



ADVENTURE

THE OLD MAN AND THE SEA FLOOR

Inside über-inventor Phil Nuytten's latest quest to take his Exosuit 2000 to new depths—and subsea history

BY ANTHONY A. DAVIS - On a cool, bright Saturday morning in March, Phil Nuytten stands on the deck of a 23-metre barge docked in British Columbia's Horseshoe Bay. He wears a weather-beaten black-and-yellow parka. An orange inflatable life vest peeks out from underneath his coat, though on this day the barge would remain close to shore, in shallow water little more than six metres deep. That's a pittance for a man who, many times in his long, storied career in the oceans, has gone to

the ink-black depths where only a few whale species and just a handful of humans dare go.

Nuytten (pronounced "New-ten") is one of Canada's most prolific inventors; his ingenious subsea doodads have significantly advanced how humans research and work deep down in the oceans. Nuytten, who turns 80 in August, has no plans to retire and shows little sign of slowing down. On the deck of the barge, he snaps photos as a crew from one of his companies, Nuytco Research Ltd., based in

North Vancouver, prepares to test the latest iteration of one of his best-known inventions. With no fanfare, Nuytten is about to take another wet step into subsea history.

In the middle of the barge, secured in a cage like a monster and suspended from a tall hoist, is a brand-new black-and-gray contraption: a humanoid-on-too-many-steroids-shaped thing with a round acrylic face in a thick steel head. It sports a large metal backpack carrying air tanks and carbon dioxide

PHOTOGRAPHS BY JEN OSSBORNE

scrubbers, along with four semi-enclosed thruster propellers on its sides.

At nearly 2.1 metres tall and 1,400 lb., with arms that end in vice-grip claws, the apparatus looks like it could easily crush a person. But it's designed to do the opposite: to keep any human pilot inside the "cabin" at one atmosphere—the same comfy pressure as on Earth's surface—and from being squeezed to death by the immense pressures of the deep.

At Nuytco, this high-tech husk—made from a once-classified steel alloy used in United States military submarines and only recently permitted for private industry use—is colloquially known as the "Ironsuit." But it's officially named the Exosuit 2000. The "2000" denotes how many feet down the "hard suit," known as an atmospheric diving suit (ADS), will be certified to go underwater.

At that depth, every surface of the suit will be subjected to a pressure of 881.7 pounds per square inch. If the Exosuit 2000 passes a series of progressively deeper open-water tests—Nuytten, on this day, is confident it will—it will be the deepest-diving ADS in the world. Nuytco built it for the Vietnamese navy, which will use it as a rescue asset for a recently purchased submarine with a 2,000-foot collapse depth—the point at which a sub's hull would cave in from water pressure.

Nuytten has described his revolutionary hard suits—the first was built in 1985—as little more than camera cases to protect the "soft meat" inside. Today's soft meat is Vince Galati, 46, Nuytco's test pilot. In previous weeks, the Exo 2000 underwent high-pressure testing inside a "pressure pot" placed inside a five-metre-tall test tank behind Nuytco's facility. Pilotless, it survived testing in conditions that equalled the water pressure at 3,000 feet.

Now, on the barge, the suit is cracked open at the waist and its top hoisted a metre above its bottom. Galati, in blue coveralls and a black hood pulled tight over his head, kicks off his workboots and clambers in awkwardly, socks first. Galati will "fly" the suit using footpads inside the Ironsuit's chunky metal boots; one foot controls movement left and right, the other up and down.

This third-generation ADS doubles the working depth of Nuytten's previous model, the Exosuit 1000, first sold in 2012. Millions of dollars of potential future business with navies, resource companies and research institutions around the world are at stake. Yet, as the open-water tests get under way, Nuytten looks on calmly. He's asked, "Aren't you excited?"

"We've had many, many moments like this," shrugs Nuytten, who cobbled together his first submersible in his 20s from an old

hot-water tank. "They're all exciting. But the real exciting ones are when something doesn't work. That's very exciting."

NUYTCO'S HUMDRUM-LOOKING two-storey office and manufacturing facility in North Vancouver is a short walk from the Vancouver Harbour. Step inside the door, climb the stairs and it's instantly clear that other-worldly things happen here. Hanging from steel lines near the stairwell is a stealthy-looking silver hard-shell diving suit that looks like it could be in the next Bond movie. It's actually the first prototype of an ADS suit Nuytco designed for the U.S. Navy; he's now under contract to build them a much more advanced version.

Canadian Dr. Joe MacInnis, 84, was the first scientist to dive beneath the North Pole in 1974. Still a major figure in subsea exploration and research, he speaks almost poetically about Nuytten's ability to devise technological solutions to the formidable physiological barriers humans face working deep underwater. "I've described him as a kind of Leonardo da Vinci of the underwater world." He is, MacInnis adds, "a man addicted to creativity."

Like the famous inventor, Nuytten had no formal training. As a young boy, he'd visit Vancouver's north-shore shipyards, near where his father worked, and stare down between the pilings. "I became infatuated with looking at different critters every time I could," he



(left) The Exosuit 2000; Nuytten at Nuytco's Vancouver facility with one of his many ADS designs

High on the office walls is a series of poster-sized photos from various moments in Nuytten's life as an underwater adventurer, inventor and businessman. There's a photo of a strapping young Nuytten as a commercial diver, taken in 1963. In another, he's inside his most famous invention, the Newtsuit, which was the precursor to the Exosuits. During his nearly 65-year professional career, Nuytten started a number of subsea technology and construction businesses. From 1997 to 2002, Nuytco provided crews and minisubs to the National Geographic Society's five-year Sustainable Seas Expeditions project, spearheaded by pioneering American marine biologist Sylvia Earle. In 2011, Nuytco started working with NASA and the Canadian Space Agency, training astronauts in a remote B.C. lake and in U.S. waters to pilot the company's DeepWorker minisubs and Exosuits as part of NEEMO (NASA Extreme Environment Mission Operations) in preparation for possible missions to Mars.

says. And, he thought to himself, "One day I'm going to find a way to get down there."

Soon after, a nine-year-old Nuytten raided his father's tool shed for his first attempt at making his own diving equipment. He swiped his dad's welding goggles, popped out the dark lenses and glued in thin, clear plastic sheets cut to shape. He dashed down to English Bay and, with the goggles on, stuck his head underwater between bobbing logs. "That was stupid—I could have got my head smashed in," he laughs now. But the goggles let him see to the bottom. Next came fins. Nuytten filched two handsaws from his exasperated father, unscrewing the wide, toothy blades from their wooden handles. He then taped the saw blades to an old pair of running shoes.

Soon he was swimming around, an unsupervised kid free-diving down to marvel at fish, corals, crabs and other sea creatures in his crude gear. "It was Valhalla," Nuytten recalls.

After his father and mother opened a popular restaurant called the Chilco Grill on the lower floor of their house in 1948, Nuytten, just entering his teens, saved his parents money by spear-fishing lingcod for the menu. (“Delicious fish and chips,” he says.) Later, at Kitsilano Secondary, Nuytten had an unusual problem for a student: “I was making more money than my teachers, just doing underwater salvage work on the side.” If someone’s outboard motor fell off the back of their boat, or fishing nets got caught in propellers, for \$10, \$20 or even \$50, Nuytten was there to dive down and help. In 1957, at 16, Nuytten quit school in Grade 11 to open his own dive shop, Vancouver Divers Supply.

Sixty-four years later, Nuytten is reeling off stories in his office, which is compressed with books, art, carvings and film posters, including *The Abyss* (1989) and *Titanic* (1997), two films by Canadian director James Cameron. Nuytten designed and built a functioning submarine for *The Abyss*. Nuytten’s other company, Can-Dive Construction Ltd., designed and built the propulsion systems for small, camera-toting remotely operated vehicles (ROVs) to film scenes inside the actual Titanic’s ballroom for the opening scenes of that blockbuster. That was no easy feat, with the Titanic plunked 3,840 metres down on the bottom of the Atlantic off Newfoundland.

“Jim,” Nuytten reassured Cameron, “I can guarantee you I’ll get the footage, because we have lots of fibre optic cable for the ROVs. But I can’t be sure our vehicles will come out, because all they have to do is tangle around a table or something and they’ll be screwed. They’ll be there forever.” Cameron told Nuytten to go for it; the ROVs were insured. “Sure enough,” says Nuytten, “four of our ROVs are still stuck inside the Titanic.” They were worth about \$550,000 each.

Can-Dive, a sister company to Nuytco, is Canada’s largest construction diving contractor. Its clients have included the world’s biggest oil companies and, importantly for Nuytten, who sees himself as an environmentalist, organizations such as Greenpeace. Can-Dive specializes in complex, risky marine construction projects around the world: piers, pipelines, underwater surveys, and oil rig construction and servicing. The company’s commercial divers, including Nuytten, have worked in the harshest marine environments on the planet; everything from bashing Pacific storms to ice-clogged Arctic seas.

Vancouver author Vickie Jensen recently

finished writing *Deep, Dark & Dangerous*, a book coming out this fall about British Columbia’s little-known trove of undersea technology innovators, people such as Nuytten and Al Trice, now 92, whose company, Hyco, went on to build a fleet of submersibles for oceanographic research and offshore oil exploration. Jensen says the province’s contribution in the rarefied subsea sector may be well recognized internationally, “but the strange thing to me about all of these guys’ accomplishments—it’s mostly guys, admittedly—is they were never recognized in their own backyard. Almost all of their inventions, all the vehicles they built, all the sonar they pioneered, were for global work.”

Even the Canadian military, Jensen says, tends to contract subsea services and equipment from foreign companies, usually in the U.S., even though B.C. companies like Nuytco have done extensive work with the U.S. Navy and other militaries.

UNLOCKING A DOOR leading to the lower floor of Nuytco’s facility, Nuytten leads a visitor to what turns out to be an ad hoc display of his part in the evolution of commercial diving and deep-sea exploration. There’s an astonishing array of submersibles. There’s a red, 2,000-foot-rated Dual DeepWorker, introduced in 2003. There’s a gleaming, aluminum-grey Exosuit 1000. Costing about US\$1.2 million each, the first unit was delivered in 2012 to a Boston contracting company for use in maintaining New York City’s deep underground freshwater supply infrastructure.

But the pièce de résistance stands alone in a far corner. Nuytten, who has worn hearing aids since suffering dive-related injuries years ago, walks over to it, a fatherly smile on his face. It’s a mustard-yellow Newtsuit, the very first one, and, in its time, the most advanced ADS suit ever made.

Before the Newtsuit, commercial divers wore drysuits and metal helmets, and were usually fed surface-supplied air through a hose. They were subject to water pressure and risked decompression sickness, or “the bends.” It’s a potentially deadly condition that happens when divers breathe compressed air at depths greater than 10 metres and nitrogen gas saturates their tissues. For more than a century, finding a way to make waterproof joints for suits that could withstand deep-sea pressure had repeatedly stumped inventors and engineers. Nuytten started working on the puzzle in 1979, solving and patenting it in

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1982. The Newtsuit’s secret sauce was its slick, cleverly angled 22 rotary joints filled with a viscous oil and using specialized bearings. The Newtsuit proved impervious to deep-water pressure and gave a diver unprecedented dexterity, a critical advancement for the commercial diving industry. It was both safer and cheaper to operate, in part because it eliminated the need for divers to spend hours—even days—of valuable potential work time slowly off-gassing those deadly nitrogen bubbles in expensive on-board decompression chambers.

Over the years, Nuytco sold about 20 Newtsuit systems, some to various navies that use them as their standard sub-rescue asset. They’ve also been used for scientific research, treasure hunting, photographic surveys, marine salvaging, archeology and deep-sea oil-and-gas development.

NUYTEN TAKES HIS visitor to another nearby building he leases. With a click, yet another aspect of Nuytten’s life is suddenly illuminated: a collection of carvings, masks and totem poles in various states of creation or restoration. Most are in the distinctive style of the Kwakwaka’wakw people of B.C.’s Northwest Coast. Nuytten carved many himself.

His interest in Indigenous art sprouted even before he became aware of his own heritage; he’s Métis on his father’s side. Growing up near Vancouver’s Stanley Park, Nuytten often gazed at the totem poles in wonder. “I



curator, impressed with the 11-year-old's persistence, coughed up a name: Ellen Neel, a master carver living in Vancouver.

Soon after, Nuytten's father drove him to Neel's house, where he began taking carving lessons on Saturdays and summer holidays. Through his study under her, Nuytten met other rising First Nation artists, including Amos Dawson. He became so ingrained in Kwakwaka'wakw culture that he was formally adopted in his 20s by the Dawson family and became part of Village Island's Mamalilikulla band.

Nuytten clearly learned well from his apprenticeship with Neel. Walking through his "junk" rooms, he stops by a table with a metre-long Kwakwaka'wakw-style carving he made of a red snapper with a grey face, copper eyes and black lips. As Nuytten tugs a hidden string, its dorsal fin arches up. The carving is a wearable "back-piece." Years ago, Nuytten was bestowed an "everyday" name by the

(left) Nuytten built his first hard suit in 1985 and has been improving on it ever since; (below) in his office with one of his carvings



remember them from virtually when I was a baby in a buggy. They were big, monstrous things." When he was just three or four years old, he informed his mother he wanted to learn to carve totems himself.

A precocious kid, Nuytten went on his own to the Museum of Vancouver, which houses a large collection of Kwakwaka'wakw art. He knocked on the curator's door and asked for the names and addresses of Indigenous artists. Nuytten hoped he could convince an artist to teach him carving. Eventually, the

Kwakwaka'wakw people: Tlax'wsam (pronounced "Tlock-sum"), meaning red snapper. When COVID-19 fades, Nuytten plans to wear the back-piece at a future potlatch.

Bill Cranmer, a Kwakwaka'wakw chief in Alert Bay, B.C., plays a leading role in repatriating artifacts confiscated from his people by the Canadian government in 1922, when Indian agents stopped a potlatch held by Cranmer's father, chief Dan Cranmer, and arrested and jailed people for dancing and making speeches. (Potlatches had been made illegal

in an attempt to assimilate Northwest Coast First Nations.) Cranmer has known Nuytten for decades. Nuytten visits Alert Bay as much as he can and has helped Cranmer and the village's U'mista Cultural Centre identify and find some of the works missing from what's known as the Potlatch Collection. "He's also made replicas of some pieces from old drawings and old carvings that were deteriorating," says Cranmer. "We have many good friends like Phil helping us to save our history."

BACK ON THE barge, after a few dips without a pilot, Galati is sealed into the Exo 2000 and lowered back into the shallow water. As a crew member monitors every move and function on flat screens inside a control room set up on the barge, Galati submerges in a boil of bubbles and takes the suit on an hour-long test swim. Other than a moment when Galati lost his way in the low-visibility water and went under the barge, risking a bump to the suit's metal head, the Ironsuit passed its first tests. A few days later, Galati took it on a much deeper dive off Bowen Island in Howe Sound, where the sea bottom can be 800 feet or more.

Insurance officials from Lloyd's of London joined the Nuytco crew for the final open-water tests in mid-April. The Exosuit 2000 has now been certified for use, and it and the supporting hardware that goes with it are nearly ready for shipment to Vietnam.

Next on Nuytten's long to-do list are even more fanciful ideas. He and his companies have been involved in making numerous documentaries and TV series, such as the Discovery Channel's *Deadliest Catch*. Recently, a British production company approached him about making a documentary involving a diver in an Exosuit walking the 13 km across the bottom of the Straits of Tiran. Archeologists believe the bottom, up to 290 metres deep and lying between the Sinai and Arabian peninsulas, could hold artifacts related to the Biblical story of Moses parting the Red Sea. And one of Nuytten's more extreme ideas, Vent Base Alpha—a permanent human colony 5,000 feet down at the bottom of the Strait of Juan de Fuca and powered by the 370° C heat spurting from geothermal vents there—"is still on my bucket list," he says.

For Nuytten, inventing is his addiction. Unlike smoking and drinking, both of which he gave up on the same day 27 years ago, he just can't quit it. "To this day, even this morning, I do endless drawings of ideas," he says. "Most turn out to be not as good as I thought they were. But the few that do turn out to be good are usually very good. At least for the things I need them for." ♦