

# Stealing White

## How a corporate spy swiped plans for DuPont's billion-dollar color formula

By Del Quentin Wilber | February 4, 2016



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There's white, and then there's the immaculate ultrawhite behind the French doors of a new GE Café Series refrigerator. There's white, and then there's the luminous-from-every-angle white hood of a 50th anniversary Ford Mustang GT. There's white, and then there's the how-white-my-shirts-can-be white that's used to brighten myriad products, from the pages of new Bibles to the hulls of superyachts to the snowy filling inside Oreo cookies.

All this whiteness is the product of a compound known as titanium dioxide, or  $\text{TiO}_2$ . A naturally occurring oxide,  $\text{TiO}_2$  is generally extracted from ilmenite ore and was first used as a pigment in the 19th century. In the 1940s chemists at DuPont refined the process until they hit on what's widely considered a superior form of "titanium white," which has been used in cosmetics and plastics and to whiten the chalked lines on tennis courts. DuPont has built its titanium dioxide into a \$2.6 billion business, which it spun off as part of chemicals company Chemours, in Wilmington, Del., last fall.

A handful of other companies produce TiO<sub>2</sub>, including Kronos Worldwide in Dallas and Tronox of Stamford, Conn. Chemours and these others will churn out more than 5 million tons of TiO<sub>2</sub> powder in 2016. China also produces large amounts of the pigment, and its industries consume about a quarter of the world's supply. Most of China's TiO<sub>2</sub> plants, however, use a less efficient and more hazardous process than the one developed at DuPont. Starting in the 1990s, if not earlier, China's government and Chinese state-run businesses began seeking ways to adopt DuPont's methods. Only they didn't approach the company to make a formal deal. According to U.S. law enforcement officials, they set out to rip off DuPont.

"It's about stealing something you can make a buck off of. It's part of a strategy to profit off what American ingenuity creates"

"At first, you're like: Why are they stealing the color white? I had to Google it to figure out what titanium dioxide even was," says Dean Chappell, acting section chief of counterespionage for the FBI. "Then you realize there is a strategy to it." You can't even call it spying, adds John Carlin, the assistant attorney general in charge of the U.S. Department of Justice's national security division. "This is theft. And this—stealing the color white—is a very good example of the problem. It's not a national security secret. It's about stealing something you can make a buck off of. It's part of a strategy to profit off what American ingenuity creates."

Most trade-secret theft goes unreported. Companies worry that disclosing such incidents will hurt their stock prices, harm relationships with customers, or prompt federal agents to put them under a microscope. Theft of trade secrets also rarely results in criminal charges because the cases are time-consuming and complicated, and it's often difficult to win a conviction for conspiracy to commit espionage. A 2013 study estimated that China accounted for as much as 80 percent of the \$300 billion in losses sustained by U.S. companies from the theft of intellectual property. Often, China won't even release the records or serve the subpoenas that might contribute to a prosecution. To win in court, companies must prove they properly safeguarded their trade secrets, something many fail to do.

DuPont/Chemours does shield its titanium dioxide process. Guards patrol its plants, which are surrounded by tall fences. Visitors have to be escorted and are forbidden from taking photographs. Documents and blueprints must be signed out, bags inspected. Employees sign confidentiality agreements and are relentlessly drilled on protecting proprietary information. Work is compartmentalized so that few employees have access to everything in a plant. The company vets all its contractors.

Even so, as documents and testimony in a 2014 federal trial in San Francisco reveal, a naturalized American citizen, business owner, and technology consultant named Walter Liew stole DuPont's protocols for producing its superior titanium white from 1997 through 2011. He even took blueprints for a factory and used the information to win contracts worth almost \$30 million. FBI agents and federal prosecutors now consider the Liew case a watershed in their understanding of Beijing's pursuit of U.S. intellectual property. Liew's defenders say the U.S. targeted a hardworking, resourceful entrepreneur to protect the bottom line of a massive U.S. corporation—that DuPont was less victim than aggressor, recruiting law enforcement to stifle competition.

Titanium dioxide arrives at DuPont's plant embedded in rock and must be separated out and refined. When DuPont first produced the pigment, it relied on a crude, messy method known as the sulfate batch process. By the late 1940s, however, DuPont's engineers had developed a more efficient approach: the chloride route.

The basics are public knowledge. First, the ore is fed into a large ceramic-lined vessel—the chlorinator. There it's mixed with coke (pure carbon) and chlorine and heated to at least 1,800F. "The material inside here resembles lava. This is like running a big volcano," Daniel Dayton, a former top executive at DuPont, told jurors about the chlorinator in 2014. (Chemours and DuPont declined to comment for this story.)

Hot gas in the chlorinator gets piped out and condensed into a new compound called titanium tetrachloride, or "tickle," as engineers call it. The tickle is heated again, subjected to various purifying chemical reactions, and cooled. Now a yellowish liquid, the tickle is inserted into a second vessel, called the oxidizer. It's again heated to very high temperatures and mixed with oxygen; the reaction knocks the chlorine molecule off the titanium, and two oxygen molecules attach to the titanium in its place. The resulting particles are so fine that the white stuff has the consistency of talcum powder.

Other companies have developed chloride-route processes, but Chemours's is considered the best. Company executives have said they spend \$150 million a year to improve the procedure, even if it's just to boost production by 1 percent. The company has "a particular way of combining things that are proprietary and nonproprietary and make it work," Assistant U.S. Attorney Peter Axelrod told jurors in 2014. "And that process, that system, that technology, is what the Chinese government and the state-owned entity wanted," he added, referring to a company we'll come to in a moment. To get this info, they relied on Liew.

Now 58, Liew appears in photographs to be a short, slim man with a youthful, bespectacled face, big ears, and parted dark hair. According to friends, associates, and reams of trial testimony and interviews with U.S. law enforcement officials, Liew was successful but didn't feel successful enough. He was a charmer who could quickly exploit someone's weaknesses and a compulsive diarist. He kept thousands of pages of notes and records that were eventually used against him in court.

Of Chinese heritage, Liew was born in Malaysia in August 1957. He grew up poor, the second-youngest of nine children of a subsistence farmer. He sold ice cream on the side of the road. "We were busy day and night," Pong Chiyu, a brother-in-law, wrote to a federal judge on Liew's behalf. "Life was tough, but Walter Liew was still very hardworking in his studies."

Liew excelled at school and traveled overseas to earn his college degrees—a bachelor's from Taiwan University and a master's in electrical engineering in 1982 from the University of Oklahoma. He worked for Hewlett-Packard before starting a technology consulting firm in 1989, fulfilling a personal dream. "Walter's ambition really was to be more than a midlevel engineer," Stuart Gasner, his lawyer, told jurors. "He wanted to make money. He wanted to have his own business and what that entails." In 1991, at 34, he married a

Chinese woman named Christina (it was a second marriage for both), and they became naturalized U.S. citizens before the decade was through.

The same year he married, Liew was invited to a banquet in Beijing at which government officials thanked him for being a “patriotic overseas Chinese.” According to FBI agent Kevin Phelan, who supervised the investigation of Liew, “the banquet became his calling card.” In a 2004 letter to win a titanium dioxide contract from a Chinese company, Liew described meeting at the banquet Luo Gan, then the secretary general of the state council, Beijing’s top policymaking body. Luo provided him with “directives so that I would better understand China and continue to make contributions to her,” Liew wrote.

As Axelrod, the federal prosecutor, later put it in court: “Mr. Luo provided Mr. Liew with directives. And those directives, through Chinese agencies, included key task projects for the benefit of the Chinese government. Chief or key among those was the development of chloride-route TiO<sub>2</sub> technology. And with Mr. Luo’s directives to Mr. Liew, so began a 20-year course of conduct of lying, cheating, and stealing.”

Liew didn’t respond to letters seeking comment, and messages left with his wife weren’t returned. Gasner said in a statement, “Walter Liew is a small-business man who took on an ambitious project and ran head on into two powerful forces, the DuPont Corporation and a federal government, eager to find economic espionage where China is involved.”

In the mid-’90s, Liew established ties with Chinese corporations and officials and landed a contract to design a plant in Zhuzhou, producing acrylic resin, a paint additive. The plant was built—a genuine success for Liew. As his work on the project wound down, he turned to TiO<sub>2</sub>. It’s not clear why he did so. Most likely, U.S. law enforcement officials say, Liew realized the money was too good to pass up. “There is a much bigger, long-term payday in titanium dioxide,” Phelan says. “He knew that.”

In 1997, Liew and two American associates met with executives for a steel company in Chengde, an industrial city northeast of Beijing, that was seeking to build a titanium dioxide plant. Liew knew little about the substance, but he was confident in his ability to navigate what had been billed as an introductory get-to-know-you session.

When Liew and his partners entered the conference room, they were shocked to face 50 of the company’s engineers, who peppered them with detailed questions they couldn’t answer. One of the Americans, Michael Marinak, a chemical engineer by training who had been consulting with Liew since 1993, watched the fiasco with growing dread, he says in an interview. He pulled Liew aside and told him they needed to end it immediately, if they hoped to escape with their reputations.

Determined never to be embarrassed in that way again, Liew and his associates went online and began searching for those who knew something about DuPont’s chloride-route process. They found Tim Spitler, a 49-year-old former DuPont engineer living in Reno, Nev. In October 1997, Liew, his wife, and Marinak piled into a small car and drove from Oakland, Calif., to Reno to pay him a visit.

The four met in a hotel room and later had dinner. Marinak doesn't recall much about the meeting, he says, because he was battling a painful blood clot in his leg. FBI reports of interviews with Spitler are somewhat contradictory in describing what transpired. (Spitler, who had been expected to testify at Liew's trial, killed himself in early 2012, not long after Liew and his wife were arrested.)

The DuPont (Chemours) Edge Moor plant is an approximately 115-acre pigment manufacturing facility in Edgemoor, Del., just east of Wilmington.

Photographer: Jim Graham/Redux

According to the FBI documents, the relationship between Liew and Spitler lasted for years. Liew flattered Spitler, who was bitter about DuPont's business strategies and its decision in the '90s to fire thousands of employees. Spitler also admitted to agents that he felt insecure about not having attended a top university (he got a degree from Tri-State University in Angola, Ind.) and was constantly worried about losing his job. Liew made Spitler feel valued and understood. He sent him a gift basket every Christmas, the FBI reports show, and helped pay for the funeral of Spitler's daughter, who'd committed suicide in 2006. When Spitler would call to thank Liew for his generosity, the businessman would steer the conversation to business and titanium dioxide.

Spitler provided Liew with information about DuPont's processes—even sketches of key components—and allowed him to root through boxes in his house and take whatever records he found. Spitler told federal agents that Liew paid him \$15,000 for DuPont-related documents, including a blueprint to a plant in Delaware. The schematics provided details of flow rates, pipeline sizes, temperatures, and chemical compositions. As such, it was considered one of DuPont's most critical trade secrets, U.S. law enforcement officials contend, and Liew used the documents to prove his bona fides to Chinese executives.

Spitler told agents that he cautioned Liew that building a titanium dioxide factory was a difficult undertaking. "Even with the best technology with stolen prints, but without startup people and maintenance expertise, the plant won't be successful," he warned Liew in a 2000 phone call, according to Liew's own notes of the conversation.

Liew kept an eye out for other former DuPont engineers and, through Internet searches, turned up a company in Wilmington that referred such workers to new employers. Liew arranged interviews and soon was sitting across from Robert Maegerle in a Wilmington office in 1997. Maegerle, then 62, was a balding and paunchy retired mechanical engineer who'd worked at DuPont for 35 years, starting in 1956 as an intern, not long after the company had begun using the chloride-route process. Maegerle had specialized in titanium dioxide.

Like Spitler, he wasn't pleased with some of DuPont's business decisions, trial testimony showed. He expressed frustration at DuPont's abandonment of a potential titanium dioxide project in South Korea on which he'd been a top engineer. Not long after his interview in Wilmington, Maegerle began consulting for Liew. His work accelerated as Liew began competing for a contract to overhaul a relatively small plant in Liaoning province in northeastern China for Pangang Jinzhou, a subsidiary of the enormous state-run Pangang

Group. (Calls and a fax seeking comment from Pangang Group weren't returned. Messages left with the Chinese Embassy in Washington were also not returned.)

"My company has possession and mastery of the complete DuPont way of titanium white by chlorination"

In 2004, Liew sent a letter to Hong Jibi, chairman of Pangang Group, explaining why his company should be considered for the work. "DuPont has the most advanced white by chlorination technology, but DuPont's technology has always been highly monopolized, and absolutely not transferable," he wrote. "After many years of follow-up research and application, my company has possession and mastery of the complete DuPont way of titanium white by chlorination."

Over the course of winning this contract and another from Pangang Group, Liew showed Chinese executives Spitler's blueprints and other sensitive documents. In July 2008, as he was seeking another contract, this one to design a far larger titanium dioxide plant in Chongqing, a sprawling city in southwest China, he provided photographs he'd obtained from Maegerle of DuPont equipment. According to trial testimony, Liew and his wife met with Pangang executives in Beijing and explained how they would build the plant, claiming they had a 16-member team well-versed in making titanium dioxide. That was clearly an exaggeration. Except for Maegerle, none of Liew's employees had a background in producing the color white. Several had been hired through Craigslist. One told investigators his education on titanium dioxide initially consisted of reading Wikipedia.

As they assembled their proposal for Pangang Group, Maegerle fed Liew details from a 407-page manual known as the "basic data document" for DuPont's titanium dioxide plant in Kuan Yin, Taiwan. The document contains much of the information needed to build a plant, and DuPont engineers would later uncover more than 120 instances in which their former employee provided the document's details to Liew, according to trial testimony. In a brief letter from prison, Maegerle declined to comment for this story.

The pair's scheming paid off. In May 2009, Liew's company won a \$17.8 million contract to help design the large titanium dioxide plant in Chongqing. In just a few years, Liew had won at least three contracts from Pangang Group valued at \$28 million.

Liew didn't spend it, though. He continued to live in a modest rented house on a cul-de-sac in the hills of Orinda, Calif., about a 30-minute drive from San Francisco. Two of his few extravagances were a maroon Mercedes SUV and a luxurious condominium in Singapore, U.S. law enforcement officials say. "We didn't find any Picassos or anything," says Phelan, the FBI agent. "He was living a very upper-middle-class life."

Liew was wiring most of his proceeds, about \$17 million, overseas. U.S. officials have no idea where that money went or how it was spent.

In January 2009, Liew's company, Performance Group, declared bankruptcy. He claimed just \$4.78 million in revenue from 2006 to 2010, and his companies (Performance Group changed names twice) paid about \$4,000 in taxes. Federal investigators would later determine Liew owed the U.S. government at least \$6 million in back taxes.

In 2009, Pangang Group hired a consultant, a retired DuPont engineer who ran his own firm, to review Liew's work. That engineer, Tze Chao, now 81, had previously provided Pangang Group with DuPont trade secrets, and his job was to ensure that Liew's plans were feasible and contained actual DuPont information, U.S. officials say. Chao added some trade secrets of his own to his report. He later pleaded guilty in federal court to one count of economic espionage; he has yet to be sentenced.

Pangang Group also hired the well-respected Australian consulting firm TZ Minerals International to check Liew's plans. A review by such consultants is typically conducted to protect companies from ending up in legal disputes over the use of proprietary information. However, U.S. law enforcement officials say, Pangang Group had the opposite motive: to confirm that Liew was providing real DuPont plans and processes.

The consultants warned Pangang Group that Liew's company was providing "chlorination technology" that "originates with DuPont," the firm wrote in a report, and recommended seeking "further legal counsel."

Pangang Group ignored the advice, or more likely its executives were pleased to know they were getting the real deal, U.S. law enforcement officials say. But the discovery apparently concerned a top TZMI consultant. He contacted DuPont and told the chemical giant about Liew's firm. His alert came to the attention of Connie Hubbard, DuPont's competitive-intelligence manager, whose job was to coordinate information-sharing among officials in the company and to watch for threats to DuPont's business. TZMI declined to comment.

## It's Not Paranoia If ...

1

Six Chinese nationals were indicted in 2013 on charges of conspiring to steal trade secrets from several U.S.-based seed manufacturers.

2

Five Chinese military officers were indicted in 2014 on charges of hacking the computers of U.S. companies and a trade union to obtain trade secrets. They remain at large.

3

A Chinese businessman was charged in 2014 with hacking into Boeing's computers to steal information about U.S. military aircraft and systems.

4

A 62-year-old former employee of PPG Industries, a supplier of manufacturing materials, was charged in May 2015 with stealing the company's secrets and passing them to a glass company in China. He killed himself a month later.

5

Six Chinese citizens, including two university professors, were charged in May 2015 with stealing sensitive mobile phone technology from two U.S. companies and sharing it with the Chinese government.

Hubbard saw that Liew's company was boasting on its website that it had "extensive hands-on experience in fine chemicals" and that its experts have "many years of working experiences from" Dow, DuPont, Rohm & Haas, Chevron, and others. DuPont's lawyers sent Liew a stern letter, asking him to explain how his company had come to master the chloride-route process. Liew never replied, though his website soon dropped references to DuPont's technology. In August 2010, DuPont received its second warning about Liew. An anonymous letter claimed that he and one of his employees had "embezzled Titanium Technology from US Company" and sold it to China. To this day, DuPont executives and FBI agents don't know who sent the letter.

Within a few months, DuPont filed a lawsuit accusing Liew of stealing its trade secrets. It also called the FBI. In July 2011 the agency raided Liew's home and offices in California, as well as Maegerle's home in Delaware. During the search of Liew's home, an agent found Christina Liew's purse in the kitchen. In it were several keys, including one to a safe-deposit box. When an agent approached Christina with the key, a Chinese-speaking agent overheard her husband tell her, "You don't know, you don't know." Christina told the agent she didn't know anything about the key.

A few minutes later, she asked if she could leave the house to get breakfast, and agents were happy to oblige. They trailed her to an Oakland bank, where they later used the key in her purse to unlock the couple's safe-deposit box, revealing a stash of incriminating files. After visiting the bank, she drove to a run-down motel, where agents spotted her meeting with several Chinese men who were later identified as Pangang Group executives. The FBI raided the motel and recovered records linking the executives from Pangang Group to the Chinese government.

In 2014, Liew was [convicted](#) of economic espionage, possession of trade secrets, and tax fraud in federal court and has begun serving a 15-year sentence in prison. He's appealing the verdict. Gasner, who represented Liew at trial, maintains that DuPont overstated what Liew shared about its methods, saying they're "commonplace in the titanium dioxide industry." Maegerle was convicted as an accomplice; he's been sentenced to two and a half years for conspiring to sell trade secrets, attempting to steal trade secrets, and conspiring to obstruct justice. In September 2015, Christina Liew, who had pleaded guilty to tampering with evidence, was sentenced to three years of probation.

In China, meanwhile, the Chongqing plant remains unfinished, as far as anyone in the U.S. knows. A smaller plant, in Jinzhou, is operational and is widely believed to use DuPont processes. The Justice Department has charged executives of Pangang Group and three subsidiaries with conspiring to commit economic espionage but has not been able to serve the defendants with an indictment. In a final twist, the Chinese may have gotten what they needed directly from the chemical company. Newly filed court documents reveal that the FBI motel raid found evidence DuPont's computers had been hacked.

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