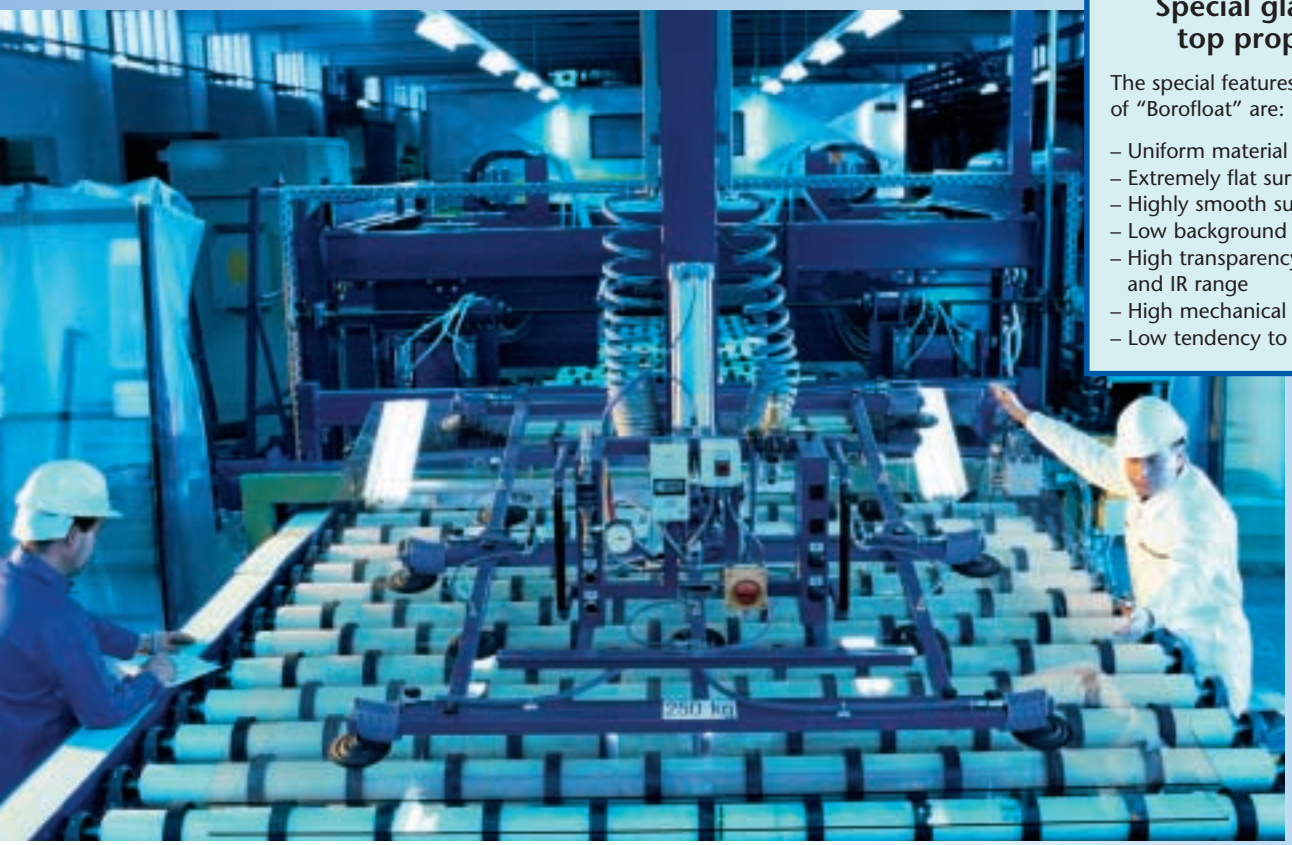
Since the average sample per day includes well over 100,000 pieces, cost is a major consideration. "Borofloat" is significantly less expensive than optical glasses, and provides numerous chemical and physical properties which make it an ideal glass for sample plates.

"Borofloat" is the first borosilicate glass to be produced by the microfloat technology. This innovative manufacturing process provides a smooth flat

Gel electrophoresis with twin-set plates. Under a laser beam the fragments fluoresce in specific colors so that they can be reconstructed by a computer.



Decoding a gene sequence



In Jena Schott was the first to produce Borosilicate glass using the microfloat process.

Special glass with top properties

The special features of "Borofloat" are:

- Uniform material strength
- Extremely flat surface
- Highly smooth surface
- Low background fluorescence
- High transparency in the UV/VIS and IR range
- High mechanical strength
- Low tendency to corrode

surface in the required micron range, for thin gel interlayers in the range of two hundred microns. A very constant thickness of the glass plate pairs allows more than 60 different fragments to be tested in one single sequencing step without interference problems. "Borofloat" is also highly resistant to water, acidic and saline solutions, as well as to chlorine bromine, iodine and organic substances. This resistance guarantees minimum problems during the sequencing process and allows several chemical washing steps without damage to the surface.

Low background fluorescence

Modern detection methods using UV(IR)-lasers and photo detectors depend on clear, undistorted sample conditions. Most ordinary sample plates have a high fluorescence background intensity, reaching their peaks in the UV (ultraviolet)-VIS (visible) range. Surface reflection of UV light causes distorted, diffused or even wrong band scans. The fluorescence intensity of "Borofloat" is three times less than ordinary electrophoresis plates. These new features allow brilliant, undistorted sample scans and high-resolution band visualization, within the UV-VIS spectrum.

A new market

The potential of biotechnology is recognized around the world. All efforts are concentrated on creating a complete DNA data base.

This information should help to explain how humans are "built", to identify genetical differences between people and to study genes in relation to diseases ■

More than 3 billion items of information

A full blueprint of the human body can be found in 46 chromosomes in the nucleus of every cell. The chromosomes consists of a DNA double helix comprising the four chemical components thymine, guanine, adenine and cytosine. Our DNA contains more than three billion items of information which, in total, form the genome. Approximately three percent of these items of information are contained in the genes that control our cells. Part of the DNA activates or deactivates the genes at a given time within the body's development. What the rest of the information does is unknown.