

August 4, 2015

A loyal reader asked for some good news. [Discovery.com](#) has the first piece. Seems one disgusting American swamp filled with pestilence, is sinking and someday will disappear. We allude to Washington, DC.

Twelve feet of sea-level rise -- right in the middle of several forecasts that report Antarctic glaciers are starting to collapse -- would push water up to the steps of the Jefferson Memorial. A new study finds the region will also sink 6 inches, due to natural forces, in the next 100 years.

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More good news, this time from [Glenn Reynolds](#) of Instapundit. In his USA Today column this week he compliments the administration for the stance they have taken on occupational licensing.

Last week, I wrote in these pages about how politicians use regulation and licensing to protect their supporters from competition at the expense of the public welfare.

A few days later, the White House essentially endorsed this point with a new report on how occupational licensing hurts the economy, and in particular the working poor. This isn't a new point, of course. Libertarians (like me) have been making it for decades, and the Institute For Justice, a libertarian public-interest law firm, has been suing on behalf of licensing's victims for many years. But it's one thing for libertarian economists and lawyers to argue for a position, and it's another for it to be endorsed by a Democratic White House.

The White House report, entitled Occupational Licensing: A Framework for Policymakers, raises some important points. First, "more than one-quarter of U.S. workers now require a license to do their jobs, with most of these workers licensed by the states. The share of workers licensed at the state level has risen fivefold since the 1950s." Where a license used to be required only for unusual jobs, now licensing requirements take up a major part of the employment sphere — and not just for physicians, but also for florists or funeral attendants. ...

[NY Times](#) brings more good news with a well reasoned and written article on "The Myth of Big Bad Gluten."

As many as one in three Americans tries to avoid gluten, a protein found in wheat, barley and rye. Gluten-free menus, gluten-free labels and gluten-free guests at summer dinners have proliferated.

Some of the anti-glutenists argue that we haven't eaten wheat for long enough to adapt to it as a species. Agriculture began just 12,000 years ago, not enough time for our bodies, which evolved over millions of years, primarily in Africa, to adjust. According to this theory, we're intrinsically hunter-gatherers, not bread-eaters. If exposed to gluten, some of us will develop celiac disease or gluten intolerance, or we'll simply feel lousy.

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Is this enough time to adapt? To answer that question, consider how some populations have adapted to milk consumption. We can digest lactose, a sugar in milk, as infants, but many stop producing the enzyme that breaks it down — called lactase — in adulthood. For these “lactose intolerant” people, drinking milk can cause bloating and diarrhea. To cope, milk-drinking populations have evolved a trait called “lactase persistence”: the lactase gene stays active into adulthood, allowing them to digest milk.

Milk-producing animals were first domesticated about the same time as wheat in the Middle East. As the custom of dairying spread, so did lactase persistence. What surprises scientists today, though, is just how recently, and how completely, that trait has spread in some populations. Few Scandinavian hunter-gatherers living 5,400 years ago had lactase persistence genes, for example. Today, most Scandinavians do.

Here’s the lesson: Adaptation to a new food stuff can occur quickly — in a few millenniums in this case. So if it happened with milk, why not with wheat? ...

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The neighborhood dentist seems far removed from the upper echelons of medicine, someone who comes in for a few minutes at the end of a cleaning to check your teeth and ask about your kids, occasionally doing a filling or root canal. No doubt these services are critical to patients and our overall health, but some might be surprised to learn that a dentist could afford to spend \$50,000 on a hunting expedition.

It turns out, however, that dentists are quite well paid. According to official government statistics, the median dentist in the U.S. in 2012 earned \$149,310 per year. But that median figure obscures variation around the country and among dentists with different specialties. In some high-priced cities, dentists make a lot of money with non-medical, cosmetic procedures from teeth whitening to botox. And according to the American Dental Association, the average dental specialist earned \$283,900 in 2013.

Dentists in some places are so well compensated that they earn more than the average doctor. According to a 2012 report in The Journal of the American Medical Association, the average hourly wage of a dentist in America is \$69.60 vs. \$67.30 for a physician. As recently as 1996, dentists were making less than doctors. Meanwhile, the average general dental practitioner took in \$181,000 in 2013, according to the dental association, compared to \$175,000 for a family doctor, according to WebMD Medscape’s annual compensation report. ...

And if you've been wondering how the Mexican Sinaloa cartel digs mile long tunnels, The New Yorker has answers.

At 8:52 P.M. on July 11th, Joaquín Guzmán Loera, the drug kingpin known as El Chapo, sat on the bed of his cell in Altiplano, Mexico's only super-maximum-security prison. Surveillance footage appears to show a small screen glowing on a table nearby—inmates are not allowed cell phones, but this rule is not always enforced. Guzmán changed his shoes, walked to a shower area in the corner of the cell, and knelt behind a waist-high concrete partition, out of view of security cameras. Six seconds later, he was gone.

A rough-edged opening, about twenty inches square, had been cut into the floor. According to Mexico's national-security commissioner, Guzmán climbed into the hole and down a ladder, entering a 4,921-foot-long tunnel. Fluorescent lights hung from a ceiling-mounted PVC pipe, which also brought fresh air into the passageway. Metal tracks had been bolted to the ground, allowing an ad-hoc vehicle—a railcar rigged to the frame of a small motorcycle—to be driven from one end of the tunnel to the other. The gray stone walls, about thirty inches apart, were scored with jagged marks made by electric spades; Guzmán's shoulders probably brushed the walls as he passed.

The tunnel ended beneath a small cinder-block house in an open field. As Guzmán climbed a wooden ladder toward ground level, he passed the evidence of what seemed to be a months-long engineering project: a generator, which had powered the tools that workmen used to build the tunnel; a heavy-duty electric winch, to lower machinery into the pit; gallons of hydraulic fluid; coils of steel mesh.

Guzmán's method of escape should have surprised no one. Last year, in Culiacán, he evaded Mexican marines by disappearing into a network of subterranean passageways connecting seven houses. He did not invent smuggling tunnels—bank robbers, rumrunners, and guerrillas had used them for decades—but his criminal enterprise, the Sinaloa drug cartel, built the first cross-border narcotúnel, in 1989. Since then, Sinaloa has refined the art of underground construction and has used tunnels more effectively than any criminal group in history.

In the past quarter century, officials have discovered a hundred and eighty-one illicit passages under the U.S.-Mexico border. Most have been short, narrow "gopher holes" just big enough for a person to crawl through. Sinaloa specializes instead in infrastructural marvels that federal agents call supertunnels. Agents estimate that a single supertunnel takes several months and more than a million dollars to build. Many include elevators, electric lights, ventilation ducts, and cleverly disguised entry and exit shafts. They can reach as deep as seventy feet, and they tend to be tall enough for an adult to walk or ride through. ...



Discovery

Washington D.C. Is Sinking

by Paul Heltzel

Twelve feet of sea-level rise -- right in the middle of several forecasts that report Antarctic glaciers are starting to collapse -- would push water up to the steps of the Jefferson Memorial. A new study finds the region will also sink 6 inches, due to natural forces, in the next 100 years.

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The nation's capital will drop 6 inches in the next 100 years, finds a new study. And faced with sea-level rise, it's likely Washington will see significant flooding throughout the city as global sea-level rise is projected to reach 3 feet by 2100. According to a report from [Climate Central](#), Washington will see record flooding due to climate change by 2040, affecting 1,350 acres of land and 1,400 people in 400 homes.

"Right now is the time to start making preparations," said Ben DeJong of the University of Vermont, the lead author of the study, in a statement. "Six extra inches of water really matters in this part of the world." DeJong was part of a team including scientists from the U.S. Geological Survey, Utah State, Berkeley and Imperial College in London.

This natural phenomenon, unlike human-driven climate change, is called forebulge collapse.

During the last Ice Age, the researchers write, a vast North American ice sheet pushed underlying mantle rock outward, south of Long Island, N.Y which drove upward the land under the Chesapeake Bay.

About 20,000 years ago, the ice sheet started melting, and the forebulge began sinking.

The researchers obtained their data by drilling 70 boreholes, some 100 feet deep, in the Blackwater National Wildlife Refuge, on the Eastern Shore. Sediment cores, combined with LiDAR and GPS data helped create 3-D modeling of the area. The data shows that the area is beginning to sink and will continue to do so for thousands of years.

"It's a bit like sitting on one side of a water bed filled with very thick honey," DeJong said. "Then the other side goes up. But when you stand, the bulge comes down again."

USA Today

[White House leans right on licensing](#)

Recent report on occupational licensing costs echoes libertarians.

by Glenn Reynolds



A florist at work.

[Last week](#), I wrote in these pages about how politicians use regulation and licensing to protect their supporters from competition at the expense of the public welfare.

A few days later, the White House [essentially endorsed](#) this point with a new report on how occupational licensing hurts the economy, and in particular the working poor. This isn't a new point, of course. Libertarians (like me) have been making it for decades, and the [Institute For Justice](#), a libertarian public-interest law firm, has been [suing](#) on behalf of licensing's victims for many years. But it's one thing for [libertarian economists](#) and lawyers to argue for a position, and it's another for it to be endorsed by a Democratic White House.

The White House report, entitled [Occupational Licensing: A Framework for Policymakers](#), raises some important points. First, “more than one-quarter of U.S. workers now require a license to do their jobs, with most of these workers licensed by the states. The share of workers licensed at the state level has risen fivefold since the 1950s.” Where a license used to be required only for unusual jobs, now licensing requirements take up a major part of the employment sphere — and not just for physicians, but also for florists or funeral attendants.

Many of the jobs subject to licensing are the sort of [entry-level or near-entry level jobs](#) traditionally occupied by poor people trying to better themselves. Forcing them to undergo testing, apprenticeships, etc., in order to occupy these jobs makes bettering themselves much harder, reducing social mobility.

Though the licensing requirements are supposedly for the protection of the public, the report notes that they [vary wildly](#) from state to state, which suggests that they’re more about protecting existing businesses from competition, or generating licensing fees for the states, than about consumer welfare. As the report notes, “Empirical work suggests that licensed professions’ degree of political influence is one of the most important factors in determining whether states regulate an occupation.”

In fact, when a profession is licensed, the number of practitioners [falls](#) — so we have fewer jobs — while prices for consumers increase, though the quality of services does not. Like any cartel, licensing is good for the insiders — the people already in the profession, with licenses, and the bureaucrats who regulate them — and bad for everyone else, both consumers and people who would like to work in the field but can’t afford to meet the licensing requirements (which, remember, [don’t actually](#) make them any better at their jobs).

Licensing also [limits mobility](#) across state lines: You might have put in years of time and effort to get a license in your home state, but if you want to move to another you might have to start over at square one, or at least sit for an exam and pay a (often steep) fee. Making it harder for people to move promotes economic stagnation, something we have quite enough of already.

The White House report is a good start, but for anything to change we need to see legislative action. [Sometimes](#), the courts will strike down particularly egregious state barriers, but only in worst-case scenarios. If anything is to be done, it will probably take action by the states — which [could be difficult](#) to achieve, as entrenched interests try hard to block such changes — or by Congress.

There’s no question that Congress, under the Constitution, has the power to ban state protectionism via its powers under the [Commerce Clause](#) and the [14th Amendment](#). In fact, [controlling state protectionism](#) was one of the main reasons the Constitution was originally adopted. We now have a [Republican](#) House and Senate that purport to stand up for small businesses and entrepreneurs, and a White House report that would provide bipartisan justification for such action. Will Congress do its part? Or, when it comes to promoting opportunity, is it all just talk?

Glenn Harlan Reynolds, a University of Tennessee law professor, is the author of The New School: How the Information Age Will Save American Education from Itself.

NY Times

The Myth of Big, Bad Gluten

by Moises Velasquez-Manoff

AS many as one in three Americans tries to avoid gluten, a protein found in wheat, barley and rye. Gluten-free menus, gluten-free labels and gluten-free guests at summer dinners have proliferated.

Some of the anti-glutenists argue that we haven't eaten wheat for long enough to adapt to it as a species. Agriculture began just 12,000 years ago, not enough time for our bodies, which evolved over millions of years, primarily in Africa, to adjust. According to this theory, we're intrinsically hunter-gatherers, not bread-eaters. If exposed to gluten, some of us will develop celiac disease or gluten intolerance, or we'll simply feel lousy.

Most of these assertions, however, are contradicted by significant evidence, and distract us from our actual problem: an immune system that has become overly sensitive.

Wheat was first domesticated in southeastern Anatolia perhaps 11,000 years ago. (An archaeological site in Israel, called Ohalo II, indicates that people have eaten wild grains, like barley and wheat, for much longer — about 23,000 years.)

Is this enough time to adapt? To answer that question, consider how some populations have adapted to milk consumption. We can digest lactose, a sugar in milk, as infants, but many stop producing the enzyme that breaks it down — called lactase — in adulthood. For these “lactose intolerant” people, drinking milk can cause bloating and diarrhea. To cope, milk-drinking populations have evolved a trait called “lactase persistence”: the lactase gene stays active into adulthood, allowing them to digest milk.

Milk-producing animals were first domesticated about the same time as wheat in the Middle East. As the custom of dairying spread, so did lactase persistence. What surprises scientists today, though, is just how recently, and how completely, that trait has spread in some populations. Few Scandinavian hunter-gatherers living 5,400 years ago had lactase persistence genes, for example. Today, most Scandinavians do.

Here's the lesson: Adaptation to a new food stuff can occur quickly — in a few millenniums in this case. So if it happened with milk, why not with wheat?

“If eating wheat was so bad for us, it's hard to imagine that populations that ate it would have tolerated it for 10,000 years,” Sarah A. Tishkoff, a geneticist at the University of Pennsylvania who studies lactase persistence, told me.

For Dr. Bana Jabri, director of research at the University of Chicago Celiac Disease Center, it's the genetics of celiac disease that contradict the argument that wheat is intrinsically toxic.

Active celiac disease can cause severe health problems, from stunting and osteoporosis to miscarriage. It strikes a relatively small number of people — just around 1 percent of the population. Yet given the significant costs to fitness, you'd anticipate that the genes associated with celiac would be gradually removed from the gene pool of those eating wheat.

A few years ago, Dr. Jabri and the population geneticist Luis B. Barreiro tested that assumption and discovered precisely the opposite. Not only were celiac-associated genes abundant in the

Middle Eastern populations whose ancestors first domesticated wheat; some celiac-linked variants showed evidence of having spread in recent millennia.

People who had them, in other words, had some advantage compared with those who didn't.

Dr. Barreiro, who's at the University of Montreal, has observed this pattern in many genes associated with autoimmune disorders. They've become more common in recent millennia, not less. As population density increased with farming, and as settled living and animal domestication intensified exposure to pathogens, these genes, which amp up aspects of the immune response, helped people survive, he thinks.

In essence, humanity's growing filth selected for genes that increase the risk of autoimmune disease, because those genes helped defend against deadly pathogens. Our own pestilence has shaped our genome.

The benefits of having these genes (survival) may have outweighed their costs (autoimmune disease). So it is with the sickle cell trait: Having one copy protects against cerebral malaria, another plague of settled living; having two leads to congenital anemia.

But there's another possibility: Maybe these genes don't always cause quite as much autoimmune disease.

Perhaps the best support for this idea comes from a place called Karelia. It's bisected by the Finno-Russian border. Celiac-associated genes are similarly prevalent on both sides of the border; both populations eat similar amounts of wheat. But celiac disease is almost five times as common on the Finnish side compared with the Russian. The same holds for other immune-mediated diseases, including Type 1 diabetes, allergies and asthma. All occur more frequently in Finland than in Russia.

WHAT'S the difference? The Russian side is poorer; fecal-oral infections are more common. Russian Karelia, some Finns say, resembles Finland 50 years ago. Evidently, in that environment, these [disease-associated genes](#) don't carry the same liability.

Are the gluten haters correct that modern wheat varieties contain more gluten than past cultivars, making them more toxic? Unlikely, according to recent analysis by Donald D. Kasarda, a scientist with the United States Department of Agriculture. He analyzed records of [protein content](#) in wheat harvests going back nearly a century. It hasn't changed.

Do we eat more wheat these days? Wheat consumption has, in fact, increased since the 1970s, according to the U.S.D.A. But that followed an earlier decline. In the late 19th century, Americans consumed nearly twice as much wheat per capita as we do today.

We don't really know the prevalence of celiac disease back then, of course. But analysis of serum stored since the mid-20th century suggests that the disease was roughly one-fourth as prevalent just 60 years ago. And at that point, Americans ate about as much wheat as we do now.

Overlooked in all this gluten-blaming is the following: Our default response to gluten, says Dr. Jabri, is to treat it as the harmless protein it is — to not respond.

So the real mystery of celiac disease is what breaks that tolerance, and whatever that agent is, why has it become more common in recent decades?

An important clue comes from the fact that other disorders of immune dysfunction have also increased. We're more sensitive to pollens (hay fever), our own microbes (inflammatory bowel disease) and our own tissues (multiple sclerosis).

Perhaps the sugary, greasy Western diet — increasingly recognized as pro-inflammatory — is partly responsible. Maybe shifts in our intestinal microbial communities, driven by antibiotics and hygiene, have contributed. Whatever the eventual answer, just-so stories about what we evolved eating, and what that means, blind us to this bigger, and really much more worrisome, problem: The modern immune system appears to have gone on the fritz.

Maybe we should stop asking what's wrong with wheat, and begin asking what's wrong with us.

Washington Post

Why dentists are so darn rich

By Max Ehrenfreund

At [\\$54,000](#), the reported price of the trip that an American dentist took to Zimbabwe is nearly as shocking as [the death of Cecil](#), the widely known and universally beloved lion he killed while he was there.

The neighborhood dentist seems far removed from the upper echelons of medicine, someone who comes in for a few minutes at the end of a cleaning to check your teeth and ask about your kids, occasionally doing a filling or root canal. No doubt these services are critical to patients and our overall health, but some might be surprised to learn that a dentist could afford to spend \$50,000 on a hunting expedition.

It turns out, however, that dentists are quite well paid. According to official government statistics, the median dentist in the U.S. in 2012 earned \$149,310 per year. But that median figure obscures variation around the country and among dentists with different specialties. In some high-priced cities, dentists make a lot of money with non-medical, cosmetic procedures from teeth whitening to botox. And according to the American Dental Association, the average dental specialist earned [\\$283,900](#) in 2013.

Dentists in some places are so well compensated that they earn more than the average doctor. According to a 2012 [report](#) in The Journal of the American Medical Association, the average hourly wage of a dentist in America is \$69.60 vs. \$67.30 for a physician. As recently as 1996, dentists were making less than doctors. Meanwhile, the average general dental practitioner took in \$181,000 in 2013, according to the dental association, compared to \$175,000 for a family doctor, according to WebMD Medscape's [annual compensation report](#).

Behind the high salaries

Behind the high wages is a debate over whether Americans ought to be spending so much on dental care.

Critics of the U.S. dental industry have long complained that dentists are insulated from market forces, resulting in higher prices.

"They're afraid of the competition," said Jay W. Friedman, a dentist and researcher in Los Angeles who has long advocated for dental reform.

He contends that in order to make it easier for more Americans to receive dental care, dental nurses and hygienists — who have less training — should be allowed to perform basic services independently of dentists. In most states, hygienists are barred from cleaning teeth unless they are employed by a dentist.

One study concluded that allowing hygienists to offer services independently, like nurse practitioners in general medicine, [reduced dentists' incomes by 16 percent](#).

The dentists had more competition from people whom they otherwise could have employed, forcing them to lower their prices. Not only that, but since hygienists' options for treatment were legally limited, they might have recommended less expensive treatments, and patients would have spent less overall. Hygienists who were not allowed to perform fillings, for example, might have recommended less costly sealants instead.

As it happens, Minnesota — where the trophy hunter practices — is one state that recently gave dental personnel besides dentists more freedom to serve patients.

Minnesota recently began licensing "dental therapists," and there were 32 people practicing with the designation in the state as of last year, according to [a report](#) from the state Department of Health.

Minnesota's law allows these therapists to clean, fill and pull teeth under the "general supervision" of a dentist, who does not have to be on site. The report found that therapists cost about half as much as dentists, which suggests that incomes for dentists in Minnesota could decline as more therapists are licensed.

In response to questions about expanding the dental workforce, the American Dental Association pointed to a [study](#) claiming that the main challenge facing patients acquiring care is not the limited number of dentists but the underlying cost of receiving dental services.

National spending on dental care

According to the National Association of Dental Plans, an industry group, about 39 percent of the population — [124 million Americans](#) — did not have dental benefits of any kind in 2013, compared to the [13.2 percent of adults](#) who the Obama administration now estimates lack medical insurance. President Obama's health care law requires dental coverage for children, but not adults.

"Fifteen years ago, everybody lamented the poor care that the population was getting," Friedman said. "Fifteen years from now, we're still going to be saying the same thing."

Overall, spending on dental services is increasing in line with spending in the rest of the health care system, according to data economists [published Tuesday](#). The country is [projected](#) to spend \$119.1 billion overall on dental care this year, up from \$97.3 billion eight years ago.

Experts say dentistry can have unusually high costs because of the nature of dental insurance. Medicare has never covered routine dental work, which is part of the explanation for the large number of Americans who lack dental insurance.

At the same time, dental insurance is costly relative to other kinds of medical insurance. Insurers must charge more because they know that people will use their dental insurance on a routine basis rather than just in case of a medical emergency. Given the high cost, few Americans seem to think that dental coverage is worth paying for.

In the rest of medicine, insurers have an important function in limiting costs and promoting quality. The market power of Medicare and major national insurance companies allows them to insist on better rates for their customers when they negotiate with doctors and hospitals.

"There's been less presence from all kinds of insurance payers in the dental sector," explained Andy Snyder, who is in charge of oral health at the nonpartisan National Academy for State Health Policy. "Medicare does not cover routine dental services, and private dental coverage is far less common than private medical coverage. So, the dental industry has faced less of the cost containment and quality improvement pressures that the rest of the health care sector's experienced over the last couple of decades."

** Note: After this post was published, Wonkblog received a number of comments from readers asking whether this post takes into account the cost of running a dental practice. It does. The figures from the American Dental Association cited above are net incomes: the average general practitioner took in \$646,440 a year in billings, earning \$180,950 after expenses. The report in The Journal of the American Medical Association likewise relies on data for earnings, net of costs. To be sure, many dentists are repaying student loans, but that is an expense shared by other health care professionals as well.*

New Yorker

[How the Sinaloa drug cartel digs its tunnels.](#)

by Monte Reel

At 8:52 P.M. on July 11th, Joaquín Guzmán Loera, the drug kingpin known as El Chapo, sat on the bed of his cell in Altiplano, Mexico's only super-maximum-security prison. Surveillance footage appears to show a small screen glowing on a table nearby—inmates are not allowed cell phones, but this rule is not always enforced. Guzmán changed his shoes, walked to a shower area in the corner of the cell, and knelt behind a waist-high concrete partition, out of view of security cameras. Six seconds later, he was gone.

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the tunnel; a heavy-duty electric winch, to lower machinery into the pit; gallons of hydraulic fluid; coils of steel mesh.

Guzmán's method of escape should have surprised no one. Last year, in Culiacán, he evaded Mexican marines by disappearing into a network of subterranean passageways connecting seven houses. He did not invent smuggling tunnels—bank robbers, rumrunners, and guerrillas had used them for decades—but his criminal enterprise, the Sinaloa drug cartel, built the first cross-border *narcotúnel*, in 1989. Since then, Sinaloa has refined the art of underground construction and has used tunnels more effectively than any criminal group in history.

In the past quarter century, officials have discovered a hundred and eighty-one illicit passages under the U.S.-Mexico border. Most have been short, narrow “gopher holes” just big enough for a person to crawl through. Sinaloa specializes instead in infrastructural marvels that federal agents call supertunnels. Agents estimate that a single supertunnel takes several months and more than a million dollars to build. Many include elevators, electric lights, ventilation ducts, and cleverly disguised entry and exit shafts. They can reach as deep as seventy feet, and they tend to be tall enough for an adult to walk or ride through.

These days, most of Sinaloa's supertunnels are used to ferry drugs across the border, from Garita de Otay, an industrial neighborhood in northern Tijuana, to Otay Mesa, a similar area in southern San Diego. Otay Mesa, which is bounded on the north by Brown Field Municipal Airport and on the south by Mexico, consists of highways, strip malls, and a few hundred warehouses clustered near the border. Most supertunnels terminate inside these warehouses, making them difficult to detect.

The amount of warehouse space in Otay Mesa has nearly quadrupled since the mid-nineties, and the expansion has been almost as frenetic in Garita de Otay. Forklifts, jackhammers, and heavy vehicles attract little attention. Cartel trucks back into loading bays, pallets are loaded in, and the drugs are delivered north to distribution hubs. There are three official border crossings near Otay Mesa; one, for commercial vehicles, is inside the industrial zone. “All of this has created a candy store for smugglers,” a U.S. agent told me. “This whole area belongs to them.”

Hundreds of federal agents—from Border Patrol, Homeland Security Investigations, the Drug Enforcement Administration, and Immigration and Customs Enforcement—work in a pair of large unmarked buildings on the edge of the Otay Mesa district. Among them are the ten members of the San Diego Tunnel Task Force, a multi-agency group created in 2003. The agents have found an average of two tunnels a year, but most of the people they have arrested have been low-tier Sinaloa operatives such as truck drivers and warehouse supervisors. Information within the cartel is compartmentalized, so that even when workers are caught and tempted with plea bargains they are unable to divulge much actionable intelligence.

“There are so many questions,” Tim Durst, a former Tunnel Task Force supervisor, told the *Wall Street Journal*, in 2013. “What are their techniques? How the heck do they build these things so well?”

Recent investigations—including a pending case involving a man believed to have been Sinaloa's highest-ranking tunnel manager—have provided some answers. Sherri Hobson, a federal prosecutor in San Diego, told me, “I think it's a very small group of élite members of the cartel that are doing this. This is highly sophisticated work. A lot of people think that you have a shovel and you dig. That's not the way it works.”

In December of 2012, a nineteen-year-old named Fernando walked into Mama Mia, a pizzeria in a Tijuana strip mall, and asked for a job application. As he filled out the form, a stranger entered the shop. According to statements later collected by Mexican authorities, the man handed Fernando his phone number and asked whether he wanted a job cleaning a convenience store.

Fernando never heard back from Mama Mia. Eventually, desperate for work, he called the stranger's number and met him at the strip mall. The man offered good money—twelve hundred pesos (about seventy-five dollars) a week—and Fernando agreed to go with him to look at the job site. From the strip mall, a highway leads north, past the graffiti-covered concrete walls surrounding the Tijuana Airport to the pitted roads of Garita de Otay, where convoys of eighteen-wheelers stir up dust that never quite settles. The warehouses, bland and beige, resemble cardboard boxes.

They stopped in front of a structure with no identifying marks except the street address, stencilled in black. Inside, behind a rolling gate, was a loading bay big enough to accommodate a dump truck. Inside was a storage room with cinder-block walls. Fernando didn't see anyone else in the storage room—just a deep hole and sacks of dirt. The man told Fernando that things had changed: he would be digging a tunnel, not cleaning a store. If he tried to leave, he and his family would be killed.

Around that time, sixteen other men fell into the same trap. Across Tijuana, at bus stations and on busy street corners, they were lured to the warehouse by the prospect of temporary jobs. Some said that they had been promised safe passage across the border in exchange for a few hours of construction work. Fernando was the youngest of them, and one of only two Tijuana natives. Most were laborers from Mexico's rural interior who had travelled north seeking opportunity.

According to the men, the overseer of the project, who called himself Carlos, was in his mid-thirties, with a thin, weedy mustache and a baseball cap pulled low over his brow. Carlos split the men into two groups. Fernando worked the day shift, from 6 A.M. to 6 P.M.; at night, he slept in the warehouse with the rest of his crew. Carlos brought the workers food and made sure no one left the building.

From an opening in the floor of the storage room, a shaft descended about thirty-five feet to a small chamber, where grapefruit-size rocks were embedded in the soil. Most of the time, five or six men worked inside the chamber, lengthening it into a tunnel by chipping away at the earth with handheld electric spades and filling sandbags with dirt and rocks. Three other workers hauled the bags out using a makeshift elevator—a large metal cage connected to an electric pulley system. The sandbags were then piled onto wooden pallets in the loading bay. Occasionally, Carlos was joined by other overseers, who wore ski masks. They'd threaten to beat the workmen if their northward progress slowed. The workers gained about five metres a day. At that rate, they would pass the border in about three months and reach Otay Mesa a few weeks later.

Photos subsequently showed that the ceiling of the tunnel was slightly arched, a standard characteristic of Sinaloa supertunnels, which helps to distribute the pressure of the earth and prevent collapse. The red beam of a laser pointer, running through the dusty air in the center of the passageway, kept the diggers on course. In humid, confined spaces, oxygen can drop to fatal levels. With pipe clamps, the men affixed a black plastic tube to the top of the tunnel for ventilation. They laid two metal tracks, which enabled them to ferry debris back to the elevator in a miner's cart. Later, the rails could carry drug shipments to Otay Mesa.

The walls retained their form as the men worked, but threats were ever present. The history of subterranean excavation, from the ancient Egyptians to the coal miners of Appalachia, is dense with tragedy—any strike of a pickaxe can release a deadly rush of groundwater, spark a methane fireball, or disrupt the soil enough to cause a collapse. In “A History of Tunnels,” the historian Patrick Beaver writes that even as late as the mid-twentieth century it was estimated that for every mile of tunnel built one worker died.

The biggest risk to the Tijuana diggers was probably groundwater. In the Otay Mesa region, its presence is unusually difficult to predict. “One year, you might hit massive amounts of groundwater,” a U.S. agent who examines tunnels in the area told me. “Then you might go a mile east or west, within a couple of months, and there might not be any groundwater at all.” The captive diggers had little choice but to keep going. They followed a slight upward grade, which was likely a safety precaution: if they encountered groundwater, it could flow downhill, to the origin of the tunnel, where it would be pumped out.

In February, 2013, the Mexican Army, acting on an anonymous tip, raided the warehouse in Tijuana. The first person they encountered was a surprised twenty-five-year-old named Juan José, who was in a bathroom, his face coated in dust. Nearby, two men hauled sacks of dirt out of the elevator. While the soldiers talked to the men, four others remained in the chamber, wondering why it was taking so long for the elevator to come back down. Eventually, all the workers were brought in for questioning, but they claimed to have no knowledge of drugs or smuggling. Carlos might have been able to tell the police more, but, according to the workers, he had left the building twenty minutes earlier, “to go to the store.” Based on the tunnel’s location and design, the police assumed that it was the work of the Sinaloa cartel, but they made no more arrests.

Fernando and the other diggers were taken to La Mesa prison, about four miles from the warehouse, where they are still being held. They may have been lucky to be arrested. Joseph DiMeglio, the head of the Tunnel Task Force, told me that, when a tunnel is finished, diggers are sometimes recaptured and forced to work on another project. Other times, he said, “the cartel takes them out back, you know, and gets rid of them.”

Guzmán founded the Sinaloa cartel in the mid-eighties. By the end of the decade, the Arellano Félix Organization controlled the border near Tijuana. Guzmán took over smuggling routes farther east, in Arizona. He hired pilots to fly shipments of cocaine from Colombia to private landing strips in Mexico. The drugs were loaded into vans fitted with false floors and then driven to Douglas, Arizona, and from there to Los Angeles. Using that method, Guzmán was able to smuggle in three tons of cocaine a month.

One of Guzmán’s associates was Felipe de Jesus Corona-Verbera, a 1980 graduate of the University of Guadalajara’s architecture school, who drove a gray Chrysler New Yorker, wore fine suits, and carried an attaché case. Corona-Verbera visited one cartel-owned property after another: a warehouse in Guanajuato; a supermarket in Guadalajara; a rural compound where Guzmán kept lions, bears, and crocodiles. He and Guzmán appeared to be close friends. Miguel Ángel Martínez, a member of the cartel, later told U.S. prosecutors that Corona-Verbera was the only person he’d ever heard addressing Guzmán with the informal *tú*; everyone else used the more deferential *usted*.

In 1989, Corona-Verbera, with his wife and children, moved into a trailer park on Route 666 in Douglas. He hired a local contractor, William Woods, to build a gazebo beside his trailer. He also hired Woods for a bigger project: a two-thousand-square-foot warehouse, to be built about a block from the Mexican border. The blueprints looked professional, but oddities soon

emerged. Corona-Verbera said that the building would be used as a wash bay, to hose down trucks. His plans called for drain openings, but, according to Adalberto Romero, a worker at the site, the openings did not lead to functional drains. He asked Corona-Verbera about this. “He said I had nothing to do with it, to just shut up and continue doing it,” Romero said. One night, at a nearby work site just south of the border, Romero saw more than twenty workmen, who appeared to be from rural Mexico, pushing wheelbarrows in the dark.

Within a few months, the cartel had its first supertunnel. It originated at a Sinaloa-owned house in Agua Prieta, a Mexican border town, and ended some three hundred feet away, at the warehouse in Douglas. At the house in Agua Prieta, the only way to access the tunnel was to turn on an outdoor water spigot; this triggered a hydraulic system that lifted up a billiard table in a game room on the ground floor, exposing a ladder to the tunnel.

With belowground smuggling, Sinaloa’s business quickly expanded. “If three planes arrived per week, now ten were arriving,” Martínez recalled. Guzmán’s Colombian partners began to call him El Rápido, because, according to Martínez, “before the planes were arriving back in Colombia on the return, the cocaine was already in Los Angeles.” Guzmán told Martínez, “Corona made a fucking cool tunnel. Tell them to send all the drugs they can send.”

U.S. law-enforcement agents learned about the tunnel from a confidential informant. In May, 1990, a team raided the house in Agua Prieta. In the game room, Terry Kirkpatrick, a customs agent, moved the billiard table and pulled back a rug, exposing a patch of concrete. He used a jackhammer to drill through the floor. Under the concrete was a subterranean chamber larger than the game room. Later, another agent happened to turn on the water spigot, causing the concrete slab to rise toward the ceiling as the agents looked on, stunned.

“Welcome to St. Croix! And if you forgot anything the stern is still docked in St. Thomas.”[Buy the print »](#)

After the raid, Corona-Verbera and his family fled to Mexico. Instead of lying low in a Mexico City safe house, Corona-Verbera left the city to be with his family in Guadalajara. According to Martínez, Guzmán dismissed his old friend with a terse malediction: “Let him get fucked.” Eventually, Corona-Verbera was arrested and extradited to the U.S.

Two months after the tunnel was discovered, a group of Sinaloa suspects were detained. Two of them led Kirkpatrick and other agents about thirty miles outside of Agua Prieta and showed them a mass grave. Here, they said, were the diggers who had built the tunnel to Arizona.

Meanwhile, Sinaloa was slowly gaining ground near Tijuana. After the 1990 bust, Guzmán focussed on above-ground operations, smuggling drugs inside cans of chili peppers. But in 1992 the cartel paid \$1.1 million for a warehouse in Otay Mesa. Soon, its second supertunnel project, and its first on the West Coast, was under construction.

The soil around Otay Mesa is a mixture of volcanic ash, glassy fragments, and clay. Whether the Sinaloa cartel realized it or not, the region is a geological sweet spot for building tunnels: a couple of miles to the west, the ground is sandier; to the east, where the San Ysidro Mountains straddle the border, the subsoil is harder and under more pressure. In Otay Mesa, the soil is soft enough to be dug by hand, yet firm enough so that the tunnel walls can often stand without wood or concrete reinforcement.

In 1993, the Arellano Félix Organization murdered Cardinal Juan Jesús Posadas Ocampo, apparently mistaking him for Guzmán. This sparked a manhunt, which culminated in Guzmán’s

arrest (and, subsequently, his first prison escape). During the manhunt, agents uncovered Sinaloa's California tunnel. It was more than four times the length of the tunnel to Douglas. In the press, law-enforcement officials marvelled at its lighting and ventilation systems, and the poured-concrete flooring that allowed railcars to run smoothly. Nothing like it had been built before. "I was impressed by the Douglas tunnel, but this one here is the Taj Mahal of tunnels," a customs agent told the Los Angeles *Times*. Terry Kirkpatrick told me, "It was a wakeup call."

The San Diego Tunnel Task Force owns two ground-penetrating radar devices that look a bit like push lawnmowers. The machines fire electromagnetic signals deep into the ground, and an L.C.D. screen shows the patterns of the waves as they ricochet back to the surface. The agents do not use these machines often, because they aren't very effective. According to Steve Sloan, a geophysicist who has studied tunnel detection, the heterogeneous soil near Otay Mesa creates an unusual amount of background noise. On the screen, most deep-set geophysical variations—seams of rock, mismatched strata of soil, and excavation projects—show up as indistinct lines. Investigators can determine what a given line represents only by digging, which is prohibitively expensive and time-consuming.

For decades, tunnels have defied detection by satellites, motion sensors, and thermal imaging systems. During the Vietnam War, when the Vietcong used underground passages like the Cu Chi tunnel network to launch surprise attacks, the Army had no effective tunnel-detection technology, so it had no choice but to send infantrymen—"tunnel rats"—on dangerous search-and-destroy missions. Serious research into tunnel detection began in the mid-nineteen-seventies, after intelligence indicated that Kim Il-sung, the President of North Korea, had dug more than twenty tunnels across the border into South Korea, for use in a future invasion. The Defense Advanced Research Projects Agency attempted to design reliable detection technology using seismic and electromagnetic waves, to no avail.

In 2005, the U.S. government funded the Tunnel Detection Initiative, which recruited academics, industry specialists, and military engineers to detect excavation near the border. "It seemed like a really simple problem," Nedra Bonal, one of the geophysicists who worked on the initiative, said. "You have a hole in the ground, and I thought I'd look at the seismic data, and that would be that." But, according to a government report, the proposals yielded "massive amounts of data and unacceptably high false alarm rates."

So the Tunnel Task Force agents patrol the Otay Mesa district on foot. The law prevents them from searching warehouses at random, without probable cause; instead, they knock on doors, hand out business cards, and ask laborers to report anything suspicious. "We've gotten multiple leads from doing that," DiMeglio, of the Tunnel Task Force, told me. Agents also monitor telephone calls.

In May, 2010, Homeland Security investigators began listening to the calls of a mid-level Sinaloa operative nicknamed Enrique. He and the other operatives used various nicknames for their bosses. Someone they called Quirino seemed to be in charge of a major tunnel project. The men also talked about Primo, who was moody. "Primo is very bitter right now," Enrique said at one point. "I mean, no one can talk to him." Other nicknames—Garañón, Greñudo, El Viejo—seemed to refer to other bosses. The agents believed that the various tunnels were being built by construction cells that were loosely affiliated with Sinaloa but unrelated to each other.

On October 18, 2010, Mexican authorities seized a hundred and thirty-four tons of marijuana from a warehouse in Tijuana, about two miles from the border. It was the largest pot bust in Mexican history. They piled the marijuana on a giant wooden platform, rigged it with fuel and gunpowder, and ignited a heady bonfire that burned for two days. Mexican authorities estimated

that the shipment, if sold on the street, could have netted more than three hundred million dollars.

On the day of the seizure, investigators listened to a call between Enrique and another suspect, who went by Tuy.

“Was it everything?” Tuy said.

“Absolutely everything,” Enrique said.

“And was it made public?” Tuy said.

“Well, I have the radio on here,” Enrique said. “I can hear it. I’m listening to it now. All of the shrimp went bad.”

The agents had been eavesdropping on these men for months, and they had deciphered their simple code: “shrimp” meant drugs; a “project” was a tunnel. Even though the shrimp had gone bad, Enrique said, “the project is still standing.”

Marijuana is bulkier and more pungent than cocaine or heroin, making it riskier to smuggle through border crossings. Supertunnels are the ideal method of transport for marijuana. Pot is easy to grow, and the profit margins are irresistible: it can be sold in the U.S. for more than ten times its worth in Tijuana. Mexico’s main marijuana-farming region is in the foothills of the Sierra Madre Occidental, eight hundred miles south of the border. This region includes the state of Sinaloa, where Guzmán was born. If Colombian cocaine was the cartel’s emblematic product during Guzmán’s early years, homegrown marijuana was always his hedge, a commodity that he could control across every link in the supply chain.

In 2006, the Office of National Drug Control Policy estimated that sixty-one per cent of Mexican drug traffickers’ profits were “directly tied to marijuana export sales.” (Other analyses vary significantly. In 2010, the RAND Corporation estimated that the proportion was between fifteen and twenty-six per cent.) Prices of illegal goods tend to be artificially inflated. As more states decriminalize marijuana, Sinaloa’s profits from the drug could fall, forcing it to increase its volume. This would require more supertunnels. Or, DiMeglio says, Sinaloa might diversify. Until recently, raids on San Diego supertunnels yielded only marijuana; in 2013, a supertunnel raid uncovered three hundred and twenty-seven pounds of cocaine.

In 2017, a fourth official border crossing will be built near Otay Mesa, and new retail businesses are already opening in the commercial plazas that flank the warehouses. In one of these plazas, next to a duty-free liquor store, I saw a zoning notice taped to a vacant storefront. I called the number and reached David Blair, a lecturer at San Diego State University’s business school. His shop, A Green Alternative, is the first licensed medical-marijuana dispensary in San Diego. He picked Otay Mesa, he said, in part because it was one of the few places where city zoning laws allow him to open—other places were too close to houses or schools. A half-mile from the dispensary are two warehouses where supertunnels were recently discovered. A seventy-three-year-old woman who worked at one of the warehouses pleaded guilty to federal money-laundering charges last year.

After the marijuana seizure in October, 2010, investigators continued to listen to wiretapped calls, which seemed to indicate that two supertunnel projects were still under way, and that at least one of them was being led by Quirino. On whiteboards and corkboards, investigators tried to map out which operatives were affiliated with which digging projects. They tacked up pictures

of known suspects; unidentified suspects were represented by a generic silhouette or a question mark.

In early November, agents raided a tunnel in Otay Mesa and arrested a truck driver who was carrying marijuana from the site. They turned the driver's cell phones over to federal prosecutors. After the bust, the suspects on the wiretaps indicated that Quirino's project had not been interrupted. This seemed to confirm the investigators' assumption that the construction cells were unrelated. But, later that month, agents raided another supertunnel and arrested a warehouse manager at the site. Studying the manager's telephone records, they noticed that he had talked to the truck driver from the other site, and that both men had contacted the same person: Quirino.

One of the investigators refers to that as the "Luke, I am your father" moment: it became clear that there was only one construction cell and that Quirino was its boss. All the nicknames—Primo, Greñudo, and so on—referred to the same man. He seemed to be in charge of all aspects of Sinaloa's supertunnels: storage of the drugs in Tijuana, construction and transportation schedules, rental and purchase of warehouses on both sides of the border.

The more the agents learned about Quirino, whose real name they still did not know, the more he seemed like a shrewd and vigilant manager. Packages were marked with labels that seemed incongruous—Burberry, Donald Duck. Investigators believed that Quirino was using the labels to keep his accounts in order by identifying which parcels belonged to which dealers. Once, he ordered digging to stop because of "eyes on the north side"—someone had been snooping around one of his warehouses in Otay Mesa. (Federal investigators later learned that the San Bernardino County police had been near the warehouse on an unrelated lead.) Although the tunnel was nearly complete, Quirino told his operatives to rent a different warehouse, a few blocks away, and redirect the digging toward the new warehouse. The tunnel reached its new exit point three months later. "Nothing I've ever seen criminally has worked as efficiently as it did when he was the boss," an agent told me.

In early 2012, Mexican police arrested Quirino in Zapopan, an upscale suburb of Guadalajara. His real name was José Sanchez-Villalobos, and he had recently turned forty-nine. They described him as Sinaloa's financial officer in charge of the California border region. For a man suspected of being such a key figure in the drug trade, he had maintained a remarkably low profile—even Mexican journalists specializing in the Sinaloa cartel had never heard of him—but the few facts that emerged were consistent with a caricature of a cartel boss: it was said that he owned a racetrack, on which he drove his collection of Aston Martins, and that he kept a baby panther as a pet.

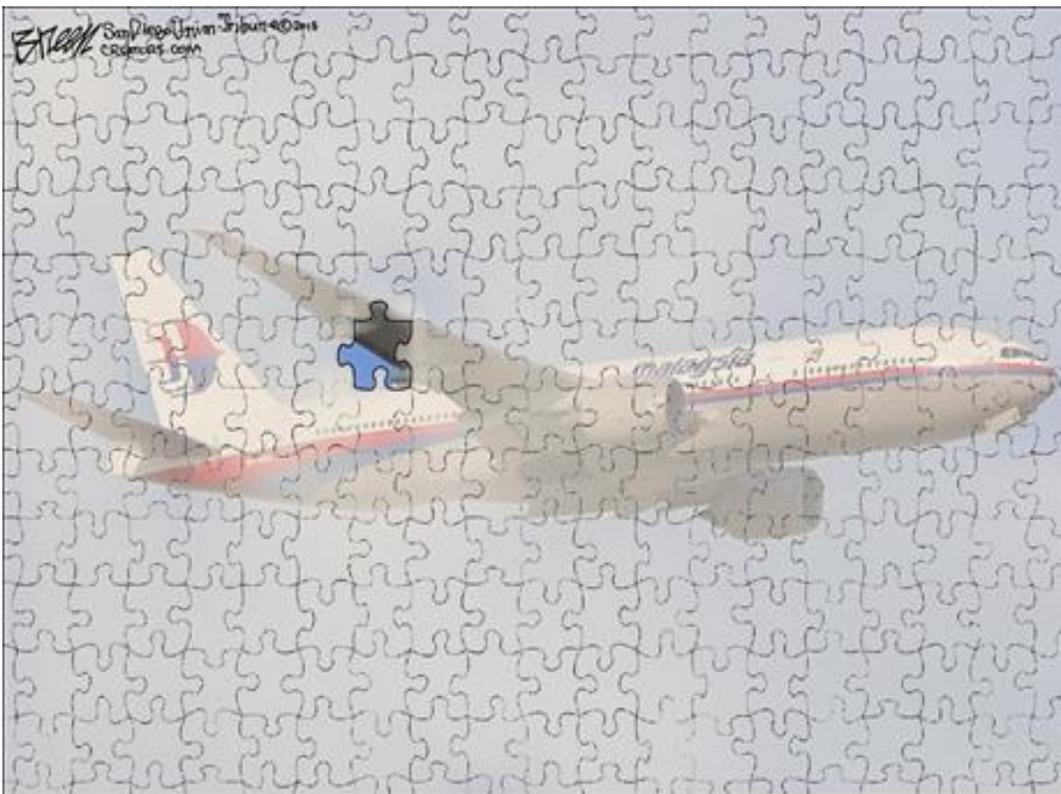
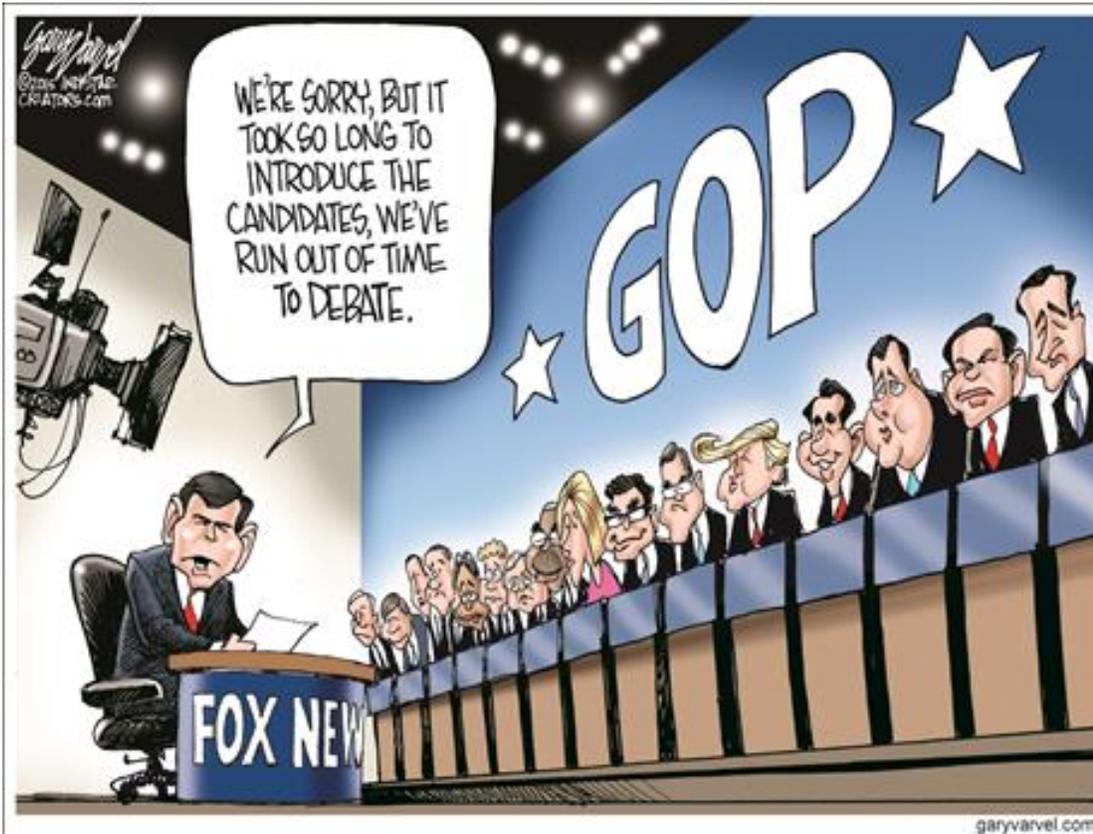
About a year after Sanchez-Villalobos was arrested, investigators heard chatter on the phone lines again. New taskmasters had stepped in to oversee supertunnel construction. The new bosses seemed to lack their predecessor's managerial skill, but, according to Sherri Hobson, the prosecutor in San Diego, they were starting to adapt. Drugs are now distributed in smaller shipments, and drivers on the California side use smaller trucks. The cartel also seems to be testing tunnel locations that require novel excavation techniques. This April, as Border Patrol agents were raking the soil near the border fence—they do this regularly, to render fresh footprints more visible—they saw what they thought was a natural sinkhole. It turned out to be a collapsed supertunnel running toward a residential neighborhood in San Diego, about five miles east of Otay Mesa. The soil there is sandy, DiMeglio said, and "a lot of shoring needs to be done in that area, because sand doesn't hold like clay does."

Recently, agents raiding Sinaloa dig sites have found horizontal directional drilling machines, which oil and gas companies often use to build pipelines, and which can cost hundreds of thousands of dollars. Horizontal directional drilling requires less manual labor than traditional digging, and the machines bore smaller, shallower tunnels. If Sinaloa were to transition to a network of such pipelines, it could use air pressure to propel parcels of drugs under the border through pneumatic tubes.

Another tunnel, which was recently discovered in the Imperial Valley, about a hundred miles east of Otay Mesa, terminated in a canal. Security footage shows a man emerging from the water in a wetsuit. Near the canal, Border Patrol agents found nearly sixty pounds of cocaine and three scuba tanks. Two of the tanks were “rebreathers”—special cylinders that allow divers to stay underwater for long periods without leaving trails of bubbles. “It just shows another level of how they’re trying to be creative,” Hobson said.

Sanchez-Villalobos is being held in the high-priority section of the Altiplano prison—the same wing that Guzmán fled last month. The facts about Guzmán’s escape, along with several unanswered questions—Could he communicate with other prisoners through the bars of his cell? Why didn’t anyone hear digging?—provide grist for conspiracy theorists. If Guzmán had a cell phone in spite of prison rules, it’s possible that Sanchez-Villalobos did, too, and that he helped coordinate the escape tunnel from inside. Many elements of the smuggling tunnels in Otay Mesa—the depth, the lighting and ventilation systems, the wood shoring around the entry shaft—seemed to be replicated in the Altiplano escape tunnel. “Based on the spade marks in the side walls, it looks like it was cut in the same manner, and that the soil consistency was similar to Otay Mesa,” a special agent who has examined many Sinaloa tunnels told me.

In December, 2013, a Mexican court ordered that Sanchez-Villalobos be extradited to the U.S. He appealed. Such legal battles can take years, and Enrique Peña Nieto, the President of Mexico, has been loath to let Mexican prisoners out of the country. (It remains to be seen whether embarrassment over Guzmán’s second escape will soften Peña Nieto’s stance.) According to immigration records, at the time of his arrest in Mexico, Sanchez-Villalobos was a legal permanent resident of the U.S. He claimed Perris, California, not far from Riverside, as his primary residence. Federal authorities say that he listed his occupation as “construction.”



ONE PIECE FOUND

