

# A MAN OF IDEAS: 1998 GUNNAR NICHOLSON GOLD MEDALIST DOUGLAS WAHREN

DONALD G. MEADOWS

*INNOVATION AND LEADERSHIP MARK RESEARCHER'S CAREER*

**D**OUGLAS WAHREN HAS HAD A TALENT FOR SEEING possibilities and making them happen.

His research in such areas as turbulence and formation analysis, high consistency forming, impulse drying, and other achievements, have earned him the 1998 Gunnar Nicholson Gold Medal. The prestigious award is presented by TAPPI to individuals "who have made preeminent scientific and engineering achievements of proven commercial benefit" to the pulp and paper industry.

Wahren is distinguished in having been nominated by three previous Gold Medalists and in having worked with at least two others.

"Douglas Wahren's work on fiber network rheology has been of great importance for the development of headboxes and for our understanding of the flow of fiber suspensions, leading to great savings in pumping of pulps," noted Borje Wahlstrom, the 1992 awardee. Wahlstrom also cited Wahren's work in developing high consistency forming and tissue twin-wire forming technology and in conceiving of impulse drying.

Jasper Mardon, the 1990 medalist, noted that Wahren "is creative, inventive, and industrious." Many of Wahren's achievements were the direct result of his own efforts, Mardon pointed out, particularly the "initial ideas and plans, many analyses and measurement methods, and the final write-ups." In most cases, Wahren also served as team leader and coach for other professionals and students, Mardon added.

Lennart Stockman, the 1985 medalist, called Wahren "an outstanding scientist in the area of both fundamental and applied paper research." He acknowledged Wahren's contributions "to the development of paper technology, especially in pressing and drying."

In 1996, Wahren retired as senior vice president of STORA Corporate Research in Sweden, where he had worked since 1987. His "retirement" from STORA has allowed him to devote his full attention to consulting.



*Wahren with a bust of himself sculpted by his mother when he was a child*

Promoting himself as the "Profit Professor," Wahren has taken on a number of projects and recently joined the board of BIM Kemi AB, a specialty chemical company serving the pulp and paper industries.

## BEGINNINGS

Wahren's father and grandfather both worked in the paper industry. His father served as marketing director for Holmen paper, now part of the MoDo group, Wahren said, and his grandfather had saved the company from bankruptcy and served as its president.

Both men had a great influence on Wahren. As a child,

## AWARD WINNER



*Family pictures -- (clockwise, from top left) Wahren with his father and grandfather; an early test of surface tension; graduation day; making a presentation at the Royal Insitute of Technology; the young couple -- Inger and Douglas*



he would sit in on business discussions following Sunday dinners. His father left for the northern front in 1940 when Wahren was six years old and came back a much trimmer man. Wahren remembers his father as always being industrious and always putting the customer first. Business sometimes required his father to spend two or three months traveling, making sales calls on customers in the United States.

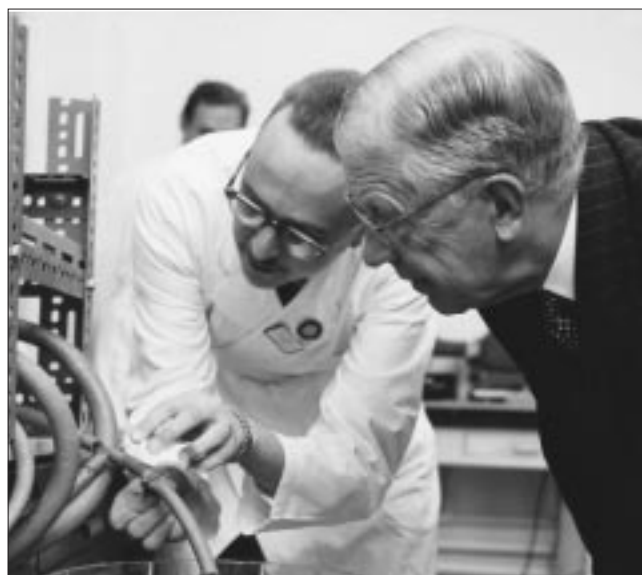
It would seem natural that Wahren might also gravitate toward a career in the paper industry, but he had other ideas. He wanted to be a mechanical engineer and build things—cranes, towers, bridges. It wasn't until his fourth year at university, when he was persuaded to sit in on one of Börje Steenberg's lectures, that he became fascinated with papermaking.

"He hooked me," Wahren said. "At that time, papermaking as I knew it was an art, a craft," he recalled. "But Steenberg showed that many things [about the process] could be analyzed and understood."

After graduating in 1957 with a degree in mechanical engineering from the Royal Institute of Technology, Stockholm, Wahren went to work for Steenberg (the 1970 TAPPI Gold Medalist) as a research assistant in the paper department of STFI. While doing fiber and fractionation studies there, Wahren discovered "crill," small fibrils in pulp samples. "These floating, swimming fibrils behaved just like krill," he observed, likening them to the tiny crustaceans and larvae eaten by baleen whales. The term also stems from "krylla," Swedish slang for "this place is swimming with people."



Named a TAPPI Fellow in 1981, Wahren receives his plaque from Fellows Committee Chairman W. O. Kroeschell



King Gustav VI Adolf of Sweden looks on as Wahren describes one of his projects at the Royal Institute of Technology

Crill can be present, even when fibers are scarce, Wahren discovered. It causes much of the filtration resistance, making it hard to dewater the sheet. By refining the pulp to remove crill, it's possible to form stronger handsheets at high freeness, he discovered.

Wahren's boundary layer studies in pulp flows evolved into efforts to measure turbulence, develop turbulence models and to control turbulence in a rational way.

In 1964, after completing his doctoral dissertation (on three-dimensional fiber networks), Wahren went to work at Beloit for a year as visiting scientist. "It was the best paper machine 'university' at the time," he discovered. It also put him in contact with Joe Parker and Edgar J. Justus (the 1988 TAPPI Gold Medalist). They, as well as Steenberg and Mardon, had a great influence on Wahren. "They required things of you and set tough goals," he said. "At the same time they were available for discussions and mentoring."

During his career, Wahren tried to follow the philosophy that a person should change jobs often, at least in research. If, after five years, you haven't accomplished what you'd set out to do, then it's time for someone else to have a hand at it. "I'm always after results," Wahren said. "I'm a results-oriented person working with the tools of science and engineering," he said.

The early 1970s were especially busy for Wahren. He was a consultant to the pulp and paper machine building industries, director of research at STFI (through 1973), taught paper technology at the Royal Institute of Technology in Stockholm, and in 1974 joined AB Karlstads Mekaniska Werkstad (KMW) as vice president-research.

## AWARD WINNER



*A cell-phone has become an essential tool Wahren uses to keep in touch with clients*

The work at KMW was also very satisfying. "When you can come up with something, know there's a customer out there who wants it, can actually deliver it, can actually sell it...and get paid for it, and it works, that's fantastic!"

While at KMW, Wahren worked on tissue former and three-layer headbox development projects. He also worked on pressing and yankee dryer technology. It was a fun time, Wahren recalls, but the company was continually pushed to the limits of its production capacity, which also made it hard to service its customers.

Eventually, the company began to focus its efforts on tissue machines, high-speed formers, and yankees and presses for heavy grades, Wahren said. It has since become part of the Valmet group.

After five years with KMW, Wahren was recruited to join the Institute of Paper Chemistry (IPC) in Appleton, WI. He was hired in 1979 by the new president, Harry Posner, to serve as vice president of research and professor of engineering. Part of Wahren's job there was to reinvigorate the research efforts.

When the leadership changed at IPC, Wahren decided it was time to move on. He'd gone through all the preliminaries of signing on with an American company in New York when he got a call on a Friday night in December 1986 from STORA. He flew to Sweden the next day, while Inger remained to look for a house. He was back in the United States on Monday and that night called to accept the job as vice president and director of research at STORA Teknik. By February 1987 he was installed in Falun where he began to build the Stora research organization, and then a new lab.

Now, having left STORA, Wahren has begun working on some of the ideas he'd "shelved" for the last 10 years.

Working with a doctorate student at the Royal Institute, he's completed a theoretical analysis of optical brightening agents. He is also building a product modeling program for paper development engineers.

### IDEAS

It's been said of Wahren that he has a knack for making very simple models of complex processes so that others can understand how to work with those processes.

Wahren's ideas on high consistency forming developed through discussions with Lennart Reiner. Together they published papers in 1968, 1970 and 1971 on turbulence measurement and characterization of headbox flows.

Wahren's idea for impulse drying was developed in the early 1970s. He did pilot work on it at KMW and patented the concept in Sweden in 1978. After conducting further laboratory trials at IPC, he published his findings in 1983.

Impulse drying addresses the need to increase the capacity for drying through a more intense process rather than trying to further the size of the dryer section. He reasoned that the drying rate was limited by the rate at which heat could be transferred to the sheet. That occurs in the dryer section through relatively soft contact with the dryer cans and by convection. If, instead, the energy could be transferred in something like a press nip, then the rate could easily increase by a thousand or more. In addition, if a pulse of steam could be sent



*Wahren with a model of the headbox he helped develop*

through the sheet it might actually blow water out of the sheet. Initial experiments went very well, but, Wahren noted, “ideas come cheaply, technology is a different thing.”

In 1981, Wahren and E. James Davis issued a report on what mills could do to conserve water and energy in the papermaking process. It built on research Wahren had conducted during the early 1970s as a project leader for Sweden’s SSVL Project. That was a Swedish effort to develop the technology to eliminate the discharge of pollutants from paper mills — the closed mill concept. The initial report described the basic framework for closing up the process. It noted that what goes into a mill must come out. In order to reduce effluent volumes, mills would need to reduce their fresh water intake. “Recirculation and re-use are only means to survive with the reduced intake of fresh water,” Wahren said. The process water also must be very clean. That might be possible by reuse of internally purified white water and by recirculating recovered fibers to the process.

Whenever possible, analysis using simple means, such as a ruler or weighing scale, is not only quick and cost-effective, but also more believable, Wahren said. In his studies of turbulence, for example, Wahren discovered that air bubbles in the jet from mill headboxes could be recognized instantly by just listening to the turbulence signal using regular headphones. That meant no time needed to be spent interpreting erroneous spectra, he said.

#### FAMILY

Norrköping, where Wahren grew up, was at one time referred to as Sweden’s Manchester because of the many textile mills that used to operate there. His mother worked as a textile designer there and was a talented sculptress. From her, Wahren acquired an appreciation for art.

Music has been a diversion Wahren has enjoyed over the years. In his youth, he played saxophone, then switched to guitar while attending university. While working for KMW in Russia, he bought an accordion to help pass the time and taught himself how to play (the instructions that came with the instrument were in Russian). Admittedly, his family doesn’t often ask him to play, except sometimes at summer picnics. “It makes a good background noise,” he said.

In 1949, the next-to-last outbreak of polio swept through Scandinavia. Wahren was one of its victims. The 15-year-old was unconscious for six weeks and found himself paralyzed from the neck down when he awoke. He was treated with penicillin “by the deciliter.” After four months he was able to move his fingers, after six months he could sit up.



*Inger and Wahren outside the farmhouse in Berga Gärd, outside of Stockholm, where they first lived*

Through exercise and the support of good friends, he continued to improve. Surviving nerve cells grew branches to help drive muscles that had lost nerve endings to the disease. “It changed my outlook,” Wahren said. “Now, I know I can do it. I might stumble and fall, but I always get up again.”

Although the couple knew of each other as children — they both lived in Norrköping and briefly went to the same school — it wasn’t until Wahren was about to graduate from his 12th year of school that he and Inger started seeing each other. Wahren had come home for Easter and, dressed in furs as a circus ape, went with a cousin to a masquerade ball. He met Inger there and danced with her several times. That was in 1953. The couple started dating and married in 1957.

Douglas and Inger have two children. Their daughter, Caroline, lives within a few minutes drive of the new house. Like her mother and grandmother, she chose a profession in healthcare. Their son, Johan, lives in Toledo, OH, in the United States. He does carpentry and home renovation.

The Wahrens moved into their new house in Täby on August 1, 1997. Although rather nondescript on the outside, the single-level house has a number of unique features that made it most appealing. Wahren's especially pleased with the heating and ventilation system which brings fresh air in, but keeps temperatures quite constant. It was also the white walls and high ceilings that appealed to Douglas and his wife, Inger, allowing them to display the artwork they've inherited and acquired.

The house is part of a small development recently built on a former farm. It's quite a change (though only a short drive) from the 16th century farmhouse at Berga Gärd that the couple lived in when they were first married. Inger remembers how nice it was to have morning coffee outside amongst the flowers there. She remembers the lilacs and the summer roses and the drop cherry trees from the houses they had lived in.

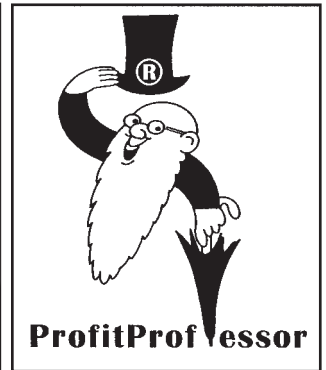
Wahren's new office sits just off the kitchen. It's equipped with three desktop computers and a small laptop, and even those are barely enough to keep up with the calculations, the imaging, the spreadsheets and communications Wahren might have going at a given moment.

It's quite a change from just 15 years ago when Wahren was using an Apple II to run calculations on optical brightness. With a total memory of 112 kb, it took that machine all night to run just one calculation, a task that might take a second or two on one of the machines he now uses.

Like many polio survivors who were able to live fairly active lives, Wahren now faces a new threat: post-polio syndrome. The condition causes a gradual loss of muscle strength and some of the abilities that had been regained through exercise and rehabilitation. It requires that Wahren exert himself less and pay closer attention to his diet, something Inger helps him with.

Although Wahren may not be as physically active as he used to be, his mind is as busy as ever. Statistics is one of his current interests, particularly as a tool for making predictions relating to paper consumption. The trick is to use the best real data possible. "If you have a reasonable set of data it's possible to handle it automatically and to evaluate whether you're on an S-curve or in some other type of process and what the spread is in a certain geographical area or market, as long as you define the niche," he said. Then, by looking at historical data for that niche in other geographic areas, it's possible to make comparisons and predictions.

A technological innovation that Wahren anticipates could have more of an impact on the industry than is generally acknowledged is direct digital printing. "Some of these processes don't use regular paper grades today," he noted, and the grades they use in the future could differ



Wahren and the new logo for his consulting business

significantly from today's standard grades. But Wahren believes issues such as that can be analyzed so the industry can grow with, and assist in the process of "going digital." The alternative is rapid obsolescence as the technology evolves.

Over the years, Wahren has turned down several offers to be president of various companies, including KMW. It would have paid good money, but he wasn't interested in that kind of work and the politicking involved, he said. "And I've seen so many worn-down presidents," he said. "I don't want power, I just want fun."

Even so, Wahren has held positions of responsibility through most of his career. When STFI was reorganized in 1969, for example, Wahren was called upon to help merge the research departments there, much as he'd later be called upon to build-up the research efforts at IPC and at STORA.

Wahren's achievements have been honored at several other points during his career. He was given the honorary title of professor at Stockholm's Royal Institute of Technology in 1973. He was named a TAPPI Fellow in 1981 and a member of the Swedish Royal Academy of Engineering Sciences in 1989. In 1988, Wahren received the TAPPI Paper and Board Manufacturing Division Award and Harris O. Ware Prize. Two years later he was given the TAPPI Research and Development Division Award and William H. Aiken Prize.

One thing Wahren is proud of is having "been party to killing off the old headboxes" through a better understanding of the role of turbulence and flocculation in formation.

Outside of the research and development he's been involved with, Wahren is happy to be remembered by his former students, as well as some former employees and colleagues, for his years as professor in Stockholm and in Appleton. "That I appreciate very much," he said. TJ

Meadows is editor of TAPPI JOURNAL; email: [dmeadows@tappi.org](mailto:dmeadows@tappi.org).