

U**P**load

► The Quarterly Journal for Science and Technology in Hawaii

■ the origins of innovation

Patent No. 2790

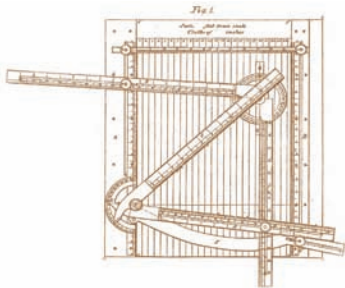
On Sept. 30, 1842, Capt. John Dominis of the Sandwich Isles laid claim to a new method of cutting ships' sails. It was among the first — if not the first — patent granted to Hawaii.

Dominis led an adventurous life. The sailor's path took him throughout the Pacific and to China. He is credited with beginning the trade in salted salmon from the Columbia River and being the first to plant peach trees in Oregon.

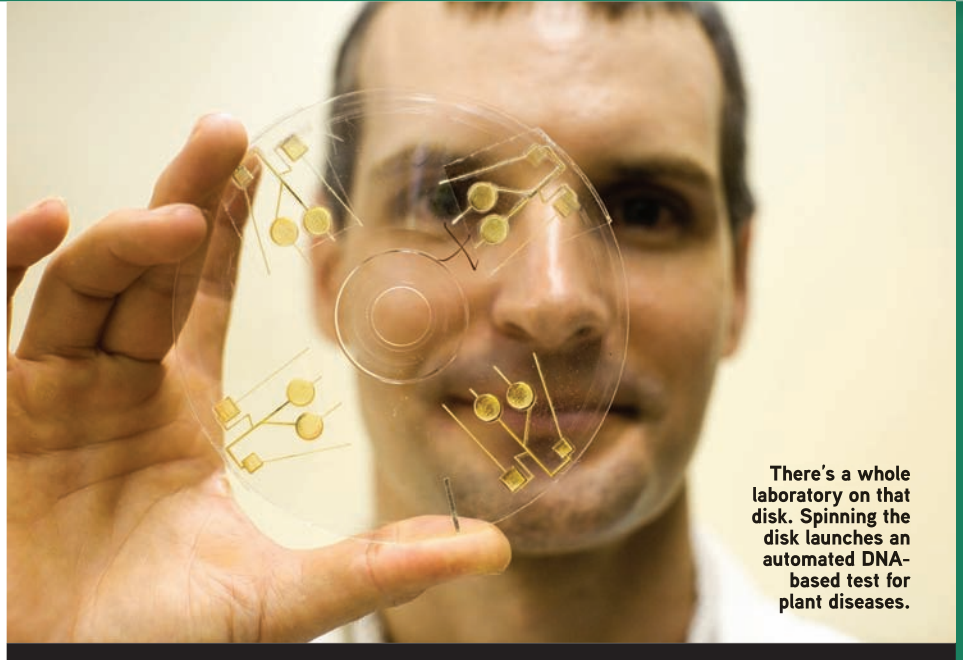
In 1837, he and his wife and son moved to Hawaii, from whence he filed his patent application for "new and useful mathematical scales and tables for determining the gores, roaches, and proportions of sails for cutting the same from rolls of fabric."

The captain touched Hawaii history in more ways than one. It was he who built Washington Place, and his son, John Owen, grew up to marry the princess who became Queen Liliuokalani.

As for the captain himself, he perished at sea on the way to China in 1846.



Early Hawaii innovation: Capt. John Dominis' sketch of his patented scales for cutting a bolt of sail cloth.



There's a whole laboratory on that disk. Spinning the disk launches an automated DNA-based test for plant diseases.

The Business of Growing Ideas

Associate professor Daniel Jenkins has an idea. He and his students in the University of Hawaii biological engineering program are creating a biosensor that can quickly test for plant diseases — from nature or terrorists — that could devastate valuable agriculture crops.

The team has been working on the idea for three years; they've developed innovative techniques for testing DNA and a simple method for automating the whole process on a disposable compact disk.

To get to the market, the biosensor idea has to move into the commercial phase. Yet Jenkins isn't sure that's going to happen. That's not his area of expertise, nor, frankly, his interest. It would require large amounts of grant money, which is hard enough to come by as it is. There isn't a developed bioscience business sector waiting to spin off ideas coming out of the university. And Jenkins has other research projects waiting.

In short, the biosensor itself may wilt on the vine.

The challenges that Jenkins' biosensor face are illustrative of the challenges that Hawaii is up against as it works to build a thriving innovation economy. Hawaii has a rich pool of inventive minds that are pumping out the ideas, particularly in the realms of life and ocean sciences and renewable energy. But for those ideas to reach the market, they need a life-support system that can nurture them into being. And there are still gaps in that system.

In the next pages, *Upload* focuses on Hawaii companies at each step of the lifecycle and how they have tackled the challenges — and capitalized on the advantages — that come from growing an idea in Hawaii.

continued on next page 

»» READ THE GROUNDBREAKING NEW REPORT ON HAWAII'S SCI-TECH SECTOR AT WWW.HISciTech.ORG

\$1.4 billion

The amount of money injected into the state economy between 1999 and 2007 by sci-tech companies supported by Act 221.

The Lifecycle of Innovation

The textbook lifecycle of a successful innovation company starts with the **idea**, which is brought into the world by an entrepreneurial **startup**. The fledgling startup eventually goes **commercial** and, over time, morphs into a **mature** company, which begins the cycle over again by putting revenue back into R&D and spinning off its next-gen products.

The steps along the way are different for every company and it's never as simple as a graphic. When you put that textbook lifecycle into the real world, it becomes more like a tornado, says Susan Scott, executive director of the Pacific Asian Center for Entrepreneurship at the University of Hawaii business college.

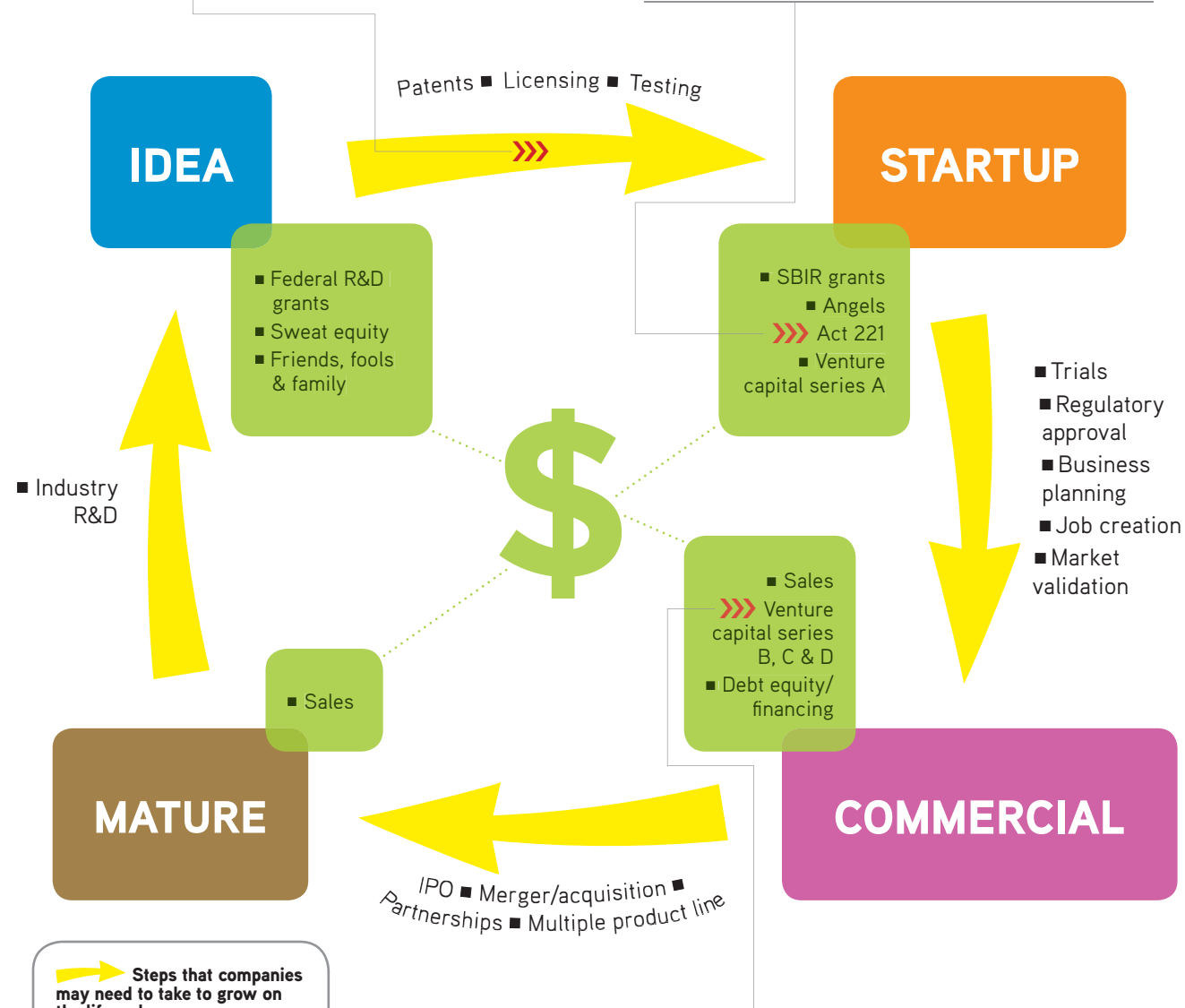
"Companies are being tossed out of the cycle constantly," she says. "Many don't make it from one stage to the next."

TECHNOLOGY TRANSFER

Hawaii needs to continue efforts to link its inventors with its entrepreneurs while building a community knowledgeable in IP protection and legal and financial support.

ACT 221 — WILL IT STAY OR WILL IT GO?

Supporters say the high-tech investment tax credit has jump-started Hawaii's innovation economy. The credit will be under fire next year as lawmakers weigh its benefits against other budget needs. Its loss would cut the growth from under the nascent sci-tech sector, supporters say.



Steps that companies may need to take to grow on the lifecycle

Funding sources commonly needed at each stage

The pressure points in Hawaii's life-support system

CAPITAL TO GROW

Hawaii has made strides in the last five years, and the environment is quite healthy for early funding rounds of up to \$1 million. Yet there is an anemic source of institutional capital to fund the later, larger rounds that companies need to grow on. Can emerging companies remain resilient in the face of the global economic downturn?

on pages 4 & 5 Upload focuses on Hawaii companies at each step of the lifecycle

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UH COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES

THE RESEARCHERS

Daniel Jenkins, Ph.D., and students in the University of Hawaii biological engineering program.

THE IDEA

DNA-based biosensor (à la a blood glucose meter) that quickly identifies plant diseases.

THE PROBLEM

Ralstonia solanacearum, a bacterium that causes a deadly wilt responsible for \$950 million of damage in potato crops worldwide every year. In Hawaii, *Ralstonia* infects tomato, pepper, eggplant and culinary ginger crops. If certain strains reached the Mainland, the results could be devastating.

THE PROMISE

Protect valuable agricultural crops from diseases introduced by nature or terrorists.

THE CHALLENGE

Develop a test that can extract the DNA, amplify it and then identify it. Automate it all on a lab-on-a-disk.

REMEMBER THE CILANTRO

Existing tests can take days or weeks, making it difficult to screen plants in the field and hard to track down the source when outbreaks do occur.



UH biological engineering student Ryo Kubota.

BROADER APPLICATION

Could be developed to screen for other pathogens such as *E. coli* or salmonella or human STDs.

FUNDING

At the tail-end of \$700,000 in grants from the U.S. Department of Agriculture.

THE FUTURE

Unclear. Will the biosensor jump the divide into the business world?

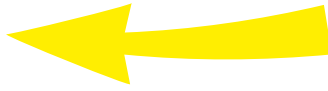
IDEA



STARTUP



COMMERCIAL



MATURE

MAKAI OCEAN ENGINEERING INC.

Privately held marine engineering company

THE MAKAI EDGE

Founded in 1973, Makai has capitalized on Hawaii's ocean location to develop skills and award-winning technologies that have been adopted around the world.

KEY BUSINESS STRATEGY

Zero debt. Leverage R&D grants, government research dollars and Act 221 R&D credits to keep developing new technologies.

AVERAGE ANNUAL REVENUE

\$5 million

EMPLOYEES

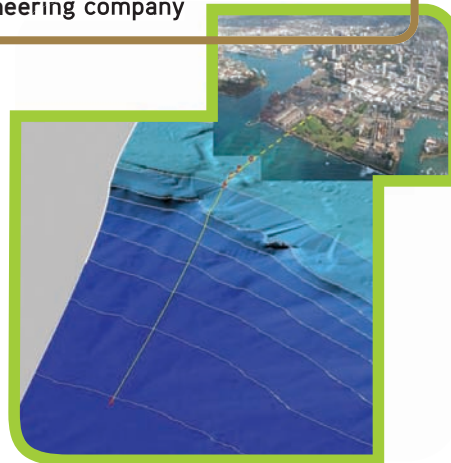
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CONNECTING THE WORLD

The majority of the world's ships installing telecommunication cables have Makai's lay software on board and its software for planning cable routes is also the industry standard.

COOLING THE WORLD

Makai helped design the first deep-water air conditioning system in the



world at the ritzy Intercontinental Bora Bora. Projects in the pipeline: Honolulu and Bahrain.

POWERING THE WORLD

In October, Makai partnered with Lockheed Martin on a U.S. energy department-funded project to develop OTEC, or ocean thermal energy conversion. Goal: Build the world's first OTEC plant on Oahu, bringing energy independence to

Hawaii within a generation. In 1979, Makai helped design the world's first demonstration OTEC plant.

NEXT-GEN MAKAI

The next project under development: visualization software that goes 4D (with time information) and 5D (with the addition of other data sources, e.g. water salinity). Research financed by Act 221 R&D credits.

LEARN MORE

www.makai.com

NATURAL POWER CONCEPTS INC.

Privately held alternative energy incubator

THE LEONARDO MAN

Founded by artist, inventor and aviator John Pitre.

MISSION

Solve global energy crisis.

STRATEGY

Agile idea incubator that circumvents the slow-moving R&D cycles and the financing needs of other companies.

TRACK RECORD

Pitre already has invented successful commercial products, including his award-winning Range of Motion, or ROM, exercise machine, which has more than \$100 million in sales.

Concerned by energy, environmental and social issues, Pitre has been working on alternative energy solutions for decades and was an early pioneer in wave-energy-capture technology.

BUSINESS MODEL

Rapid R&D and prototyping; license to industry or create spin-offs and joint ventures focused on individual technologies.

ON THE TABLE

Nearly 100 patent-pending concepts focusing on wind, water, solar and geothermal energy. First off the block: a vertical wind column and a water-current-capture device. In early prototype testing, these have surpassed the energy capture abilities of existing technologies.

THE NPC FACTOR

Aesthetically designed, wildlife



friendly products that can withstand the harsh environment.

EMPLOYEES

7 full time, 5 near-full-time independent contractors

FINANCING

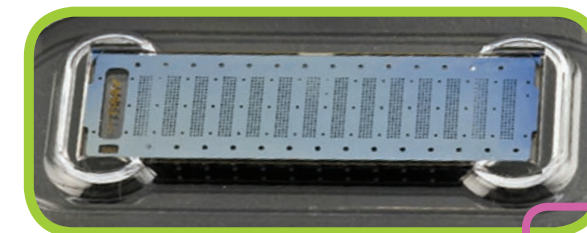
\$2 million from angel investors, leveraged with Act 221 high-tech tax credits

WHAT'S NEXT

By year's end, close first \$4 million-round of financing from private investors; identify strategic manufacturing partners.

LEARN MORE

www.naturalpowerconcepts.com



NANOPOINT INC.

Privately held biotech company

IT STARTED IN OUTER SPACE

Nanopoint spun off from Oceanit in August 2004 to investigate the prospect of turning space telescope technology around to look at our inner space, i.e. inside living human cells.

THE PRODUCT NOW

The original idea for a cell-peering NanoProbe is still in the Star Trek realm ... but not forgotten. The heart of Nanopoint's cellTRAY sys-

tem: a lab-on-a-chip with a life support system that keeps cells alive for days vs. the mere hours of current equipment.

THE NANOPOINT EDGE

For the first time, researchers can watch cells — how they live and die — over extended periods of time, opening up new research possibilities with time and scale efficiencies.

THE PROMISE

Drug discovery: Test drug safety and interactions on cells vs. living humans. Stem cell research: Advance

capability to grow stem cells. In vitro fertilization: Increase chances of quality embryos by simulating conditions in the human body.

THE MARKET ON-RAMP

At press time, Nanopoint had letters of intent in hand for its \$175,000 CT-2000 Imaging System.

ESTIMATED MARKET

\$2 billion

KEY BUSINESS STRATEGIES

Strong patent portfolio; Apple-esque attention to product design; constant research and market

feedback; distribution model harnessing companies with existing industry relationships; constant innovation — while staying focused on the product at hand.

EMPLOYEES

12 full time, 6 part time.

FINANCING

Part-way through \$5 million-Series B round with Japanese and U.S. Mainland investors.

WHAT'S NEXT

Acquisition or, ultimately, IPO.

LEARN MORE

www.nanopointimaging.com

■ quickwire

Fresh Ink for Pipeline Micro

Local startup Pipeline Micro has jumped on the big wave, inking deals for R&D contracts with some of the world's top electronics companies.

"We're in the process of negotiating and signing multiple contracts with some very large name customers," says CEO and co-founder Wayne Karo. The ink was still drying at press time so Karo could not report the companies involved, but they are based in the U.S., Canada, Japan, Singapore and Taiwan.

Pipeline Micro is a QHTB formed in 2004 to commercialize an innovative new technology developed by University of Hawaii Professor Weilin Qu, an expert in the field of boiling heat transfer and microfluidics.

Pipeline Micro has tapped Professor Qu's work to develop the world's smallest liquid cooling system for electronics. One of the biggest challenges for electronics manufacturers is managing the heat generated by the device — if you can manage the heat, you can build more powerful devices.

The electronics cooling industry is valued at \$5 billion, Karo says, and that is expected to double in the next five years.

Pipeline Micro has established a manufacturing facility in Atlanta, Ga., but the company's R&D center is based in Hawaii, and Pipeline Micro is committed to playing its role in the development of the high-tech economy here, Karo says. It already has attracted world-class Ph.D. talent to the Islands. And it has hired all of Qu's graduate students. Within their specialty, these students would be unable to find employment anywhere else in Hawaii; now they can do what they do best while staying home.



Keeping it cool. This video graphics card cooler from Pipeline Micro features microscale cooling technology that is unlike anything else on the market. Pipeline Micro's liquid cooling system has broad application for many markets and can be built into mobile devices such as laptops and products like the iPhone. With the liquid cooling system onboard, a laptop could attain the video graphics power of a desktop computer.

»» FOR MORE, GO TO WWW.PIPELINEMICRO.COM »»

The Bailout's Green Lining

Rescue plan, bailout bill — whatever you want to call it and whatever you may think of it, Congress' Wall Street package is lined with opportunity for a state working to break its dependence on fossil fuels.

Included in the \$700 billion bill is \$17 billion in renewable energy tax credits. An initial tally reveals 17 provisions relevant to private industry, four that can be used by the state and three applicable to individual tax payers. In addition to encouraging new energy sources, the bill includes tax credits for conservation and efficiency measures.

Among the opportunities in the Energy Improvement & Extension Act of 2008:

- ▶ A source of capital for new facilities via a new tax credit for investment in new clean renewable energy bonds.
- ▶ New qualified energy conservation bonds that could be leveraged for private industry use, including the purchase and installation of RE projects such as photovoltaics.
- ▶ A jump-start for plug-in electric drive vehicles with a new credit for passenger vehicles and light trucks.
- ▶ Eight more years of a 30 percent tax credit for businesses investing in wind, solar, geothermal and ocean alternative energy equipment.
- ▶ A bump for wave and tide energy, which is now included as a renewable resource for production tax credits.

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Crunch

MONEY TO GROW ON

\$1.2 billion The amount invested in Hawaii high-tech businesses between 2000 and 2007 using Act 221/215 tax credits.

\$295.6 million The amount of tax credits claimed from the state between 1999 and 2006 (2007 data not yet available). The full fiscal impact is substantially less when calculating in the state tax revenues generated by these qualified high technology businesses.

4:1 Ratio of private sector dollars invested for every \$1 of Act 221/215 tax credits claimed.

333 The number of companies receiving investment through Act 221/215 from 1999 to 2007.

\$1.4 billion The amount those companies injected into the Hawaii economy between 2002 and 2007.

4,363 The number of jobs created by 177 QHTBs in 2007; they also paid \$228 million in salaries and compensation.

2,000 Approximate number of proposals received by the Hawaii Angels since 2002.

2-3 Percentage of those proposals that have been funded, with a total angel investment of more than \$25 million.

36¢ Amount of venture capital historically invested in Hawaii for every \$1,000 of GSP. The national average is about \$1.73 for every \$1,000 GSP — Hawaii ranks in the bottom 10 states.

\$49 million Estimated annual demand for venture capital by Hawaii companies from 2008 through 2010 — a conservative estimate according to Hawaii VC industry leaders.

\$147 million The amount VC funds would need to raise in the near term — and in the face of economic belt-tightening — to serve that demand.

Sources: Hawaii Department of Taxation; Hawaii Angels; Venture Capital in Hawaii, An Assessment of Market Opportunities, prepared by the Hawaii Institute for Public Affairs.

Some people may see just an empty field.



We see possibilities for a more sustainable future.



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Exploring new technologies will help to ensure that the resources we have today are abundantly available tomorrow. By living sustainably, we leave a lasting legacy for future generations.

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tech force profile

NAME Mealani Parish

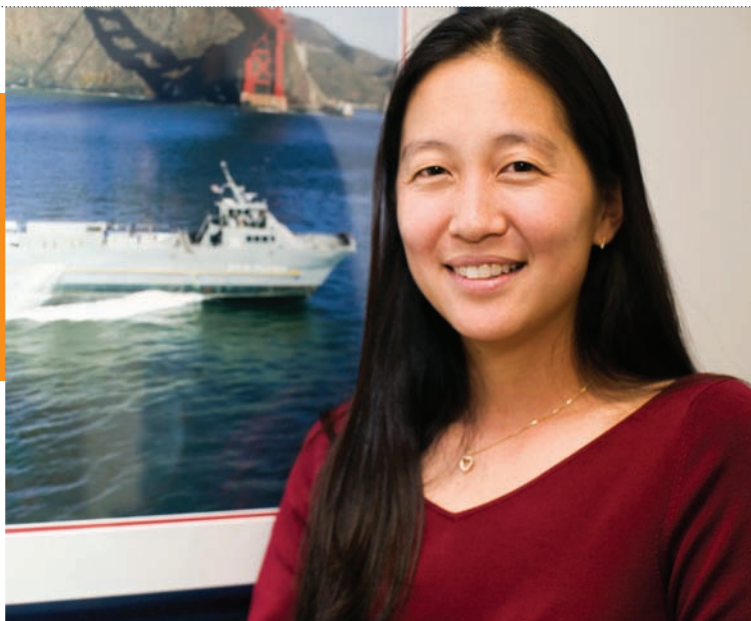
POSITION Mechanical Engineer

COMPANY Navatek Ltd.

EDUCATION Punahou (1996), Massachusetts Institute of Technology (B.S. and M.S. mechanical engineering)

AGE 29

ETC. Surfing, hula, walking her dogs, former tennis player on Punahou and MIT teams



When Mealani Parish was working in England as a mechanical engineer, she kept getting subtle hints about returning home to the Islands. The hints came from her dad, who would send news clippings about the small high-tech companies that were starting up in Hawaii.

And after 10 years away from her Mililani home — studying at MIT, interning with Toshiba in Japan and working for Schlumberger in England — Parish did decide that it was time to come back to be with her family.

In 2006, she and her English husband moved to the Islands and Parish landed a job at Navatek.

Navatek wasn't actually hiring at the time, says Todd Peltzer, a senior engineer and manager in the company. "But when good people come along, you've got to be ready to grab them, because when you need to go out and find someone like that, it is very difficult," he says.

Parish quickly became an expert in computational fluid dynamics, an area in which Navatek leads the industry. Parish runs computer models that simulate how water will flow over a hull design, looking at such factors as speed

and stability. She says one of the best things about working for Navatek — aside from the close-knit, enthusiastic team — is that several months after running the programs, she can go down to the shipyard and see — and ride on — the actual prototype that has been built.

Parish is one of a growing number of women entering the engineering ranks and she's keen to reach out to the generation coming after her. During graduate school she helped with a science club for elementary school girls, who oohed-and-ahhed over cheek cells under the microscope and made the Suessical oobleck, a gloppy, green, gooey substance that introduces the four states of matter. Now that she's in Hawaii, Parish is looking at ways she can offer the same kind of outreach in public schools here.

HAWAII'S 10 SCI-TECH SECTORS



Agricultural
Biotechnology



Astronomy



Biotechnology/
Life Sciences



Defense/
Aerospace



Energy



Environmental



Film/Digital
Media



Information/
Communication
Technology



Ocean
Sciences



Engineering/
Professional
Services

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