ON A HOT AFTERNOON in September, Renaissance Technologies LLC founder Jim Simons is too busy to take a phone call. It is, he says, from Cumrun Vafa, a preeminent Harvard University professor and expert on string theory, which describes the building blocks of the universe as extended one-dimensional particles. “Get another time when I can talk to him,” Simons tells his assistant. Then he mentions that the next day, he’ll be meeting with Thomas Insel, director of
the National Institute of Mental Health, to discuss autism research. And he's slated that Saturday to host a gala honoring Math for America, or MFA, a four-year-old nonprofit he started that provides stipends to New York City math teachers.

"I'm undoubtedly involved in too many things at the same time," Simons says in his 35th-floor office in midtown Manhattan. "But you make your life interesting."

String theory, autism, math education: It's fair to ask how Simons, 69, manages his day job overseeing the world's biggest hedge fund firm. The answer, judging from the numbers, is very well.

Renaissance is on fire: Its Medallion Fund—which uses computers and trading algorithms to invest in world markets—returned more than 50 percent in the first three quarters of 2007. It had about $6 billion in assets as of July 1. Simons registered that performance as subprime and related markets were collapsing, sending two mortgage-related hedge funds run by Bear Stearns Cos. into bankruptcy. The turmoil pummeled the Goldman Sachs Global Alpha Fund, a rival to Renaissance's funds, which fell more than 25 percent during the same time. Morgan Stanley's computer jockeys lost $390 million in a single day in early August.

Medallion's returns are no anomaly. The fund, which trades everything from soybean futures to French government bonds in rapid fire, hasn't had a negative quarter since early 1999. From the end of 1989 through 2006, it returned 38.5 percent annualized, net of fees.

More surprising than those returns is Simons's life story. At an age when hedge fund pioneers such as Michael Steinhardt have long since stopped managing other people's money, Simons is building on Medallion's success. He's adding funds and strategies and accumulating assets, which totaled $35.4 billion as of Sept. 28.

In August 2005, Simons started Renaissance Institutional Equities Fund, or RIEF, which invests in U.S. stocks. Through Sept. 30, it has returned 12.8 percent annualized. Unlike Medallion, which

turns over its holdings dozens of times each year, RIEF keeps its positions for months or longer. Simons said at the time of the fund's inception RIEF could theoretically manage as much as $100 billion. In December 2006, he limited new investments in the fund to $1.5 billion a month. As of Sept. 30, 2007, it had $25.6 billion in assets. In October, Simons started Renaissance Institutional Futures Fund, or RIFF, to invest in commodities.

It's up 5.2 percent for the month. He says Renaissance's research shows the new fund can manage as much as $50 billion. Along with RIEF, it will promote cross-fertilization of ideas inside Renaissance, Simons says. "Challenge is good," he says. "It opens one's eyes to new possibilities."

WHEN NOT IN MANHATTAN, Simons runs his empire from a 15-foot (4.6-meter) by 20-foot office in Renaissance's gated and guarded campus off Route 25A in East Setauket on New York's Long Island, some 50 miles (80 kilometers) east of the Empire State Building. With most of the trading automated, there's little of the hurly-burly of a typical hedge fund firm. Along with routine personnel and marketing tasks, Simons makes time for the researchers and programmers who stop by his office to discuss mathematical and statistical issues they've encountered as they work on new trading strategies.

More than 200 employees, of whom about a third have Ph.D.s, work in East Setauket. Another 100 are based in Manhattan, San Francisco, London and Milan. "He creates an environment where it's easy to be creative and works hard to keep the bullshit level to a minimum," says former managing director Robert Frey, who worked at Renaissance from 1992 to 2004.

Even without the new commodities fund, Renaissance's assets have more than doubled in a year from about $16 billion on Sept. 30, 2006. That growth has catapulted Renaissance past such titans as Daniel Och's Och-Ziff Capital Management Group LLC, Ray Dalio's Bridgewater Associates Inc. and David Shaw's D.E. Shaw & Co. to become the world's largest hedge fund manager, according to data compiled by Hedge Fund Research Inc. and Bloomberg. Medallion's 3.9 percent return during August, though that fund too was whipsawed by volatility, bolstered Simons's reputation as the silver-bearded wizard of quantitative investing. In quant funds, mathematicians and computer

'ALL THE QUANTS IN THE WORLD ARE TRYING TO FOLLOW IN JIM'S FOOTSTEPS,' SAYS LO OF MIT'S LAB FOR FINANCIAL ENGINEERING.
scientists mine enormous amounts of data from financial markets looking for correlations among stocks, bonds, derivatives and other instruments. They search for predictive signals that will foretell whether, say, a palladium futures contract is likely to rise or fall.

"There are just a few individuals who have truly changed how we view the markets," says Theodore Aronson, principal of Aronson + Johnson + Ortiz LP, a quantitative money management firm in Philadelphia with $29.3 billion in assets. "John Maynard Keynes is one of the few. Warren Buffett is one of the few. So is Jim Simons." Aronson credits Renaissance with validating the entire field of quantitative investing and proving that the freedom accorded to hedge fund managers to short stocks, borrow money and invest in myriad instruments can produce results that far outstrip typical market returns.

Simons, standing just under 5 feet 10 inches tall and weighing 185 pounds (84 kilograms), has trod an unlikely path. A former code cracker for the U.S. National Security Agency, in 1968 he became chairman of the mathematics department at Stony Brook University, part of the New York state university system. He built the department into what David Eisenbud, former director of the Mathematical Sciences Research Institute in Berkeley, California, calls one of the world’s top centers for geometry. In 1977, frustrated with a math problem and eager for change, he abandoned academia to start what would become Renaissance, hiring professors, code breakers and statistically minded scientists and engineers who’d worked in astrophysics, language recognition theory and computer programming.

"All the quants in the world are trying to follow in Jim’s footsteps because what he’s built at Renaissance is truly extraordinary," says Andrew Lo, director of the Massachusetts Institute of Technology Laboratory for Financial Engineering and chief scientific officer of quant hedge fund firm AlphaSimplex Group LLC. "I and many others look up to him as a tremendous role model."

The tendency for fund managers to try to emulate Simons may become more curse than blessing in the years ahead. As the selloffs in July and August showed, many quant funds are chasing the same investments. For example, as of June, Renaissance and rival AQR Capital Management LLC had four of the same top 10 stock holdings: Johnson & Johnson, Lockheed Martin Corp., International Business Machines Corp. and Chevron Corp.

The overlap became problematic as the subprime contagion spread beyond housing-related stocks, bonds, collateralized debt obligations and commercial paper, forcing some funds to lighten their holdings precisely as demand was drying up.

"All these quant funds are using similar models, looking to buy something cheap and sell something dear," says Sol Waksman, founder of Barclay Hedge Ltd., a consulting firm based in Fairfield, Iowa. While expensive securities are by their nature easily traded—liquid, in industry speak—the cheap securities hunted by most quantitative managers aren’t, Waksman says. After all, the reason they’re cheap is that nobody wants them. "Once you try and sell a low-liquidity stock, by definition there is no one to buy it," Waksman says. Overpriced stocks rose in August as hedge funds bought shares to cover their short positions, and cheap stocks
plummeted as managers rushed to raise cash.

Renaissance is under increasing pressure to stay ahead of the pack—and to keep its secrets under wraps. Save current employees and a few former ones, nobody knows precisely how the firm makes its millions. Medallion stopped taking new money from outside investors in 1993 and returned pretty much the last of their capital 12 years later. Today, the fund is run almost exclusively for the benefit of Renaissance staff. The wise-cracking Simons himself is mum on virtually all of its details.

What can he say about Medallion's trading strategy?

"Not much," Simons says with a shrug, and then takes a drag on one of the Merit cigarettes he often smokes.

What kind of instruments does it trade?

"Everything."

How many different strategies does it use?

"A lot."

Simons says his Ph.D.s laugh when they read the far-fetched theories about what their fund might be doing. One chat room participant speculated that Renaissance uses audio hookups to futures exchanges and analyzes the noise from the pits with voice-recognition software.

"All of us in the quants business have conjectures and hypotheses but very little data," MIT's Lo says. "So we like to speculate about what Renaissance could possibly be doing. They are so far ahead of everybody else that it's both challenging and as well as exciting to engage in that kind of idle speculation."

For his part, Simons says he once explored whether vegan activity affect the markets. He doesn't say what he found.

Interviews with former Medallion fund managers and with investors, rivals and quantitative scientists provide a glimpse into how the fund is run. So do annual reports, marketing materials and court documents: Ever secretive, Renaissance is suing in New York State Supreme Court two of its former Ph.D.-level researchers who were fired in 2003 after refusing to sign non-compete contracts. The firm accuses Alexander Belopolsky and Pavel Volvbeyn of appropriating trade secrets. Belopolsky and Volvbeyn deny the charges. In a July decision, the two briefly described three strategies that Renaissance had explored. One involved swaps, which are contracts to exchange interest or other payments; another used an electronic order matching system that anonymously links buyers and sellers; and a third made use of Nasdaq and New York Stock Exchange limit order books, which are real-time records of unexecuted orders to buy or sell a stock at a particular price.

With his myriad positions in different markets, Simons likens his approach to the extensive farming he once practiced in Colorado, using center pivot irrigation to grow wheat on thousands of
**World's Largest Hedge Fund Firms**

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<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>Location</th>
<th>Assets under management, in billions</th>
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*As of Sept. 28. Figures may include related assets in separate accounts. **Includes Highbridge funds. Sources: Bloomberg, Hedge Fund Research

According to data compiled by Bloomberg. With Medallion's 44.3 percent return in 2006, if Simons had invested $2 billion in the fund, he would have garnered an $885 million profit. He declines to comment on his investment. According to Bloomberg calculations, Simons ranks No. 3 among the world's hedge fund managers with $1.01 billion in firm-wide performance fees during the first three quarters of 2007. (See "The Money Makers," page 51.)

Chief Scientist Henry Laufer, who helped build the Medallion trading system, owns 10–25 percent of Renaissance, the SEC document says. Chief Financial Officer Mark Slifer and Executive Vice Presidents Peter Brown and Robert Mercer each own 5–10 percent. Simons's son Nathaniel, 41, who manages the Meritage fund of funds out of San Francisco, owns less than 5 percent, as does Renaissance trading desk manager, Paul Broder.

At the core of Renaissance's success—and the wealth Simons is creating—is his own mathematical mind-set. Outside the financial markets, he's best known for the Chern-Simons theory, which he co-developed with Chinese-American mathematician Shing-Shen Chern in 1974. In simple terms, the theory provides the tools, known as invariants, that mathematicians use to distinguish among certain curved spaces—the kinds of distortions of ordinary space that exist according to Albert Einstein's general theory of relativity. Chern-Simons is viewed as important partly because it has proven useful in explaining aspects of another field: string theory. This describes the building blocks of the universe as vibrating one-dimensional extended particles called strings. "It turns out these things we invented, Chern-Simons invariants, had their real applications to physics, about which I knew nothing," Simons told the International Association of Financial Engineers in May.

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**Simons Says He's Also Proud** of the work he did in differential geometry at the Institute for Defense Analyses' research and development center in Princeton, New Jersey. In 1968, he published a paper in the *Annals of Mathematics* called "Minimal Varieties in Riemannian Manifolds." The paper helped him win the American Mathematical Society's Oswald Veblen Prize in Geometry in 1976. The prize is named for the Princeton University geometer who became the first professor of the Institute for Advanced Study.

Simons's most enduring legacy may be as a
philanthropist as he builds on the mathematics and science that have shaped his life. In his New York office, Simons gets up and walks across the room to grab a newspaper clipping. It’s an article about the administration of President George W. Bush planning to add $50 billion to the defense budget. “Just a little extra; give them an extra $50 billion,” Simons says, his voice rising in anger. “Well, for $2 billion, we could revolutionize math education in the U.S.”

He’s referring to what he considers paltry funding for a key provision of the America Competes Act, which was signed into law on Aug. 9. The act includes a federal program to bolster math and science education based on the pilot project Simons has bankrolled with more than $25 million of his money. MPA.

Simons says America’s economic competitiveness is at stake. A 2003 study of 15-year-olds by the Program for International Student Assessment found the U.S. trailing 23 Organization for Economic Cooperation and Development countries, including No. 1 Finland, in math literacy at that age level. The U.S. was rated among just five countries, among them Greece, Turkey and Mexico.

Simons places the blame for poor high school math scores largely on unqualified teachers. Because of low pay, good math and science teachers tend to get sucked into the private sector—and the rate is accelerating. “Students, up and down the line from affluent to impoverished, are being cheated,” Simons says.

MPA pays full scholarships for math teachers to earn their master’s degrees in education at designated graduate schools. Then, it pays a stipend of $90,000 over five years of teaching as a subsidy. Fellows and other experienced teachers are eligible to apply for a master fellowship program, which provides a stipend of $50,000 over four years. MPA is rolling out the program in Los Angeles and San Diego in 2008.

Simons has donated tens of millions of dollars to math and science endeavors worldwide, including Stony Brook University and MSRI. In 2005, he kicked in $13 million with other Renaissance employees to keep the Relativistic Heavy Ion Collider operating at the Brookhaven National Laboratory in Upton, New York, after the U.S. Energy Department cut funding. The collider creates hot, dense matter similar to that which is believed to have existed in the first 10 microseconds, or millionths of a second, of the universe’s existence after the big bang.

Simons’s other major push: research into autism, a disorder marked by repetitive behavior and impairment in social communication and language. In 2005, he hired Gerald Fischbach, former dean of the faculties of health sciences at Columbia University in New York, to serve as scientific director for the Simons Foundation. The foundation funds a variety of math and science-related projects. Simons’s wife, Marilyn, 57, is president. Their daughter Audrey, 21, displays some symptoms of Asperger’s syndrome, a milder disorder that bears similarities to autism.

Under Fischbach, the foundation is building a database of DNA samples and clinical information from thousands of families across the U.S. with affected children. Scientists will use the data to identify genes that may contribute to autism. The foundation is also attracting scientists from outside the field, such as geneticist Michael Wigler of
Gerald Fischbach serves as scientific director for the Simons Foundation, which funds autism research.

Cold Spring Harbor Laboratory in New York. Fischbach says that, in the past, autism research has had trouble luring top talent because of its complexity.

Simons splits his week between two homes. His Manhattan apartment is in the same limestone building as another investor-turned-philanthropist, George Soros, 77, in Setauket, the white, gambrel-roofed house Simons has lived in for 31 years has broad picture windows overlooking the herons that populate the shimmering waters of Conscience Bay.

Flurry of recent activity. He pauses before answering.

"There was some connection between losing Nick and my desire to get as busy as I could," he says.

Scientific exploration underpins all of Simons's work. "What motivates me?" he says. "I'm ambitious and I like to do things well. I love to create something that really works. We have lots and lots and lots of strategies, and each new one gives me a lot of pleasure, to see something new that works."

The laws of the financial markets present a special challenge, Simons says. Unlike the laws governing physics or chemistry, they tend to change over time.

"One can predict the course of a comet more easily than one can predict the course of Citigroup's stock," he says.

"The attractiveness, of course, is that you can make more money successfully predicting a stock than you can a comet."

Investments, philanthropy, academia—it all traces to a life steeped in math. James Harris Simons was born in 1938, the only child of Marcia and Matthew Simons. He grew up in Brookline, Massachusetts, a Boston suburb designed partly by landscape architect Frederick Law Olmstead. Early on, Simons asked complicated mathematical questions. At about age 3, he was shocked to learn that a car could run out of gasoline. Why? By Simons's reckoning, a car would go through half a tankful, then half of what remained and then half of that, and so on: There would always be a small amount left. He'd discovered one of Zeno's paradoxes, named for the ancient Greek pre-Socratic philosopher, which would puzzle mathematicians for centuries. "Those were sophisticated thoughts for a little guy," Simons says, laughing.

At high school in Newton, Massachusetts, Simons blew through the equivalent of advanced placement math and went on to MIT. In his freshman year, he was cocky enough to enroll in a graduate level class. "The course said no requirements," he says. At MIT, Simons worked hard and played
The Richest Hedge Funds

hard—mostly late-night poker. By 1 a.m., he and
dfriends would pile into his Volkswagen Beetle and
head off to Jack & Marion’s delicatessen in Brook-
line for $1.25 chicken in a basket. Simons recalls
how two renowned MIT mathematicians, Isadore
Singer and Warren Ambrose, would sit down,
order food and work into the wee hours on
math problems.

“I just thought it was kind of a great life,” Simons
says. “Here they were, grown-ups, eating in this
deli, late, late at night, just working away. That
seemed wonderful to me.” Singer, still an MIT pro-
fessor, would become a close personal friend.

In June 1958, after just three years, Simons col-
clected his bachelor’s degree in mathematics from
MIT, returning that September for his first year of
graduate school. He then headed west to the Uni-
versity of California, Berkeley, to complete his
Ph.D. in math. There, Simons dabbled in commodi-
ties—using his and his then wife Barbara’s wedding
gift money to make a $500 killing in soybeans.

Simons’s thesis adviser—Bertram Kostant, now
professor emeritus at MIT—was skeptical about
him pursuing the proof that would form the basis
of his dissertation, “On the Transitivity of Holono-
my Systems.” It dealt with the geometry of multi-
dimensional curved spaces and
related to work by Singer and
Ambrose. “He solved it in a
remarkably short period of time,
under two years,” Kostant says.
“Jim’s an original guy. He likes to
go off in his own direction.”

After UC Berkeley, Simons won
a three-year teaching position at
MIT. He left after a year to become
an assistant math professor at
nearby Harvard. He stayed in
touch with two poker-playing MIT
classmates, Colombian nationals
Edmundo Esquenazi and Jimmy
Mayer. In 1958, Simons and Mayer
had celebrated their graduation by buying Lam-
bretta motor scooters and driving to Bogotà from
Boston. In 1964, the three cobbled together money
with Simons’s father to start a Colombian vinyl-
floor-tile factory. It would eventually prove a lucky
move, providing the younger Simons with a stake
to build his empire.

Simons was growing restless at Harvard. He was
eager to earn more money—and frustrated by
some of the math he was working on. The Institute
for Defense Analyses offered a better-paying solu-
tion: Simons could spend half of his time on math
at the nonprofit’s Princeton center and half break-
ing codes for the NSA.

In 1967, the IDA’s president, General Maxwell
Taylor, former chairman of the Joint Chiefs of Staff,
wrote an article for the New York Times Magazine
in favor of the Vietnam War. Soon after, Simons
penned a note to the editors: “Some of us at the
institute have a different view,” he wrote. “The
only available course consistent with a rational
defense policy is to withdraw with the greatest
possible dispatch.”

Maxwell eventually fired Simons, who was then
29, married and a father of three. Stony Brook Uni-
versity President John Toll wanted a star to build
the school’s math department. In 1966, the univer-
sity had made a splash by luring Nobel Prize-win-
ning physicist Chen Ning Yang from the Institute
for Advanced Study. Simons would hire stars for
the math department.

Stung by his firing from the IDA, Simons threw
himself into the task. “Having just sort of been
knocked around a little bit, I liked the idea of being
my own boss,” he says. Simons negotiated all of
the elements of a math position to lure great geom-
ters to a young school: salary, class load, leave poli-
icy and research support. “He’d figure what you
needed and get it for you,” Toll, 84, says. “He did
an outstanding job of building the department at
Stony Brook.”

AMONG THE FUTURE STARS Simons
lured were Detlef Gromoll from the University of
Bonn; Jeff Cheeger from the University of Michi-
gan; and Mikhail Gromov, who’d taught at Lenin-
grad University. All had published in prestigious
journals. “It was viewed as one of the two or three
best geometry groups in the world,” says Irwin Kra,
who succeeded Simons as math department chair-
man and is executive director at MPA. One of
Simons’s other hires was a Bronx, New York–raised
math professor from Cornell University: James Ax.

Simons dabbled again in commodities while at
Stony Brook. The Colombian factory investment
had made some profit. Simons and his partners
invested about $600,000 of it with Charles Freifeld,
a former math student of his from Harvard. During
seven months in 1974, Freifeld increased the
investment 10-fold, after fees, as sugar futures
more than doubled. The $600,000 was now $6 mil-
lion, Freifeld says.

Simons suddenly had money—but he was at a
crossroads. He had separated from his wife Barbara. As the ’70s wore on, he grew frustrated with a math problem related to the Chern-Simons theory. “It was driving me crazy,” he says. Simons met Marilyn Hawry, a graduate student in economics at Stony Brook who helped take care of Simons’s children and would become his second wife.

Simons left Stony Brook in 1977 and started Monometrics, a predecessor to Renaissance, in a strip mall across from the Setauket train station. He wanted someone to trade currencies and commodities and turned to an old friend, a fellow code cracker from the IDA: Leonard Baum. Baum was co-author of the Baum-Welch algorithm, which is used to determine probabilities in, among other things, biology, automated speech recognition and statistical computing. Simons’s idea was to harness the mathematical models that Baum was writing to trade currencies. “Once I got Lenny involved, I could see the possibilities of building models,” Simons says.

Baum never traded using the models. In the late ’70s and early ’80s, Baum was making too much money on fundamental trading. Such trading involves betting based on, say, whether British Prime Minister Margaret Thatcher would let the pound rise. In an era of one-way markets, it was much easier than using models. “The dollar was very weak; all you had to do was short the dollar and you’d make a lot of money,” Simons says.

Simons brought in Ax to look over Baum’s efforts. Ax declared that not only would the models work with the currencies Baum had written for, they could be applied to any commodity future—wheat, crude oil, you name it, Simons says.

Simons set up Ax with his own trading account, Axcom Ltd., which eventually gave birth to Medallion. Ax died of colon cancer in 2006 at age 69.

In Axcom’s early days, professionals were skeptical about the kind of systematic trading Ax was doing. Still, he was brilliant and a natural at understanding probability, having shared the American Mathematical Society’s Frank Nelson Cole Prize in Number Theory in 1967. “He had the ability to see patterns in trading data,” says Brian Keating, 36, the younger of Ax’s two sons. “People in the business thought it was magic, or nonsense.”

Ax was also sometimes difficult to work with. “Most of times things went well,” says Kevin Keating, 39, Ax’s older son, who talked with his father about his days at Axcom. “But when they didn’t, they’d butt heads.”

During the 1980s, Ax and his researchers improved on Baum’s models and used them to explore correlations from which they could profit. If a futures contract opened sharply higher versus its previous close, they would short it; if it opened sharply lower, they would buy it, says Sandor Strauss, a former manager for Medallion who now runs his own investment firm, Merfin LLC, in Walnut Creek, California.

The stuff wasn’t complicated, and it worked. In 1985, Ax persuaded Simons to let him move Axcom to Huntington Beach, California, to escape a painful divorce and enjoy year-round boating. By 1988, investors wanted to invest directly in Axcom. Simons and Ax started a hedge fund and christened it Medallion in honor of the math awards that they had won.

Ax’s signals soon seemed to short-circuit. Peak-to-trough losses by April 1989 had mounted to about 30 percent. Ax had accounted for such a drawdown in his models and pushed to keep trading. Simons wanted to stop to research what was going on. “Both were talking to their lawyers,” Strauss says. Ax, in fact, threatened to sue, Simons pulled rank, and Ax left. He went on to write a screenplay and poems in addition to working on problems involving the mathematical foundations of quantum mechanics with Princeton University professor Simon Kochen, with whom Ax shares the Cole prize.

Simons turned to Elwyn Berlekkamp to run Medallion from Berkeley, California. A consultant for Axcom whom Simons had first met at the IDA, Berlekkamp had bought most of Ax’s stake in Axcom. He worked with Strauss, Simons and another consultant, Lauffer, to overhaul Medallion’s trading system during a six-month stretch. In 1990, Berlekkamp led Medallion to a 55.9 percent gain, net of fees—and then returned to teaching math at UC Berkeley. “I got a lot more pleasure talking to academics than financial types,” says Berlekkamp, who is now professor emeritus. “Most people in this business are pretty dollar-centric. It makes for a dull life.”

Ax was gone. Berlekkamp was gone. Medallion’s
revamped trading system remained. Straus took the reins. Medallion returned 39.4 percent in 1991, 34 percent in 1992 and 39.1 percent in 1993, according to Medallion annual reports.

Back on Long Island, Simons was gathering an A-team of math brains. Laufer, a former Stony Brook professor, joined full time as research chief in late 1991. Frey, a trader from Morgan Stanley's Analytical Proprietary Trading group, the pioneering blackbox quant desk, came in 1992. Nick Patterson, another cryptologist from the IDA, joined in 1993. That year, Simons also hired Brown and Mercer, two language technology experts from the IBM Thomas J. Watson Research Center.

The nastier that stock or bond markets turned, the better Medallion seemed to perform. In 1994, as the Federal Reserve raised its federal funds target rate six times to 5.5 percent from 3 percent, Medallion returned 71 percent for the year. The Bloomberg/Effas long-term U.S. government bond index lost 6.7 percent that year. In 1995, Simons moved most of Renaissance's California operations to Long Island. The firm needed computing power to model the data Renaissance was harnessing, and Simons bought it. From 1994 to 2000, Renaissance's total CPU power grew by a factor of 50. Data bandwidth in and out of Renaissance headquarters rose by a factor of 45, according to a Medallion annual report.

Jim Simons, shown at a Berkeley, California, lecture, has started two new hedge funds since mid-2005.

The Year 2000, during which the Standard & Poor's S&P 500 Index tumbled 10.1 percent, proved Medallion's best to date. It gained 98.5 percent, net of fees. By the end of that year, Renaissance had 148 employees—and the fund had a 43.6 percent annualized return over 11 years, net of fees, according to an annual report. It hasn't had a down quarter since.

Performance such as that feeds the hedge fund industry's insatiable curiosity. Rivals search for the signals underpinning Renaissance's returns. One set of clues came in the New York State Supreme Court decision in July, which the court heavily redacted. It cites three strategies tested at the fund, including one using limit order book data. MIT's Lo says that a fund firm could look at such data and identify a large sell order for, say, $11 a share when a stock was trading at $11.05. The fund could short the stock at $11.01 and benefit if the stock hit the $11 trigger. "There's going to be tremendous downward pressure on the stock," Lo says.

Former employees say observers may gain as much insight into Renaissance's performance by scrutinizing a more obvious factor: Simons has succeeded in building a pretty good business model.

First, it's a firm run by and for scientists. "I've always said Renaissance's secret is that it didn't hire MBAs," says Berleakamp, who blames the herdlike mentality among business school graduates for poor investor returns. Programming and modeling are treated as the heart of the firm's advantage—not an expense. "If you needed a lot of computer power, the decision was based on whether you needed it, not the budget," says Peter Weinberger, former chief technology officer at Renaissance and now a software engineer at Google Inc.

Decisions are made quickly and feedback is constant. "One of the things about Renaissance is that there's a feeling of urgency," says Frey, who left to teach applied mathematics and statistics at Stony Brook in 2004. "We always believed that there was a wolf at the door, that somebody would get there before we did."

From Simons on down, the company encourages openness, whether it's about market signals that show where a security might be headed or about technology or trading. Simons says new employees are encouraged to troll computer files detailing Renaissance's past strategies, successful or not. "If Simons's door was open, you could walk in," Weinberger says. That would go for everyone from secretaries on up. For his part, Simons says he's proud of Renaissance's low personnel turnover. The firm is