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▲ PAGE 44

"WE BELIEVE THAT THE MASS MARKET WOULD BE A GROWTH POINT FOR THE FUTURE."

—**Francis Lui,** deputy chairman, Galaxy Entertainment Group

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▲ PAGE 68

"WE WANT TO EMPOWER THE WORLD TO DESIGN ANYTHING AND PUBLISH ANYWHERE."

—**Melanie Perkins,** founder of Canva

FEATURES

HONG KONG'S 50 RICHEST

FORBES LIFE

UNDER 30

▶ PAGE 61

"IT EMBODIES EVERYTHING WE'RE TRYING TO DO HERE AT GAA."

—**Garima Arora,** founder of Gaa

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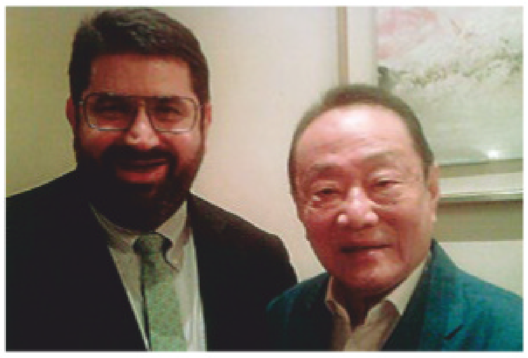


An Amazing **20-Year Journey**

It was 20 years ago this month that the Forbes family asked me to set up a regional headquarters for Asia. As I handed out my new business card to Asian business leaders, their response was often one of friendly curiosity—was *Forbes* a magazine or a list? Were there still hot-air balloon and motorcycle tours, and would the Highlander yacht return to Asian ports of call? Most of all, could they meet the Forbes family?

Given this unique family heritage and a century of celebrating entrepreneurial capitalism, we focused our editorial and business model on the business families that drive Asia's economies. We held the first Forbes Global CEO Conference, launched the Asia rich lists and, through the pages of *Forbes Asia* and our signature events, featured the best big companies and the most promising up-and-coming companies, the power business women and the heroes of philanthropy, the next tycoons and the under-30 game changers. In short, over the past two decades, *Forbes Asia* became the referee and scorekeeper of Asia's tycoons, and those aspiring to business success. Along the way, I've had the great privilege to be able to spend time with many of the world's most successful and inspirational entrepreneurs.

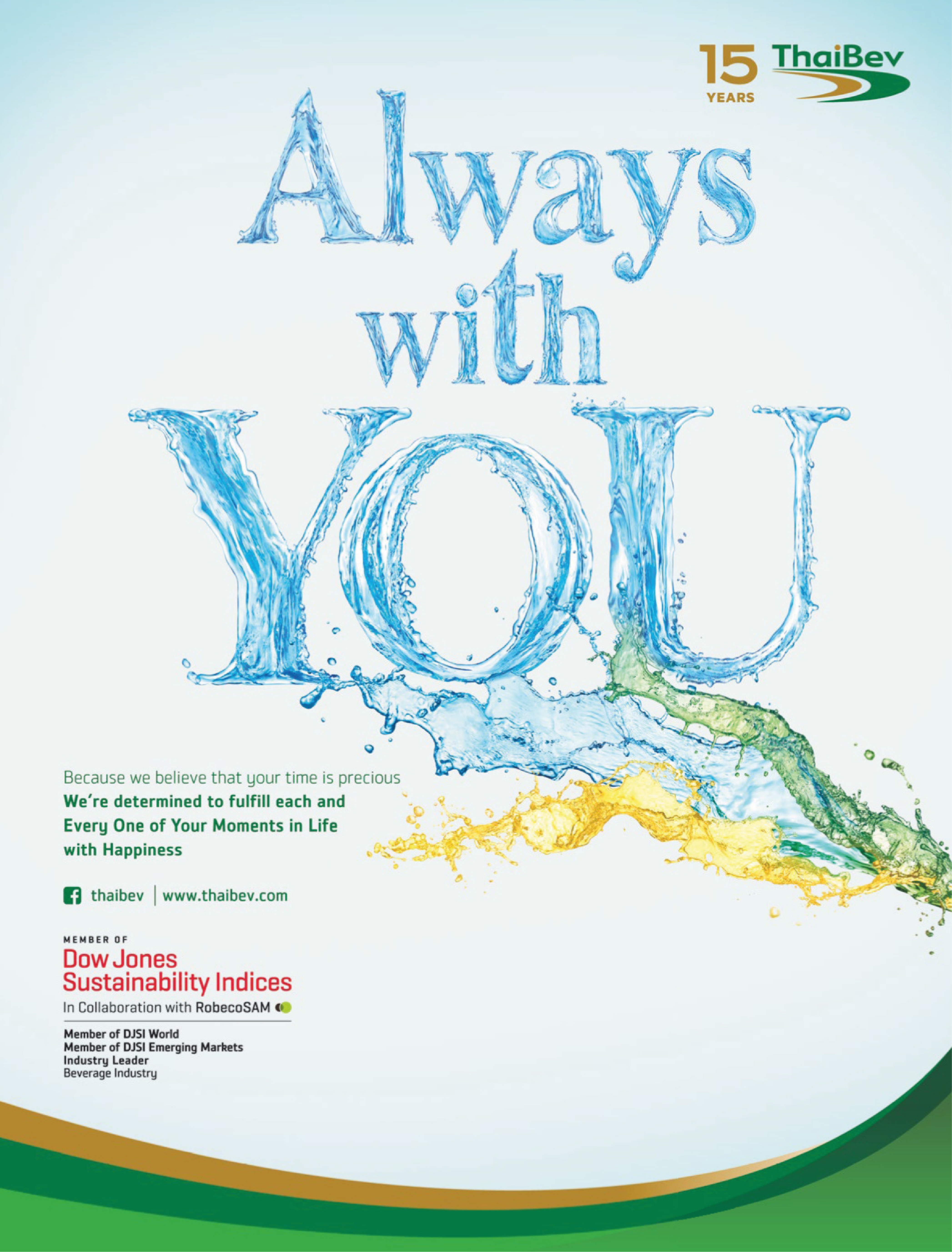
With me for nearly this entire journey are several key colleagues I'd like to recognize: Jennifer Chung, our office manager, company secretary and my first hire at Forbes Asia 20 years ago; Tina Wee, who joined 19 years ago as marketing manager and is now senior vice president responsible for our conferences and local licensed editions; and Justin Doebele, who moved from Forbes in New York (where he worked on the billionaires and global teams) to Singapore as senior editor in 2000. Justin started the Asia rich lists, covered some great entrepreneurs (like Jack Ma in 2000), helped to launch *Forbes India* and then moved to Jakarta to launch and edit *Forbes Indonesia*. I'm pleased to share that Justin has returned to Singapore and with this issue takes over as the editor of *Forbes Asia*.

Also returning to Singapore is the Forbes Global CEO Conference, which will take place October 15-16. We are delighted to be partnering with the Singapore Economic Development Board to convene leading business families and CEOs from around the world.

In closing, I'd like to wish our readers and business partners a happy, healthy and prosperous new year.

William Adamopoulos
CEO, Forbes Asia

From top: Will Adamopoulos with Li Ka-shing and Steve Forbes, Carlos Slim, Robert Kuok, Oprah Winfrey and Warren Buffett, Bill Gates and Masayoshi Son.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Change and **Continuity**

This first issue of 2019 signals more than the start of a new year, it represents the start of a new team and structure for Forbes Asia. For the first time, Forbes Asia's content creation team will be predominantly located in Asia, and the content creation process will be fully integrated across platforms such as print, digital, social, lists and events.

The main goal of this new, localized and integrated approach will be to provide even greater value to the worldwide Forbes community, especially those in Asia. This content creation will be carried out by a talented multinational staff in the Singapore and Hong Kong offices, as well as by our far-flung editorial bureaus, contributors and researchers across the region.

As we begin this new chapter, hats off to former editor Tim Ferguson, who is owed a huge debt of gratitude. He and his team did a remarkable job during his tenure to create a strong editorial franchise for the Forbes Asia brand in the region.

Aside from these changes, many aspects of the brand remain steadfast. One is an unshakeable commitment to outstanding business journalism, created with integrity and the highest standards of reporting and editing. Forbes Asia's content is focused unabashedly on the chief headknockers—be they young entrepreneurs or established tycoons—and how they are contributing to Asia's dynamic growth story.

Another long-term strength is the connections that our community has with the Forbes Asia brand—be it through an interview with a writer, articles read in a magazine, clicks on Forbes.com, or attendance at an event. As long as this community finds value in being engaged with Forbes Asia, through whatever platform, then we can't ask for a better metric of success. Any comments to enhance that engagement are most welcome at editor@forbesasia.com. Best wishes to all for the coming year.

Justin Doebele
Editor, Forbes Asia
editor@forbesasia.com


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"With all thy getting, get understanding"

THE EURO
HOW TO MAKE IT GREAT

BY STEVE FORBES, EDITOR-IN-CHIEF

THIS YEAR MARKS the 20th anniversary of the euro's introduction, and not many champagne bottles have been uncorked in celebration. Since 2008, the EU has been beset by economic crises that have dulled any luster the new currency had.

Too bad. Had Europeans understood the proper principles of monetary policy, the euro would be a resounding success, doing for participating EU countries just what the dollar has done for the U.S.—a common currency that enormously facilitates prosperity-creating investment and commerce. But this extraordinary creation has been bedeviled by profound misunderstandings that could ultimately threaten its very existence.

Many critics moan that the euro has prevented Greece, Portugal, Spain, Ireland and others from using devaluations to help their economies recover from terrible contractions. Still others carp that the euro enabled Germany to rack up big trade surpluses without fear of having to revalue its currency, as previously would have happened. The biggest condemnation has been that the euro is doomed unless the EU has a united financial and banking regulatory system as well as a united fiscal/budgetary system.

These and other negative assessments are off base:

• **Prosperity.** The euro did make it easier for capital to flow across borders, thereby reducing costs of exchanging individual currencies and hedging against the risks of the currencies' fluctuating against each other. However, the Continent's chronic subpar economic performance didn't improve as much as had been expected because the problems are structural: excessive taxation and regulation.

• **The euro is a straitjacket.** One of the most pernicious myths afflicting current economic policymaking is that devaluations are a great way to boost a troubled economy. Exports suddenly become cheaper, thereby ginning up overseas sales. An artificially enlarged money supply will stimulate activity. But the reality is this: No state in history ever devalued its way to strength and prosperity. An unstable currency hurts productive investment and misdirects capital.

Nonetheless, a host of economists lament that countries such as Greece and Italy can't devalue their currencies since they're tied to the euro. Everyone should rejoice that this is the case. Otherwise, Greece would have become the EU's version of Venezuela, and Italy's lira would resemble Argentina's chronically shrinking peso.

• **The euro can't work without a single, Europe-wide regulatory and tax/budget arrangement.** Nonsense. A country can use any currency it wants. Panama, Ecuador, El Salvador and Timor-Leste (East Timor) directly use the U.S. dollar. Countries such as Costa Rica allow the dollar to be used alongside their own national currencies. The euro is legal tender in Monaco and Vatican City. Numerous nations employ currency boards to rigidly link their money to a hard currency, such as the dollar or the euro. Hong Kong has done this with the greenback since the early 1980s. Bulgaria has done the same thing with the euro for more than 20 years. Several countries in Africa are pegged to the euro.

Needless to say, in none of these cases are budgets, taxes, government spending and financial regulations coordinated with the U.S. or the EU.

• **The euro will eventually fail because it obliges Germany to bail out profligate countries like Greece.** No, it won't, and no, it doesn't. Back in the 1970s Washington refused to bail out New York City when it was on the verge of bankruptcy, even though they share a common currency.

The euro would do just fine if authorities accepted the following fundamental truths:

• **Money is not an instrument for guiding an economy.** It isn't similar to the steering wheel of a car. Attempts to misuse it in this way retard economic progress. Countries with stable, trustworthy money always do better than those with weak currencies. Always. Too many times American and European central banks have tried to use monetary policy to overcome barriers to growth.

• **Money measures value the way a clock measures time.** Money works best when it has a fixed value.

• **The best way to achieve a stable, trustworthy currency is to tie it to a fixed weight of gold.** Contrary to myth, this no more restricts the size of an economy than the 12 inches in a foot restricts the size of a building a contractor may wish to construct.

Robert Mundell, the Nobel Prize-winning economist regarded as the euro's godfather, believed that his conception would lead to a stronger, more prosperous Europe and would become a global alternative to the dollar that would force the authorities of both currencies to pursue sound monetary policies. He never imagined that both would remain in the thrall of funny-money theorems.

Furnishing Trade

Farooq Kathwari has been chairman and CEO of Connecticut-based Ethan Allen Interiors since 1987, and has been doing business in China for over four decades. Despite trade tensions between the U.S. and China, the American furniture maker is expanding in China. For almost two decades, Ethan Allen has exported its furniture to China rather than make it, and sell it, there.

COURTESY OF ETHAN ALLEN

BY DAVID A. ANDELMAN

FORBES ASIA: What kind of opportunities do you see these days?

KATHWARI: We have maintained a balanced approach. In the last 15 or 20 years, 70% of all manufacturing left the U.S. and went to China. Many of our competitors went to China and elsewhere. But we wanted to stay in our North Atlantic zone. So, we went to Mexico and bought a small plant. We've taken this 40,000 square foot plant and 90 people to 600,000 square feet with over a thousand people. So, we have over a thousand people and they do really an amazing job. That has also helped us ship products to China.

Why manufacture in the U.S. and Mexico and ship to China, rather than manufacture and sell in China?

We used to buy leather upholstery from China and now we're shipping from Mexico to China. We did it because we have to be competitive. The Chinese aren't going to buy from us if they can make products at the same quality we provide.

How did you first build your operations in China?

We were approached by Markor, a Chinese company based in Urumqi, part of Xinjiang. They said they would like to get into the furniture retailing and manufacturing business in China. So, 17 years back we entered into an agreement. We gave them the blueprints to establish an upholstery plant in China. But we also of course have had some compensation for all the advice that we've given them. So, they decided to build manufacturing in Tianjin and Urumqi.

What percentage of your overall business is in China?

About 10% of our wholesale business is in China today, which would be about 5% or 6% of our total business. We consider the Ethan Allen products sold in China at a wholesale level. We don't take them as retail sales there obviously because the stores are owned by them.

Will the U.S. and China trade war create a backlash against U.S. brands?

Well, there is some. However, in the last two or three years, we've opened a number of flagship stores in China. We have 88 stores right now. They are all Markor, but we are there for the grand openings.

How will changing tariffs between the two countries impact your business?

There are no tariffs from Mexico to China or Honduras to China. In Honduras, we are using the same manufacturing techniques. So lately, the Chinese have requested to please make more of that product in Honduras rather than in North Carolina.

Why? They're afraid of the tariff issues?

From Honduras there are no tariffs. We were going to shift our manufacturing there anyway, because in some cases it makes sense with the pressures on pricing. We also decided that some manufacturing of our wood products should be done in Indonesia. Manufacturing in China was being impacted by higher costs, also higher regulatory costs. So, the Chinese started investing in Vietnam.

Indonesia seems like a wonderful source for wood.

Absolutely, they have great sources of wood and are great craftsmen. The Vietnamese are also amazing people in what they do.

Can you rely on Indonesia to meet shipping and production deadlines?

In Indonesia, they are almost fully committed to working with us and they do a reasonably good job.

What tariff exposures do you have in China and how will that affect costs?

We do have some business in China, which is impacted by tariffs—chandeliers, lighting fixtures.

Costs could potentially increase 25% if Trump imposes full tariffs this year. Will that affect your business substantially?

No, not for us because we don't buy much from China.

You have 88 locations in China. Is that number rising or falling?

We've already gone from zero to 88. Our projection is that in the next 12 months we'd be at least 100.

So you're not really affected by these macroeconomic issues?

Like everything else in China, things go fast. So, what's happened to the business in China, for our partner and others, is they have more competition. To some degree, that is impacting us.

How has manufacturing technology played a role in the U.S. and China?

About 10 or 12 years back, we had a million square feet of space and maybe a hundred-plus people making parts for a sofa and a chair in North Carolina. Today, that has been reduced to 50,000 square feet and 50 people and we are making parts of a sofa in five minutes through a computerized system. Technology has played an important role in everything we do in manufacturing. In China, they were able to use modern technology more than we've had in the U.S.

How do you think the U.S. and China trade war will be resolved soon?

My perspective is that is going to continue. I don't think it's going to end. We're going to be living in uncertain times for some time to come.

So neither side has an incentive to settle?

I think they are negotiating. I think they're settling, but they're settling on a system of ongoing, continuous negotiations at least to some degree. Things are not going to be settled in the sense of finding any lasting solution.

So, the next president could substantially change that whole equation?

They could, but I'll tell you this: rightly or wrongly, President Trump has taken lots of steps relative to trade. We were having a lot of issues on trade.

This interview is a condensed version. For a full version, please visit Forbes.com

1. RYAN TOYSREVIEW
$22 MIL
Ryan's just like every other 7-year-old: He loves Legos, trains, cars—and his 17 million followers. His latest mini-mogul move: a line of collectibles and more, now selling at Walmart.

2. JAKE PAUL
$21.5 MIL
The boisterous younger brother of controversial Logan (No. 10) earned a career-best income from his thriving merchandise business. He attracted more than 3.5 billion views of his rap songs and goofy pranks over our scoring period.

3. DUDE PERFECT
$20 MIL
This five-man sports crew (Coby and Cory Cotton, Garrett Hilbert, Cody Jones and Tyler Toney) specializes in feats of dexterity and intricate trick shots—say, hurling Ping-Pong balls to trigger domino-falls of Oreos, which garnered 175 million views.

YOUTUBE'S TOP 10

The most-moneyed digital superstars.

BY NATALIE ROBEHMED AND MADELINE BERG

6. MARKIPLIER
$17.5 MIL

7. VANOSSGAMING
$17 MIL
Witty Canadian gamer Evan Fong plays mainstream titles like *Call of Duty* and *Assassin's Creed.* On the side he's launching a hip-hop career, but music (so far) isn't proving nearly as lucrative as the subtle art of being a couch potato.

BRAND PARTNERSHIPS, a clothing line, millions of fans: What was once solely the province of athletes and A-listers now includes "Markiplier," one of the world's highest-earning YouTubers, who hauled in $17.5 million over our 12-month scoring period.

The Hawaii native (real name: Mark Fischbach) launched his YouTube channel in 2012 when he was a biomedical-engineering student at the University of Cincinnati. He was going through tough times: He'd broken up with his girlfriend, been laid off from his desk job and had an adrenal-gland tumor removed that surgeons found when they went to take out his appendix.

"A whole bunch of things happened that made me feel like I didn't have any control in my life, so I had to do something," says Fischbach, 29, who now lives in Los Angeles. At first he recorded audio snippets as practice for a potential career in voice acting, but he soon found an audience through clips in which he played video games while providing wry running commentary.

Don't think watching someone play PS4 sounds like fun? Markiplier's 22.4 million YouTube subscribers, with their 10 billion video views of his work, beg to differ. Indeed, Fischbach is one of five gamers on this year's list. The top ten YouTube stars earned an aggregate $180.5 million this past year, up 42% from 2017. It pays to play: Compared with other common YouTube categories, such as scripted comedy or elaborate pranks, gaming clips can be produced and edited quickly; some gamers post new footage daily. (The going rate for top online talent, *Forbes* estimates, is about $5 per thousand views.)

It helps, too, that the same young viewers who eschew television in favor of YouTube are bonkers for video games. "Ten to

4. DANTDM

$18.5 MIL

Last year's top earner at $16.5 million—Daniel Middleton, a British gamer who specializes in *Minecraft*—has been playing on-camera for six years, amassing a following of 20.7 million, who shell out for his tour and merchandise, which includes backpacks, baseball caps and hoodies.

5. JEFFREE STAR

$18 MIL

The makeup artist, famous since the Myspace era, has reinvented himself as a beauty mogul, cofounding Jeffree Star Cosmetics, which sells an estimated $100 million–plus of eye shadow, lipstick and highlighters annually.

8. JACKSEPTICEYE

$16 MIL

Foulmouthed, energetic Seán McLoughlin is the most popular YouTuber in Ireland thanks to his colorful video-game commentary. A few bad words haven't kept him from going mainstream: He did a series for Disney and is developing exclusive content for live-streaming platform Twitch.

9. PEWDIEPIE

$15.5 MIL

Scandal hasn't stopped Felix Kjellberg, the Swedish gamer who is the most followed YouTuber (72.5 million followers). Despite a backlash last year after a rash of anti-Semitic videos, advertisers have returned, shelling out up to $450,000 for a sponsored clip.

10. LOGAN PAUL

$14.5 MIL

In January 2018 the 23-year-old elder Paul brother was kicked off YouTube's Google Preferred program, which gives favorable ad rates to popular channels, after he filmed a video in Japan that showed an apparent suicide hanging from a tree. He apologized. His income from videos (pratfalls, pranks) and brand deals took a hit, but loyal fans kept his hefty merchandise business afloat.

15 years ago, gaming wasn't cool. You didn't game because it was cool, you gamed because you loved it," says David Huntzinger, a digital-talent agent at WME. "Now you have Drake going on Twitch and playing Fortnite, and [professional] athletes in the locker room saying they can't stop playing Xbox—it's what these kids are living and breathing."

Like any good mogul, Fischbach is diversifying: In October, he cofounded an athleisure line, Cloak, with fellow list member Seán McLoughlin, better known as "Jacksepticeye" (No. 8, $16 million). The workout line includes $85 sweaters and $35 T-shirts. Even if they intend to exercise nothing more than their thumbs, fans have snapped the gear up: The presale items sold out in 48 hours.

Merchandise has become an increasingly important revenue stream for these top digital stars, almost all of whom (No. 1 being a notable exception) are in their 20s and 30s. Each of the ten on our list now has a line of merchandise, whose blossoming sales help account for that 42% income increase from a year ago. "I've built this huge community, and we've made a lot of people laugh," says Fischbach, who sees Cloak as the first step toward an empire built on assets more tangible than video uploads.

For now, though, all those gaming clips serve as a force multiplier for the man known as Markiplier. Like any savvy businessman, he's thinking ahead. "I'm not going to be able to make videos on YouTube forever," he says. "I need to plan for the future."

METHODOLOGY: All earnings estimates are from June 1, 2017, through June 1, 2018. Figures are pretax; fees for agents, managers and lawyers are not deducted. Earnings estimates are based on data from Captiv8, SocialBlade and Pollstar, as well as interviews with industry insiders.

The odd couple of freight brokerage: Transfix cofounders Drew McElroy *(right)*, a trucking industry veteran, and Jonathan Salama, a Parisian tech whiz, in a Freightliner truck.

HARRY FELLOWS FOR FORBES

18-Wheelers at App Speed

As a child Drew McElroy learned about freight brokerage. At 36 he's doing to the $700 billion trucking business what Uber did to the taxi industry.

BY AMY FELDMAN

At 12, Drew McElroy was in trucking. His parents ran a freight brokerage operation out of a spare bedroom in Milltown, New Jersey—connecting truck owners to companies that needed to move goods—and he helped out by working the phones.

Fifteen years later, a light bulb went off. Weren't truck brokers doing the same thing that Uber and Lyft do? They match rides to vehicles, minimizing wasted miles, and use algorithms to set prices based on supply and demand. "I realized, Holy crap, no one is doing this," McElroy says. "There is a clear path to changing this entire industry that isn't that complicated."

It was a smart idea. Trucking is a $700 billion market, and the bill for moving full truckloads in the U.S. runs to more than $500 billion a year. In 2013, four years after that aha moment, McElroy cofounded Transfix, an online freight marketplace that uses algorithms and machine learning to give full-load shippers better prices and truck owners better routes. The timing was good. Truckers, largely middle-aged men, had recently begun carrying smartphones and were willing to install the Transfix app. Most trucking is done by small contractors who are desperate to keep their rigs full to cover the financing on those trucks.

Transfix, based in New York City's Garment District, is on track to collect $100 million in shipping charges for 2018. It will remit the lion's share of this gross revenue to people who own the vehicles. With venture funding of $78 million from such firms as New Enterprise Associates (NEA) and Silicon Valley's Canvas Ventures, the 140-employee business is worth roughly $800 million, gaining it a spot on Forbes' 2018 list of Next Billion-Dollar Startups, one of two trucking companies to make the cut. McElroy, the company's chief executive, and his cofounder, Jonathan Salama, its chief technology officer, have stakes that are probably worth $50 million each.

McElroy believes the company can reach $1 billion in revenue, with double-digit operating margins, by 2021, helping customers like Anheuser-Busch and Unilever manage their logistics. Since trucking was deregulated in the 1980s, some 18,000 freight brokerages have sprung up; the largest player, publicly traded C.H. Robinson, has less than 3% of the market. The potential for technology to streamline this work explains why digital freight brokerage is irresistible to venture capitalists.

Which means, of course, that Transfix faces competition, not just from Robinson but also from newcomers like Seattle-based Convoy and Uber Freight. "This is one of the industries that venture loves," says Ben Narasin, a venture partner at NEA, who personally invested in Transfix's seed round. "I'm always surprised when I see any industry this big and antiquated."

McElroy, 36, was born in Paterson, New Jersey, where his father, Danny was a dockworker on the midnight-to-8 a.m. shift. The family struggled when McElroy was young, but his parents' freight-brokerage business eventually became successful enough for them to send him to the Lawrenceville School, a prep school in New Jersey, and then to Georgetown University where he graduated in 2004. McElroy returned to the family business after college. His dad was diagnosed with cancer in 2009 and died less than a year later. McElroy shelved his dream of an Uber-like startup long enough to help his mother get back on her feet—she's still running the business—and then left.

McElroy took a 50-page business plan to San Francisco and slept on friends' couches while he learned how to start a tech company. "I hustled," he says. "It was my real-world M.B.A." In 2013 a venture capitalist at Venrock in Palo Alto, California, who had also attended Georgetown introduced him to Salama, a Paris-bred consultant at the firm.

Salama, now 32, had worked for Gilt, an online retailer in New York, and Cherry, an on-demand car wash startup (subsequently acquired by Lyft). At Cherry he worked on building a marketplace that incorporated GPS tracking to match people who needed a car wash with those who would do the job. But his ideas for new companies went nowhere. "They were either good ideas but not in a big enough space or simply bad ideas," he says with a laugh.

McElroy met Salama one evening in Brooklyn and pitched him on the idea for a digital freight brokerage. "It was like a great first date," McElroy recalls. "I said, 'Let's talk in a couple of days.' He was like, 'You do all the thinking you want, I'm going home to start building the technology, and you tell me if I should ever stop.'" A week later they incorporated the business and split ownership 50-50.

McElroy updated his LinkedIn profile to say that he was chief executive of Transfix. The company was scarcely more than an idea, but within 30 minutes his cellphone rang. On the other end was Angelo Ventrone, then head of global logistics for Barnes & Noble. Ventrone, who is now vice president of logistics at the Wisconsin-based shipping-supply company Uline, says that as soon as they spoke he was ready to become Transfix's first customer. "It was the dinosaur era for the longest time," he says. "I said, 'That solves a huge issue at Barnes & Noble. When can we start?'"

Transfix got a regular shipment of books from a printer in Indianapolis to a warehouse in New Jersey for $1,700 a load a few times a week, despite having no software in place. Salama was solving that problem, holed up in his apartment writing 10,000 lines of code. "Building things doesn't come hard," Salama says. "It takes a lot of patience and a lot of hours, but if you have a clear vision of the product, it just flows."McElroy raised $250,000 from friends and family. In January 2014, Salama finished the first version of the product. To get rig owners to sign up, McElroy hung out at truck stops and went to the annual Truckers Jamboree at the Iowa 80 Truckstop, which bills itself as the world's largest truck stop. He offered drivers pork chops and beer if they'd download the Transfix app. One year the company set up a tank for a game of dunk-a-broker, a lighthearted way to make fun of the industry's distrust of brokers. So far, 56,000 drivers have signed up.

Historically, freight pricing has been both complex and opaque, which allowed brokers to squeeze smaller shippers and truckers and profit from a bigger spread. Transfix's pricing algorithm, by contrast, spits out a rate without human bias, relying on information from thousands of data points, including historical shipments, loading times and weather forecasts. The company takes the risk that occasionally its rate will fall below breakeven and uses each new piece of data about cost to improve the pricing formula.

Carriers need to make $1.70 per loaded mile to break even and lose money if their truckers drive empty, as they do for more than 50 billion miles a year. McElroy figures he can increase their take-home pay by routing them more efficiently. For shippers, the advantage is a better, more reliable price. Brokers earn money on the spread between what they make from shippers and what they pay truckers, typically around 16%; Transfix believes it ultimately may be able to use its technology to cut that spread in half.

"The beauty of this is it takes a lot of the cost out," says Jay Pickett, transportation manager at Ravago Americas, the U.S. division of the Belgian plastics giant, which relies on Transfix for an increasing number of its 200,000 shipments a year. "I don't think the big guys are ready to take that cost out and share it with shippers."

Transfix's real-time tracking allows shippers to better plan loading and unloading schedules, and occasionally catch fraud. In one instance, Transfix's data indicated that a truck filled with aluminum ingots had gone off course; it ended up stopped at the side of the road in a bad neighborhood for hours, a red flag for a driver-enabled hijacking. More often, the data helps shippers prepare warehouses and workers for a truck's arrival.

McElroy's expansion will be aimed first at international growth; later the company hopes to target shipments smaller than a full truckload. (The permutations and geometry of partial shipments will make that a challenge, even for Salama.) After a year spent focused on profitability, McElroy says, he can redirect his attention to growth. "I believe I am the luckiest man alive," he says. "My mother would slap me if I ever lost sight of how lucky I am." Ⓕ

TRUCKING BY THE NUMBERS

TOTAL TRUCKING INDUSTRY REVENUE	$700 BILLION
TOTAL FREIGHT MOVED BY TRUCKS	10.8 BILLION TONS
PERCENTAGE OF CARRIERS THAT OPERATE SIX OR FEWER TRUCKS	91%
TOTAL VC FUNDING TO DIGITAL FREIGHT OVER THE PAST FIVE YEARS	$2.2 BILLION

SOURCES: AMERICAN TRUCKING ASSOCIATIONS; PITCHBOOK.

Dawn of an Asian Era

One of these days, maybe soon, this trade war is going to end. The U.S. could end the war by reintegrating itself into the multilateral global trading system. Or it could surrender its global economic leadership to China. Either way, it's worth pondering the shape of the global order afterwards. It will be a truly multipolar world, with Asia as one of its most dominant regions. Since the 2008 global financial crisis, emerging Asia's combined GDP has grown 188%, versus 19% in the U.S. and 13% in the EU, according to the IMF. This Asian dominance should only grow. Within a decade, Asia's GDP is projected to exceed the combined GDPs of the U.S. and Europe.

Of the $30 trillion the Brookings Institution projects the world's middle class will spend in the next decade-and-a-half, most will come from emerging Asia—such as China, Indonesia, India and Vietnam—and only 3% from developed countries. Asia's economic rise will reshape the global order and mint new fortunes across Asia. Asia already has more billionaires, at 827, than second-place U.S. at 585, according to the 2018 Forbes billionaires list.

GETTY IMAGES

Without any grand design or pretense of shared values, Asia has become one of the world's most economically integrated regions.

Whatever the U.S. government does next, American society's deep divisions and polarization will persist beyond the trade war's end. Thus, America's leadership in the post-trade war global order will be severely weakened, if not eliminated. Europe, meanwhile, will be increasingly inward-looking, busy amalgamating 27 diverse countries under a single European identity and polity. The EU, a top-down, grand design intended to unify Europe, has run aground on the shoals of resurgent populist nationalism, leaving it little space for global leadership as it deals with this existential crisis.

Next comes Asia. Without any grand design or pretense of shared values, Asia has become one of the world's most economically integrated regions, second only to Europe, despite lacking a regional free trade agreement. That said, Asia will remain diverse, fragmented, and beset with geopolitical tensions.

Don't expect an "Asian Union" soon. Asia's economic integration stems from grassroots pragmatic opportunism—the exact opposite of Europe's top-down grand design. Despite geopolitics, Asian businesses find ways to trade, invest and collaborate across borders. Today, Asia has the world's most sophisticated and productive supply chains, which are rapidly expanding into Central Asia and Africa, and are amplified by China's Belt and Road Initiative.

The post-trade war world will be fragmented and chaotic—conditions to which Asian pragmatism has already shown it can adapt, and under which it will continue to thrive and prosper. During Europe's colonial heyday, trade followed the flag. Asia will reshape the global order through infrastructure-enabled trade that seeks and follows opportunities wherever they are found.

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Video On-The-Go

Of the many things Apple can boast about its iPhone, the one I've heard Apple executives and communications folks repeat most is that the iPhone is "the world's most popular camera." Ultimately, a digital single-lens reflex camera, or DSLR, still produces a superior image, but the iPhone is the most popular camera because it is significantly more portable, and hence always at its owner's side.

Shenzhen-based DJI, best known for its drones, appears likely to do the same for videography that smartphones did for cameras with its Osmo Pocket—a handheld gimbal and camera system. Don't get me wrong: I don't think filmmakers or professional videographers will dump their Arri Alexa or Red Camera anytime soon, but the Osmo Pocket looks likely to creep into professional settings the same way the smartphone has.

These days, portability and ease-of-use are paramount, and DJI has nailed both with the Osmo Pocket. Essentially a five-inch stick with a camera head mounted on a tiny gimbal (a stabilizing system for cameras), this tiny gadget allows its user to capture high-resolution, smooth videos with one hand, even while moving.

The device's body is mostly plastic, which feels a bit cheap in an age of glass-and-metal phones, but keeps the Osmo Pocket light at 116g. There's a one-inch touchscreen on the body that allows the user to see what they're shooting, and two buttons to operate the camera. The gimbal system is a three-axis motor—tilt, roll and pan—that supports a 12-megapixel, f/2.0 camera.

Those who are familiar with smartphone videography know that the only way to get smooth videos on a smartphone is to use a gimbal. One of the best ones on the market right now is the Zhiyun Smooth 4, which I own. Thus, while the iPhone XS's camera can pull in more details than the DJI Osmo Pocket, stabilization is better on the Osmo.

Now consider that the DJI's device can fit in your pocket, while the iPhone XS and Zhiyun Smooth 4 gimbal combined are more than twice as long and three times as heavy. Plus, setting up the iPhone on the gimbal alone takes at least a minute, while the Osmo Pocket is ready in under five seconds to shoot 4K videos at 60 frames-per-second.

The Osmo Pocket is jam-packed with additional features. It can snap photos, both in regular form or a 3X3 panorama that stitches nine shots together into one large canvas. It can be operated as a standalone device or connected to a smartphone, which gives it a larger viewfinder and more control options, and it can shoot time-lapse or slow-motion videos.

But the Osmo Pocket's most ingenious feature is intelligent face-tracking. When the Osmo Pocket is in selfie-recording mode, it automatically detects and follows the user's face. This tracking feature also works on cars or animals when you're shooting the real world, but given the rise of me-first vlogging content on social media, the face-tracking feature will probably be the most widely used.

The Osmo Pocket's battery allows users to shoot about 70 minutes of continuous footage. I wish it could go a bit longer, but recharging via the USB-C port is easy. In general, videos or photos captured by the Osmo Pocket are not going to look as great as footage captured by the best smartphones (let alone DSLRs), but they're more than good enough for social media, and can in limited doses even be used in a professional setting. In fact, the Osmo Pocket seems destined to become a game-changer for the influencer community—a group whose members love to record footage of themselves doing the most mundane things. Now, instead of having to carry a gimbal in a backpack and take a minute to set it up, they can record within seconds. Be prepared for your social media feeds to be spammed. F

The 12-megapixel camera is supported by a triple-axis gimbal system.

BEN SIN

Ben Sin is a Hong Kong-based contributor for *Forbes Asia* who writes about consumer tech.

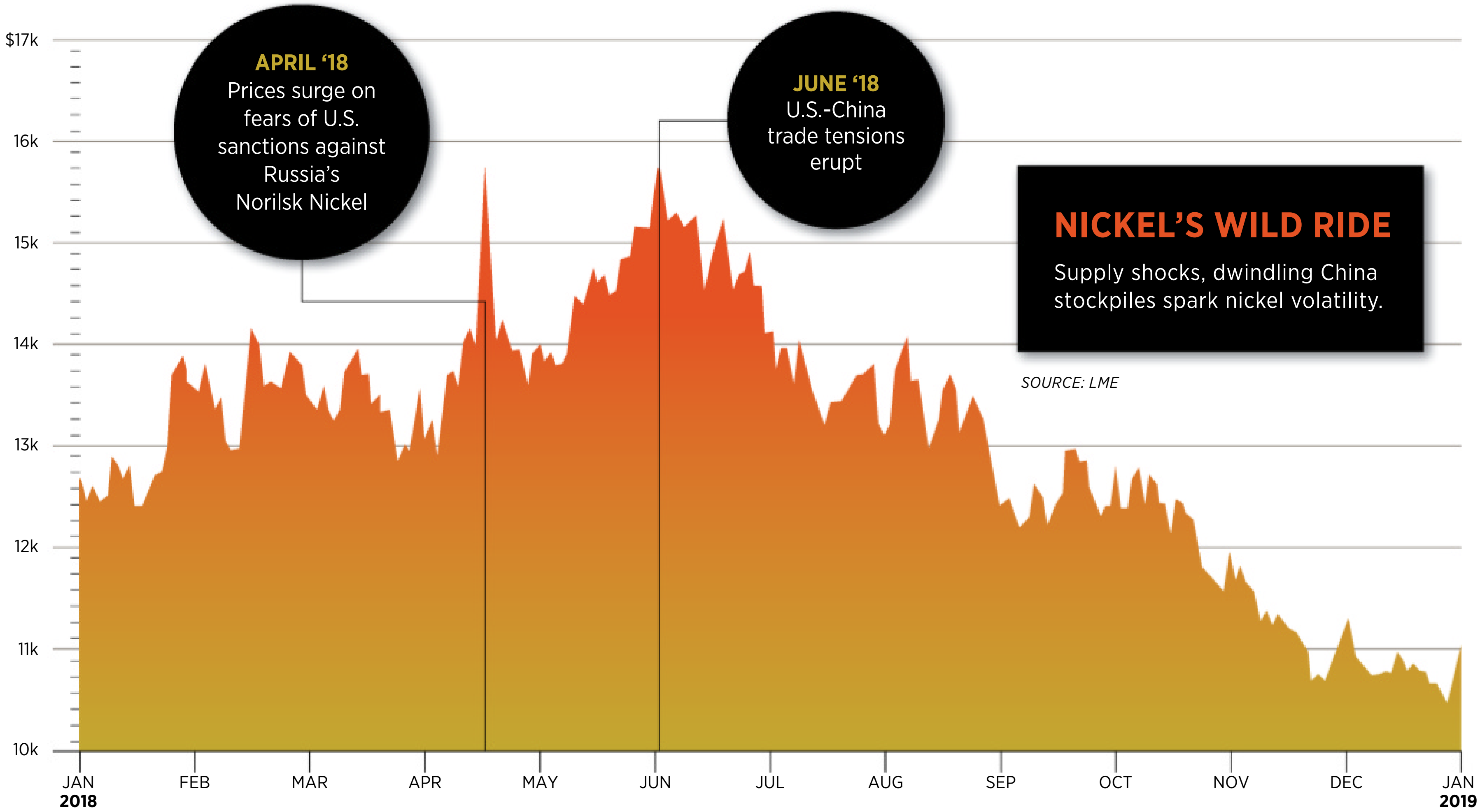
Nickel: As Good As Gold?

The future of nickel can perhaps be best defined by its physical description: silvery-white and lustrous with a slight golden tinge. Other commodities (such as gold) may be more popular, but nickel is a multipurpose, adaptable metal that has a potentially lustrous outlook. That outlook might not be apparent from a recent chart of nickel's price. Nickel has been buffeted by vacillating supplies from Indonesia and the Philippines as well as drastic declines in China's stockpiles. More recently, U.S.-China trade tensions have created uncertainty over demand for steel and stainless steel, putting downward pressure on prices for nickel, a key ingredient in both. As a result, nickel, after surging 63% on the London Metal Exchange between October 2017 and April 2018 to a three-year high of $16,690 per tonne, has since fallen back to about $11,600 a tonne.

Despite its gyrations, nickel still counts many investors among its faithful. Approximately 80% of the primary (i.e. not recycled) nickel consumed globally each year is used in alloys like stainless steel and superalloys. Nickel alloys are often used in harsh environments, from chemical plants and petroleum refineries to power plants, jet engines and even the exhaust system of a Lamborghini.

But nickel alloys are also a crucial ingredient in the batteries that power electric vehicles, or EVs. By 2030, the battery alone of an electric car will contain roughly 45kg of nickel. The worldwide push for EVs as a way to reduce emissions from fossil fuel-powered vehicles has already sent consumption of nickel for lithium-ion batteries soaring. In 2017, EV batteries accounted for roughly 4% of total nickel demand—but this figure is likely to increase fourfold within 10 years from burgeoning EV demand.

Cobalt is another key ingredient in lithium-ion batteries and so both it and nickel are likely to benefit most from the EV revolution. A conventional lithium-ion NMC 111 battery contains roughly equal quantities of nickel and cobalt, along with manganese. As nickel is a cheaper alternative to cobalt, many automakers



and battery manufacturers have begun exploiting new combinations that allow them to swap cobalt for nickel in that mix. Batteries with a higher proportion of nickel are lighter and have also been found to deliver superior energy density over traditional NMC 111 chemistry, thus reducing overall costs.

Nickel's day won't come right away. The EV market still represents only a tiny fraction of overall demand for nickel. As a result, nickel prices are likely to remain weak until EV demand takes off in two to three years. Yet consider: The International Energy Administration predicts annual demand for electric cars to reach 125 million by 2030 from three million currently.

The world's largest mining companies are already betting big on that projection. BHP Billiton, Glencore and Vale are among a growing list of miners investing in a potential boom in nickel demand. Australian tycoon and politician Clive Palmer, for example, plans to reopen Queensland Nickel's Yabulu refinery. Located in Townsville, Queensland, the nickel-cobalt refinery was one of the world's largest for 40 years until it was shut down in early 2016 as nickel prices slumped to a 12-year low.

Indonesia, which produces one-third of the world's nickel ore, has been gradually raising output since early 2017 when it partially lifted a three-year export ban. Indonesian state miner PT Antam now aims to export 5 million tonnes of nickel ore in 2019, up from an estimated 3.9 million tonnes in 2018. PT Antam and state-owned energy company Pertamina are also teaming up to build their own lithium-ion battery factory.

Cash is also pouring in to Indonesian nickel production from abroad. Investors from China, Japan and South Korea are reportedly investing $4 billion to build a lithium battery factory at the Indonesia Morowali Industrial Park (IMIP) on the island of Sulawesi. The group also aims to establish a facility to produce nickel- and cobalt-based chemicals.

The IMIP site is already home to 20 nickel ore processing facilities feeding 1.5 million tonnes of nickel pig iron annually into the nearby Tsingshan stainless steel mill. One of the suppliers of nickel to the Chinese-owned facility is Hengjaya, a mine owned and operated by Australia's Nickel Mines that raised A$200 million ($150 million) via an IPO in August 2018 on the Australian Securities Exchange.

The bottom line is that nickel consumption by electric car battery makers may still be tiny. Yet it is only a matter of time before EV demand kicks in to send nickel demand soaring. The big miners are banking on it. F

In 2017, EV batteries accounted for roughly 4% of total nickel demand—but this figure is likely to increase fourfold within 10 years from burgeoning EV demand.

GETTY IMAGES

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BENOIT TESSIER/NEWSCOM, CARO/RUPERT OBERHÄUSER/NEWSCOM

Steely Resolve

A winning Essar Steel bid will mark Lakshmi Mittal's homecoming.

BY SAMAR SRIVASTAVA

Lakshmi Mittal, 68, rarely gives up without a good fight. He's a veteran of many acquisition battles, most notably the six-month campaign he and son Aditya Mittal waged in the summer of 2006 to acquire Arcelor. The fight for Essar Steel has proved to be no different, with three parties keeping their eye firmly on the prize over the past few months—Essar Steel's 10 million tonne integrated steel plant in India, the world's fastest growing steel market.

The last year was action-packed as ArcelorMittal, NuMetal—a group led by Russia's VTB Bank—and billionaire mining magnate Anil Agarwal's Vedanta traded punches, exchanged blows but each time got up to fight the next round. Mittal probably had an idea of how long and drawn out the process would be. "Certainly in the case of Essar there are unexpected twists and turns and there will be delays to the initial ambitious timeframe that was laid out as part of the process," he says in an email interview.

After nearly six months of litigation, NuMetal was relegated to the corner when it was asked to pay the approximately 480 billion rupees ($6.8 billion) Essar owed its banks. As the committee of creditors sat down to vote last October there was high drama, with the billionaire Ruia brothers, Shashi and Ravi, who control Essar Steel (through their Essar Steel Asia Holdings) making a last-minute attempt to pay off all the creditors in full and take the company out of bankruptcy. A day later, the lenders declared ArcelorMittal the winner on the basis of them submitting the highest bid along with a revival plan. The steelmaker had also cleared its dues in Uttam Galva Steels and KSS Petron India, in which it had held minority stakes, to have its bid for Essar Steel considered. While the bankruptcy court in late January rejected the Ruias' counteroffer, Mittal faces yet another challenger. Billionaire Mukesh Ambani's Reliance Industries in late January joined a group of creditors staking their claim to Essar.

India is the world's fastest growing steel market.

A victory will represent a homecoming of sorts for Mittal. Since he left Kolkata in the 1970s to run his family's steel mill in Indonesia, he's never produced steel in India. Over the years he's also realized how difficult it is to enter India with a greenfield plant. Over the last decade, South Korea's Posco has had to abandon plans to set up a plant in the state of Odisha due to land acquisition problems. Tata Steel's Kalinganagar expansion, also in Odisha, was plagued by delays. ArcelorMittal has made two attempts to set up greenfield plants in Odisha and another state, Jharkand, only to fail mainly on account of land acquisition problems. The only project that hasn't been abandoned so far is an automotive steel joint venture with the state-owned Steel Authority of India.

Further exacerbating ArcelorMittal's frustration is the fact that India is the world's fastest growing steel market. Since 2010, crude steel production has risen 4.6% a year to 95 million tonnes, according to the World Steel Association. With Indian infrastructure spending rising, the Ministry of Steel expects installed capacity to rise from 128 million tonnes in 2018 to 300 million tonnes in 2030. At 69kg per person, India has one of the lowest per-capita steel consumption (*see chart*). As a result, it's no surprise that the recent bids for bankrupt steel plants in India—Bhushan Steel, Monnet Ispat & Energy, Electrosteel Steels—have seen the banks recover almost all their pending dues. In fact, some analysts believe the acquirers could have overpaid if the steel cycle takes a turn for the worse.

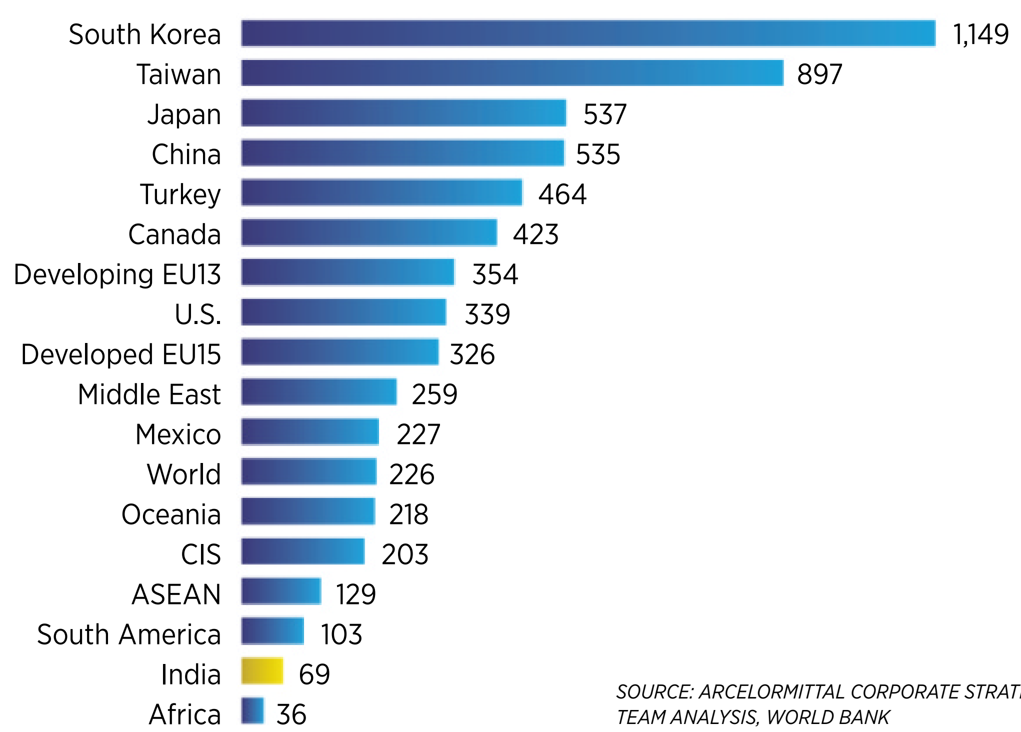
The Indian bankruptcy auction also came at an opportune time for Mittal. He's spent the decade since the financial crisis deleveraging his balance sheet. The company aims to bring its net debt down from $10.5 billion to $6 billion in the medium term. "We believe this is the level that will ensure we are able to maintain an investment grade rating through any point in the cycle," says Mittal. The Essar acquisition will see ArcelorMittal take on additional debt.

Adding Essar Steel would take ArcelorMittal's 114 million tonne capacity up by 8%. The company believes it is well-placed to turn the plant around. By infusing working capital and de-bottlenecking it, ArcelorMittal could get the plant to produce close to its stated capacity of 10 million tonnes. At a bid price of about $7 billion, Essar's plant is cheaper than the globally accepted benchmark of $1 billion for one million tonnes. That probably also explains why Mittal has readily agreed to pay the dues amounting to about $1 billion that Uttam Galva and KSS Petron owe the banks. He's getting a $2 billion discount and a functioning plant to boot. F

—This article was adapted from Forbes India, a licensee of Forbes Media.

ROOM TO GROW

Crude steel consumption per capita for selected countries and regions in 2017 *(KG PER CAPITA)*



SOURCE: ARCELORMITTAL CORPORATE STRATEGY TEAM ANALYSIS, WORLD BANK

JAPAN IN 2019: INNOVATION-LED GROWTH

One of Japan's strengths has always been in the area of innovation: Japanese firms are known worldwide for embracing and developing new technologies. The companies profiled in this section are primary examples of ones deploying this strategy.

Seeing the demand coming from healthcare industries around the world, including Japan, Mr. Fujio Mitarai, Chairman and CEO of Canon, has decided to revamp the entire corporate structure at his firm, so as to position medical technologies as a core revenue source. Lucrative opportunities are seen in diagnostic imaging, healthcare information technology and in-vitro diagnostics. With Japan leading the world in imaging scan rates per head of population, the innovation of miniature endoscopes is also an example of how Japanese companies are applying cutting edge expertise to produce better health care.

On the shop-floor, Mr. Akihiro Teramachi, President and CEO of THK is applying robots and AI in the increasing automation of production lines to help offset declining labor availability. He is also putting into place the Flexible Manufacturing Systems necessary to stay abreast of the high-mix low-volume order format likely to emerge as a result of the diversification of newer markets.

Mr. Kouichi Tamai, President and Representative Director of Fuji Xerox, is also leading with innovation. His approach is called Smart Work Innovation, which is term covering a host of new services from Fuji Xerox. The approach combines aspects of AI, IoT and what the company calls IoH—the Internet of Humans. One example is software for reading handwritten documents with 99.96% accuracy, so data stored on these documents can be converted and digitally processed.

Even a traditional firm such as Kikkoman, which has been making soy sauce for more than 300 years, employs innovations. As Yuzaburo Mogi, the Honorary CEO of Kikkoman Corporation notes, "Innovation drives demand, which drives growth." Kikkoman has been using innovations in its products and marketing efforts to grow the company into a leader in the global soy sauce market.

On a broad scale, Japan is helping the economy, and companies, with such innovations as the introduction of 5G telcom services—a fifth generation mobile Internet service that is as much as 10 to 20 times faster than those currently available. The rollout of 5G worldwide is expected to boost the sales of electrical components, such as semiconductors, sensors and other technology which are often produced by Japanese firms.

While Japan is buffeted by some headwinds, such as possible spillover effects of the U.S.-China trade dispute and local challenges such as an aging population, overall Japan's economy remains resilient and the corporate community's reputation for innovation remains strong. As the world's third largest economy, Japan has tremendous resources to deploy to overcome any challenges and maintain its position as one of the world's leading economies with a corporate sector underpinned by innovation-led growth.

CANON: IMAGING THE FUTURE

Once known only for its camera and office equipment, Canon is evolving into an imaging solutions provider under the leadership of Chairman and CEO Fujio Mitarai.

Fujio Mitarai
Chairman and CEO, Canon Inc.

Once known primarily for its camera and office equipment, Canon is in the midst of a grand strategic transformation into a provider of strategically diversified imaging products and services. Navigating this ambitious journey is Chairman and CEO Fujio Mitarai, who is leading the company through five phases of its medium- to long-term Excellent Global Corporation Plan.

Having successfully implemented the previous four phases of the plan, Canon is carrying out Phase V, covering 2016 through 2020, with a focus on seven key policies: establishing a new production system to achieve a cost-of-sales ratio of 45%; reinforcing and expanding new businesses while creating future businesses; restructuring its global sales network in accordance with market changes; enhancing R&D capabilities through open innovation; completing its Three Regional Headquarters management system comprising Japan, the United States and Europe; cultivating globally competent human resources; and re-instilling the Canon Spirit as a foundation for new growth. However, the acquisition of new businesses has already resulted in dramatic change.

"This transformation is already starting to show results," says Mitarai. "Currently, new businesses account for about 25% of sales, and by 2020 I'm hoping that will be about 30% of total sales. We're not just adding new businesses. We're strengthening them and looking into further M&As."

Transformation Track Record

It's been 85 years since Canon's predecessor, Precision Optical Instruments Laboratory, developed the Kwanon, Japan's first 35mm focal-plane shutter camera, and the company is still globally renowned for its superior camera products. In 2018, Canon launched the EOS R, a full-frame mirrorless interchangeable-lens camera. It features a highly innovative lens mount, provides more responsive autofocus, and enables unprecedented creative power in photography and visual

Canon's EOS R is a full-frame mirrorless interchangeable-lens camera with an entirely new lens mount.

expression. But while Canon has continued to set industry standards in both consumer and professional imaging systems, it has also been working non-stop to reinvent itself.

Around the time Mitarai became President of Canon in 1995, the shift from analog to digital in cameras and other electronics was already rapidly gathering steam. The switchover was a full trend by 1998, and demand for digital products gave Canon eight years of expanding sales and profit from 2000 to 2007. But even amid this growth, Mitarai had the foresight to launch the Excellent Global Corporation Plan, a strategy to put Canon at the forefront of innovation in the 21st century. So when the financial crisis of 2007-2008 struck and many other companies met significant headwinds, Canon was able to minimize its effects.

"In light of this situation, I began thinking that we truly needed to change our portfolio," says Mitarai. "I didn't want to let go of any of the management resources that the company had built up, but I began looking for new businesses in peripheral fields that we believed had potential for growth and could supplement our existing businesses. So in 2010, we acquired the Dutch company Océ, which possessed superb high-speed printing technology. This of course complemented our existing office equipment business."

Through this acquisition, Canon has been advancing the digitalization of commercial printing by launching innovative products such as the Océ ProStream 1000, which can achieve high-speed inkjet printing on offset coated paper with quality that comes close to that of typical offset printing.

But Canon didn't stop there. Over the past eight years it has pulled off a series of acquisitions to bolster and expand its businesses. To complement its existing network camera line, it acquired Swedish network camera company Axis in 2015. Working together, Canon and Axis co-developed the AXIS Q1659, an interchangeable-lens network camera that can be fitted with lenses ranging from wide-angle to telephoto. What's more, Denmark-based Milestone Systems, a dominant player in video management software, joined the Canon Group in 2014, offering Canon customers enhanced abilities in managing multiple network cameras. Yokohama, one of the host cities of Rugby World Cup 2019, has introduced Canon's network camera system, which is capable of high-resolution nighttime video and 360-degree omnidirectional shooting. By introducing this system, Yokohama can help prevent incidents and accidents at large public events. These cameras are also expected to demonstrate their value in helping authorities quickly grasp the situation when a natural disaster occurs.

Axis network camera systems support security at Sweden's Malmö Central Station.

Healthcare as Canon's Third Business Pillar

As part of its transformation, Canon is now strengthening its medical technologies in a bid to establish healthcare as one of its three main businesses after cameras and office products. The company aims to become one of the top three players in the field. To that end, Canon acquired Toshiba Medical Systems Corporation in 2016 in a deal worth 665.5 billion yen (US$5.7 billion). The company, now known as Canon Medical Systems, is a leading provider of diagnostic imaging systems such as X-ray, computed tomography (CT), and magnetic resonance imagery (MRI) systems.

"Canon actually has a very long history in the medical field, ever since the founding of the company when we were involved in medical equipment such as indirect X-ray cameras," says Mitarai. "When we welcomed Toshiba Medical into the Canon Group, we knew that we could achieve a lot of synergy, especially in the realm of image-processing technology. We hope to leverage their CT, MRI, and diagnostic ultrasound systems expertise for joint research to unleash further innovations."

Collaborating with Harvard Medical School teaching affiliates and other leading medical centers around the world, Canon is now focused on three key areas: diagnostic imaging, healthcare IT, and in-vitro diagnostics. What's more, Canon is also working on developing new fields through innovations such as miniature endoscopes of less than 1mm in diameter and robotic systems that will automatically guide needles into the body.

"Of all our new business areas, I'm most interested in medical," says Mitarai. "The medical world is so broad. At the moment,

Canon is establishing healthcare as one of its three main businesses after cameras and office products.

the scope of our business is limited to diagnostic equipment, but there's also regenerative medicine, including induced pluripotent stem (iPS) cells, the biochemical industry, and pharmaceuticals. I'm sure it will take a lot of time before we make inroads, but I'm hoping we can establish a presence in some of these medical fields as well. I believe that the medical business has the broadest potential for growth, and I would like them to make focused investments."

Innovating in Mainstay Businesses

Some of these new business areas, such as medical and network cameras, may at first glance appear very different. But these are all areas that can increasingly make use of advanced technologies such as artificial intelligence and automation. For instance, Canon's network video solutions use deep learning in tandem with high-resolution network cameras to automatically count the number of people in a crowd and infer the age and gender of people from live video. Canon is also developing a Wide Area Monitoring System for security purposes that will be able to track individuals and even anticipate their next action using multiple cameras.

"Even in medical imaging and diagnostics, AI will be crucial," says Mitarai. "Until now, doctors have been diagnosing illnesses from images using their own eyes, but in the future AI will have advanced to a point where it can diagnose illnesses while doctors perform other tasks. I think AI can be applied in many areas to advance our existing businesses."

Mitarai also aims to strengthen and expand the scope of Canon's industries as the business landscape undergoes rapid change. As smartphones feature better and better cameras, consumer camera sales will continue to decline, but new products with innovative features, such as mirrorless interchangeable-lens cameras, can increase the company's market share. That's also the case in the B2B market in areas such as electronic newsgathering. At Rugby World Cup 2019 and other large-scale international sporting events in the near future, Canon hopes to show the world its broadcast camera and display technologies that realize extremely high-resolution 8K imaging. Meanwhile, the automotive industry should continue to generate strong demand for lenses and camera systems amid the rollout of autonomous vehicles. Manufacturing plants are also boosting demand for cameras used by robots and for factory automation.

"Canon has a hand in all kinds of camera-related applications," says Mitarai. "Perhaps I shouldn't call these products 'cameras,' but 'optical devices' from now on. Canon's optical technologies are being applied in various areas now. So I think that's where our camera technology can continue to play a very important role in the industrial world."

Looking to the Future

In 2017, Canon marked its 80th anniversary while its sales surpassed 4 trillion yen (US$36.1 billion) for the first time since the financial crisis of 2008. With Canon's new businesses in place and ready to drive growth, the company is set to rebalance its portfolio in order to stay flexible. Canon's current business is made up of four segments: the Office unit accounts for 45.7% of sales, the Imaging System unit 27.8%, the Industry and Others unit 17.9%, and the Medical System unit 10.7%; sales between segments account for 2.1%. For Phase VI, Canon's next five-year plan spanning 2021 through 2025, Mitarai thinks the new businesses that he's now fostering could contribute up to 35% of sales. That means existing businesses will need to continue to grow at around 2-3% annually while new businesses will have to grow 7-8%.

But what kind of company will Canon become when this grand transformation is complete?

"Of course, Canon is always going to be a camera and office equipment company, but we're also adding network cameras and commercial printing presses to our portfolio," Mitarai says. "However, with the growth of our B2B businesses, the proportion that B2C makes of our overall business could decline."

As for Mitarai himself, he's showing no signs of slowing down, even at the age of 83. His secret? "You just have to keep following your dreams," he says with a smile.

A native of Kyushu, Japan, Fujio Mitarai decided not to follow his father and brothers into medical school, but instead joined Canon, where his uncle served as the first President. Five years later, he was posted to the United States, where he stayed for 23 years, eventually becoming President of Canon U.S.A. Back in Japan, he was later appointed President of Canon Inc. before becoming Chairman and CEO.

global.canon

A PROVEN RECIPE FOR SUCCESS

An inconspicuous Japanese firm that doesn't make cars or cameras or TVs became a business pioneer in America and replicated that success story around the world.

It is a common observation in boardrooms and CEO conferences around the world that Yuzaburo Mogi, the Honorary CEO of Kikkoman Corporation, has learned to defy time. Although he joined the company back in the 1950s and became its President in 1995, he still keeps up a daily work regimen that embarrasses younger colleagues. His energy and positive attitude have driven Kikkoman from being a well-known domestic producer of soy sauce to a growing giant in the global foods business.

Kikkoman has been making its mainstay product, soy sauce, for more than 350 years, and Mogi's family has played a key role in it for most of that time. In 1960, the young Mogi went to the United States to study Western business and earned an M.B.A. from Columbia.

Everything he had learned overseas told him that the only way for the company to grow was to become more of an international business, and that meant producing locally. He surveyed numerous possible sites in the country and repeatedly explained the benefits of establishing a production base in the US to Kikkoman's senior management, which eventually led to the successful completion of the company's first US factory.

"We started shipping product from our Wisconsin factory in 1973, and while we faced some difficulties in the beginning, after the first few years we started to grow, and we've been growing ever since," he reminisces.

Success in America was just a stepping stone for the firm. "We created a sound business model in America, then replicated it in Europe, Asia, and around the world," Mogi explains. "Now we derive about 70 percent of our operating income from overseas operations."

Kikkoman's legendary success has made it a case study in famous business schools worldwide. Students examine what secret ingredients made a soy sauce maker one of the world's most admired international businesses.

To Mogi, there is no big secret: "The first step was getting people to try our product. At first they didn't even know what *shoyu* (soy sauce) was, and then gradually they discovered that they like it. The next step was to show them that they can use it in their own daily cooking to enhance flavors. We are strong believers in 'food culture' and 'food education,' so it was natural to show people in different countries how they could use this all-purpose seasoning to make their own foods taste even better."

One might say that showing your product to potential customers doesn't require marketing genius. There must have been something else.

"Well, another key to success abroad is *chiiki kyosei*, or living in harmony with the place where we are doing business. That means buying goods and raw materials locally, hiring locally, using local vendors, practicing environmental conservation, and especially, interacting proactively with the local community. One area that we care deeply about is education," said Mogi. There are many examples, but one clear case was just a few months ago: When the Wisconsin factory celebrated its 45th anniversary, the company donated US$600,000 in scholarship funds to a group of six local high schools. "Supporting education is just one way that we engage with communities. It goes far beyond what most companies think of as good corporate citizenship."

Mogi is a highly respected elder statesman in the business world both inside and outside of Japan. That makes his views on the state of the economy particularly influential: "Companies that produce added value reap profits. Added value translates to GNP growth. In the 1960s and '70s, Japanese companies were highly innovative. By constantly adding value to products, they created enormous demand, which led to a huge economic boom. In order to grow now, companies need to become innovative again. It is essential to create new demand, and that means a need for innovation and for new investment. Innovation drives demand, which drives growth."

For half a century, Mogi says, Kikkoman has worked hard to be innovative, not simply to expand its product range, but to create increasing demand for its products. And it is still growing worldwide. Clearly, they have found a recipe for success that continues to serve the company well all over the globe.

Yuzaburo Mogi
Honorary CEO and Chairman of the Board of Directors, Kikkoman Corporation

Yuzaburo Mogi is a descendant of one of the founding families of Kikkoman, which is among the oldest continually running businesses in Japan. He became company President in 1995, was named Chairman in 2004, and assumed the title of Honorary CEO and Chairman of the Board of Directors in 2011. Mogi holds an MBA from Columbia University.

THK TO GROW CORE BUSINESSES DESPITE UNCERTAIN GLOBAL ECONOMIC OUTLOOK

Like its illustrious past, the future is looking bright for THK, where President and CEO Akihiro Teramachi sees the increasing shift to industrial automation as an opportunity to boost the fortunes of the company that pioneered the Linear Motion Guide. "I see major opportunities ahead," he says.

THK was an early adopter of Artificial Intelligence (AI), the Internet of Things (IoT), and robotics, and Teramachi expects the company to rely increasingly on non-human input in its manufacturing operations. He anticipates a growing lean to IoT amid the ongoing transition to 5G, and the company expects increased orders from the makers of a variety of electrical components, including semiconductors and sensors.

Akihiro Teramachi
Chief Executive Officer and President, THK

However, US-China tensions cloud the future, and harbor the potential to damage the global economy.

"We are now seeing significant impact from the US-China trade war. In particular, China is already beginning to postpone investment activity, and I feel that the effect of this is beginning to have repercussions in Europe and Japan as well," he says. "Looking ahead, determining whether this economic war continues and, if so, for how long, will be a major challenge. We must pay close attention to developments."

With a view to staying ahead of the pack, Teramachi and his staff are forging ahead with the commercialization of OMNI edge, and operational trials are due to begin in February 2019. OMNI edge is a new predictive application that brings together the THK Sensing System—a technology for quantifying damage and the lubrication status of the Linear Motion Guide—with edge computing to facilitate the simple creation of IoT networks and safe and secure data gathering.

"OMNI edge will provide our clients with new, unprecedented services, and help drive our company toward further growth," says Teramachi.

The use of AI can reap huge benefits, but increasingly intelligent robots may soon emerge that are capable of disrupting the existing master-servant relationship between humans and machines. Teramachi urges his staff to hone their skills to keep up.

"Humans must acquire the skills necessary to be able to control robots, AI, and computers, otherwise they run the risk of being displaced by them," he says.

At the same time, Teramachi maintains a positive outlook for his company and, in February 2018, THK adopted a five-year management target that aims for consolidated sales of 500 billion yen (US$4.4 billion), and an operating profit of 100 billion yen (US$881 million). The sales breakdown in the period to

the end of December 2022 is expected to see the industrial machinery business account for 350 billion yen (US$3.1 billion), and the automotive and transportation business expand to 150 billion yen (US$1.3 billion).

"The order cycle and work-related cycle from order to delivery in the transport equipment business is approximately four years, meaning our current sales activities are aimed at delivery in 2022. In that sense, we have a target that is, to some extent, within our sights," Teramachi says. "As the IoT era strides firmly forth, the industrial equipment business will develop new products and services such as OMNI edge, and we will add these new business areas to our existing lineups to achieve further growth."

Ultimately, while it might not be plain sailing in the short term, Teramachi is taking a mid- to long-term stance, and looking to navigate his company toward calmer, more profitable waters in the future.

Akihiro Teramachi graduated from Keio University in 1971 and joined THK Co., Ltd. in 1975. He became a Director in 1982 and Vice President in 1994, before taking over as CEO in 1997.

www.thk.com

FUJI XEROX: MAKING WORK SMARTER THROUGH INNOVATION

President Kouichi Tamai is transforming Fuji Xerox into an AI-powered solutions provider for smarter work.

Kouichi Tamai
President and Representative Director, Fuji Xerox Co., Ltd.

In June 2018, Fuji Xerox appointed Kouichi Tamai as its new President and Representative Director. It came at a time of historic change for the company. Fuji Xerox is transforming itself from a photocopier manufacturer into a diversified solutions and services provider, while withdrawing from unprofitable businesses and pushing ahead with aggressive structural reforms.

"In the first half of this fiscal year through September 30, 2018, sales were down 6% over the previous year as we strategically reduced unprofitable businesses, but our operating profit was up 63%," Tamai notes. "We are determined to reinvent ourselves."

Building on a Strong Foundation

Established in 1962, Fuji Xerox is 75% owned by FUJIFILM Holdings Corporation and 25% by Xerox Limited. It's one of the world's longest-running joint ventures between Japanese and American companies, and has the largest market share in most of the countries or regions where it operates, which are Japan and Asia-Pacific. But in 2008, Fuji Xerox's leaders decided that its business model had to evolve. It would no longer depend on selling hardware such as multifunction printers.

Tamai became Corporate Vice President of Fuji Photo Film Co., Ltd. (currently called FUJIFILM Corporation) in 2006, leading various businesses there in achieving double-digit growth. He then served as Chief Innovation Officer of its holding company, spearheading company-wide reforms. His new leadership role at Fuji Xerox comes as the venture is deploying innovative technologies to make work smarter and more streamlined.

What is Smart Work Innovation?

Like a Renaissance man seeking new ways to improve existing methods of doing things, Tamai is spearheading a change in how people work. Fuji Xerox is rolling out new services under its value proposition strategy: Smart Work Innovation. Launched first in Japan in 2018 with a plan to progressively deliver later in the Asia-Pacific, the strategy brings together technologies in the areas of artificial intelligence (AI), Internet of Things (IoT), and Internet of Humans (IoH). General workers as well as specialists can benefit from these services. The overall aim is to enhance business competitiveness by automating repetitive tasks, sharing professional expertise among all workers, providing secure communications, and using data to foster creative ways of working.

Tamai cites several examples of Smart Work Innovation. One is automatic data extraction from handwritten forms. This technology, Document AI, can recognize handwriting with an extreme accuracy of 99.96% and convert the information into data for processing. The solution can be used to ingest data

Fuji Xerox's new ApeosPort-VII C multifunction printer

from company invoices and other handwritten documents. In a case study at a financial institution, worker productivity doubled with the platform.

"Smart Work Innovation liberates workers from repetitive tasks and opens professional expertise," says Tamai. "Particularly in industrialized countries, simple tasks can be automated, giving people more freedom to do creative work."

In November 2018, Tamai unveiled a concrete example of the Smart Work Innovation approach with the new ApeosPort-VII C and DocuCentre-VII C series of multifunction printers. These 16 cloud-connectable printers make work easier with a simple connection to smartphones or other mobile devices, enabling users to print from anywhere. They are also equipped with an array of enhanced security measures that are superior to those of competing printers, meeting the needs of data privacy and security for both hardware and software.

Envisioning the Future

Tamai is confident that the Smart Work Innovation approach will help boost Fuji Xerox's operating profit ratio to reach double digits in fiscal 2019. His confidence is backed by the experiences he accumulated at FUJIFILM Holdings as he leads Fuji Xerox toward its 60th anniversary in 2022.

"Fuji Xerox will still have printers, but they won't be just for printing or copying," says Tamai. "Our printers will serve as a core portal in the office that connect with various cloud and other services leveraging AI, IoT, IoH, and other accumulated technologies. This is to serve our focus of providing customers with solutions and services to streamline business operations and boost productivity; all in all, to resolve social issues such as answering to the shortfall in human resources or workstyle reforms."

For Fuji Xerox, the utilization of leading technologies such as AI and IoT goes beyond office work. To pioneer the future of communications in commercial printing from a global perspective, Fuji Xerox unveiled in 2018 a new hub for open innovations—dubbed Future Edge—inside its product development site in Ebina City, Kanagawa, Japan. Here, the company works closely together with its customers on transforming communications, utilizing technologies such as AI, IoT, and even robotic process automation (RPA). Future Edge also aims to demonstrate how these technologies can enhance the productivity of print operations and reform workstyles by enabling people to access the state of print jobs remotely and automate workflows that require human labor. More than 2,000 people have visited the facility thus far from Japan and abroad, from both inside and outside the commercial printing industry.

"Fuji Xerox's mission is to help businesses work creatively and concentrate on what matters most to them," Tamai continues. "With my whole heart, I want to help customers with a smarter way to work."

Future Edge, a new hub for open innovations in Ebina City, Kanagawa, Japan

Tamai has a skillset that's well suited to the job. His patience, determination and attention to detail are plain when he opens one of his notebooks, revealing lines and lines of almost obsessively neat Japanese script. He is also a skilled draughtsman from his training as a mechanical engineer, and is proud to show off his immaculate technical drawings. It's no wonder some of his colleagues used to call him "Da Vinci."

Kouichi Tamai joined Fuji Xerox Co., Ltd. in 2017 as the Deputy President and Representative Director. He holds a doctorate degree in engineering from the Faculty of Engineering, University of Tokyo.

fujixerox.com

TIM PANNELL FOR FORBES

BILLIONAIRE, BUST AND BACK

Starting in the 1970s, Bill Boyd built an empire of budget casinos and established himself as one of Vegas' original godfathers. But as the city transformed from a desert backwater into a luxury gambling hub, he tried to reinvent himself and nearly lost it all. Now he is doubling down on his low-stakes roots.

BY ABRAM BROWN

Summer usually quiets Las Vegas. But on a 38-degree day in June, gamblers stream into the downtown California Hotel, the original property of publicly traded Boyd Gaming. Bill Boyd, the company's cofounder and executive chairman, is walking the casino floor, winding up a routine he's been honing for 40 years. He passes the blackjack tables, nodding to his veteran dealers, then ambles past the video-poker machines and the Buffalo Stampede slots.

Like all Boyd properties, the California caters to budget-conscious gamblers, mostly locals and middle-class out-of-towners. So it packs in slots and low-limit table games. "The atmosphere here is different," Boyd says. "If I was at the Wynn"—the shard-shaped luxury casino on the Strip created by his former business partner, the billionaire Steve Wynn—"I'd be busy looking around." The California is not where Diana Ross comes to play. Or where you dine on a $100 steak.

Near the front entrance, Boyd, 87, pauses next to a nearly two-meter, koa-wood statue of a grinning, twirling Buddha, a gift several decades ago from a group of happy customers. "That's for good luck," he says, rubbing the Buddha's well-worn belly and completing a long-standing ritual at the California. A little good fortune goes a long way in Vegas. So do cool-headed decisions when luck runs out. When Boyd took his company public in 1993, it owned six strongly profitable casinos, which generated over $430 million in revenue. All fit the same mold as the California. They were inexpensive places to gamble.

Bill Boyd (left), Las Vegas Mayor Oran Gragson (middle) and Sam Boyd celebrate the California's opening on January 1, 1975.

profit in 2017. Revenue sits at $2.4 billion. "When the Great Recession hit, it was very difficult," Smith says. "We made some very tough decisions to shut down projects, refine our business and work our way through."

Boyd sinks into a cushioned banquette at the California's Redwood Steakhouse, positioning himself comfortably to recount the origins of his company, which started here with the California. Tens of thousands of dollars could be won and lost on the California's blackjack tables in the time it takes Boyd to tell his story, one that dates to the mob-connected Vegas of Bugsy Siegel in the 1940s. "Incidentally," he says, "the movie *Bugsy* said the Flamingo was the first hotel on the Strip. It was actually the third."

Over the next 15 years, a rising stock price made Boyd a billionaire and emboldened him to roll the dice by building higher-end casinos: the Borgata in Atlantic City in 2003 and Echelon Place on the Strip three years later. The moves suffered from exceptionally poor timing. Both Atlantic City and Las Vegas had become increasingly saturated markets. And then the Great Recession hit. In 17 months, Boyd Gaming's stock lost 94% of its value, falling to nearly $3 a share in November 2008.

To stave off bankruptcy, Boyd was forced to make a number of humbling decisions. He shelved plans for luxury casinos, instead doubling down on adding budget ones across rural America. And since his actions had gotten the company into this mess, he reasoned, maybe he could use some advice on getting out of it. With that in mind, he elevated the company president, Keith Smith, to CEO, giving himself a partner for the first time since the death of his father—the other cofounder of Boyd Gaming—in 1993. "At the beginning of our existence, my dad and I were risk-takers, and you needed that," says Boyd, a white-haired man with a gold, diamond-studded pinkie ring. "We didn't need that anymore. We needed somebody that was more conservative than I was."

"The biggest change for the company over the past decade is that they've become quite a bit more disciplined," says David Katz, an analyst at Jefferies, an investment bank. "I don't want to say 'risk averse'. … They've become a bit more 'risk appropriate.'" Since November 2008, Boyd Gaming stock has risen over 700%, almost triple the S&P 500's increase. Boyd himself is nearly a billionaire again (estimated net worth: $700 million-plus), and his company has swung from a $223 million loss in 2008 to nearly $200 million in

Boyd moved to Vegas when he was in elementary school. "As I'm growing up, my mom and dad would always say to me, 'Billy, you don't want to grow up to be a dealer like your dad, so get an education.'" After serving in the Korean War, he received a law degree from the University of Utah and worked as a lawyer for several decades; by that point, his father, Sam, had become an established casino manager. In the early 1970s they pooled their money to buy a piece of land on Fremont Street and then built and opened the California there. All told, it probably cost them $11 million (over $50 million in current dollars), the funds coming from the Boyds, outside investors (many of them the California's employees) and a Bank of Las Vegas loan. In 1979 they opened Sam's Town on a 13-acre lot on Boulder Highway, far from downtown and designed to lure gamblers coming to or leaving the city. The Stardust, an aging gem on the Strip whose mob history would inspire Martin Scorsese's *Casino*, was bought for $115 million (about $280 million today) in 1985.

His father's death left Boyd to guide the company alone, and he took it in a different direction: Atlantic City, which was already long into a boom. The number of casinos there had grown from zero in 1976, the year gambling became legal, to a dozen 20 years later. And before legalized gambling spread throughout the East Coast, the so-called "casino win"—the revenue generated from gambling—across Atlantic City casinos neared $4 billion.

A.C. beckoned Boyd in the form of a 1997 phone call from Steve Wynn. The two had joined forces a decade earlier to spruce up part of Fremont Street in downtown Vegas. Now Wynn had a different idea: a 50-50 partnership in a new casino he wanted to put up in New Jersey. The 2,000-room Bor-

LAS VEGAS NEWS BUREAU

gata would ultimately cost $1.1 billion. It was nice—stocked with 300-thread-count sheets, gold-tinted windows and 13 Dale Chihuly glass chandeliers—but still just another casino in an increasingly crowded city.

Back in Vegas, Boyd soon envisioned something even grander than the Borgata and readied plans to redevelop the Stardust, drawing up a blueprint for four hotels, a casino and a spa on a 63-acre lot that would be rechristened Echelon Place. Like the Borgata, the Echelon faced a slew of established competitors. The Mirage had opened in 1989, and since then the city added a number of upscale casinos, including the Luxor (1993), MGM Grand (1993), the New York-New York (1996), the Bellagio (1998), the Venetian (1999) and the Wynn (2005). Nevertheless, the Stardust was torn down, and by the time Boyd Gaming halted construction on the Echelon in 2008, it had already spent $1 billion. Estimates showed that completing it could cost at least five times that amount.

> "AT THE BEGINNING OF OUR EXISTENCE, MY DAD AND I WERE RISK-TAKERS, AND YOU NEEDED THAT."

Boyd and Smith thought work on the Echelon could resume within a year. It never did. "It was worse than we thought it could be," Smith says. "Three years later, we finally said, 'Okay, it's not three or four quarters. This thing isn't getting any better.'" In 2013, the Malaysia's Genting Group bought the Echelon property for $350 million. "It was very disappointing. It was going to be the crown jewel of the company," Boyd says. "As much as we didn't want to stop construction, as much as we didn't want to sell it, we knew that we had to in order to survive."

Things were grim in Atlantic City, too. By 2013, more than a dozen states beyond Nevada and New Jersey had casino-style gambling, and total gaming revenue in Atlantic City had fallen from a record high of $5.2 billion in 2006 to under $3 billion. By one measure, the number of out-of-towners visiting Atlantic City fell by more than 20% in that same period. The Borgata wasn't immune. Since 2006, its revenue had declined by almost a third, to roughly $700 million. Boyd and Smith decided to walk away, dealing its 50% stake to MGM Resorts for $900 million in 2016.

With the luxury plans gone, Boyd returned to what had made his company successful in the first place: cheap casinos serving low-stakes gamblers. Rather than expand in crowded Vegas, Boyd cast his eye around America. Building new casinos would require a level of risk he no longer wanted to stomach; besides, he had Smith at his side emphasizing new construction's drain on their barely recovered cash flow. Better to grow through acquisitions. In the last six years, Boyd Gaming has purchased 13 casinos, spending $2.9 billion. To make those deals, Smith studied the numbers on prospective purchases and targeted casinos with $10 million to $15 million in Ebitda, eventually moving on to ones closer to $20 million—basically pinpointing places that dominated their local area. "If there are five competitors in the market, we don't want to buy the fifth [best] asset or the fourth [best] asset," he says.

The little gambling empire now stretches from Pennsylvania (the Valley Forge Casino Resort) to Illinois (the Par-a-Dice) to Louisiana (Sam's Town Shreveport). In October, Boyd Gaming completed its latest deal, a $575 million purchase of four casinos in Missouri, Indiana and Ohio from Pinnacle Entertainment. "They've put some good financial rigor around what they're doing," says Katz, the Jefferies analyst. Wall Street is upbeat on Boyd Gaming; a majority of analysts suggest buying the stock. Observers see the rural casinos as less susceptible to broad changes in consumer spending.

Vegas, on the other hand, proved vulnerable in the 2008 recession—the economy there shrank for three years straight, a year longer than the country as a whole. Boyd and Smith now meet several times a week, frequently on the floor of one of the Vegas casinos. They find an empty card table and light up cigars, usually long, fat Churchills. "That's where we go over all of our business," Boyd says.

Despite his advancing age, much of Boyd's life is unchanged. He still drives a Mercedes sedan that has ECHELON spelled out on its vanity plates. "I always ask, 'Dad, why don't you take those off?'" his daughter Marianne says. "He says, 'It just reminds me that everything doesn't always go perfect.'" Boyd has never sold a share of Boyd Gaming since it went public, and he lived in the same house for 40 years before recently moving closer to Boyd Gaming's offices. "I've had friends ask, 'That's your grandfather?'" recalls his 31-year-old grandson Sam Boyd Jr., an HR executive at the company. "They're expecting something super-elaborate, like bodyguards."

Higher up in the company are two more Boyds, Marianne and her brother Willie. She is vice chairman, he is a vice president, and both sit on the board with their father. Those three Boyds control a sizable portion of Boyd Gaming stock, about 26% of the firm. Neither Marianne nor Willie sees a time when a Boyd isn't leading the business. "Willie and I will probably try our best to carry on that sort of family feeling within the company," Marianne says.

And they have plenty of their dad in them. "I think it would really, really help the company a lot if we had a property on the Strip," Marianne says. "Because people—that's what they want to do when they're in these smaller towns and they like to gamble. They want to come to the big city, and I think they would like to be on the Strip."

The thought is almost impossible for her to shake once she brings it up. "I'd love to just have a property on the Strip one day," she repeats. "I would too," Willie says. Then, as if suddenly reminded of her father's travails, she adds, "If the price is right." F

Software Sweatshop

TWO DECADES AGO, JOE LIEMANDT BECAME THE YOUNGEST MEMBER OF THE FORBES 400 BY BUILDING AN ENTERPRISE SOFTWARE JUGGERNAUT. HE'S QUIETLY RETURNED, BIGGER THAN EVER, WITH A DARKER MODEL.

BY NATHAN VARDI

TONY HEALEY FOR FORBES

From an office suite on the 26th floor of the iconic Frost Bank Tower in Austin, Texas, a little-known recruiting firm called Crossover is searching the globe for software engineers. Crossover is looking for anyone who can commit to a 40- or 50-hour workweek, but it has no interest in full-time employees. It wants contract workers who are willing to toil from their homes or even in local cafes.

"The best people in the world aren't in your Zip code," says Andy Tryba, chief executive of Crossover, in a promotional YouTube video. Which, Tryba emphasizes, also means you don't have to pay them like they are your neighbors. "The world is going to a cloud wage."

Tryba's video has 61,717 views, but he is no random YouTube proselytizer. He worked in sales at Intel for 14 years before serving in the White House as an advisor to President Barack Obama's Council on Jobs and Competitiveness. Since 2014, Tryba has been the right-hand man of Joe Liemandt, one of the most mysterious and innovative figures in technology.

In the 1990s Liemandt was the golden boy of enterprise software, a 30 Under 30 wunderkind before there was a Forbes 30 Under 30 list. Like Bill Gates before him, he dropped out of college, in his case Stanford, to start a company, Trilogy, and build his fortune. In 1996, at the age of 27, he made the cover of *Forbes*, and a few months later he appeared as the youngest self-made member of The Forbes 400, with a $500 million net worth.

In its first iteration, Trilogy Development Group sold product configuration and sales software to the likes of Hewlett-Packard and Boeing (think of the zillion variations of computers and airplanes those companies sell). Trilogy became the hot place for young coders to land in the late 1990s. Known for its testosterone-fueled work environment and an alcohol-infused mix of long hours, fast cars, gambling and sex, Trilogy served as the model for Silicon Valley's boys club. Its programmers were paid like rock stars and partied like them, too.

It made sense back then, because at the time coding was a rare and unique skill. Companies like Trilogy, eBay, Apple and Microsoft were making groundbreaking, innovative software, the first versions of everything from Web browsers to e-commerce platforms. But it makes no sense in a world of $200 laptops, where any kid in Cairo can learn to code on YouTube. And mostly what they are coding is updates to old versions of stuff like payroll and inventory management software. You pay an artist to design a Maserati; you pay a mechanic to change its oil. And the new version of Trilogy, now part of ESW Capital, Liemandt's Austin-based private equity firm, is all about changing the oil.

Tryba argues that the current cloud wage for a C++ programmer, for example, is $15 an hour. That's what Amazon pays its warehouse workers. Crossover, which is actually the recruiting wing of ESW, has amassed an army of 5,000 workers in 131 countries from Ukraine to Pakistan to Egypt. In

the past 12 years, ESW has quietly acquired some 75 software companies, mostly in the U.S., and it exports as many as 150 high-tech jobs every week.

After the dot-com crash, Trilogy faded from view, but from its ranks numerous successful tech companies, including Nutanix and SendGrid, were spawned. It also played a big part in Austin's emergence as a technology hub. Like others with dot-com fortunes, Liemandt dropped off The Forbes 400 in 2001. He stopped giving press interviews, outsourced Trilogy's U.S. workforce and took his public company private. Most assumed Liemandt had burned out, but nothing could be farther from the truth.

Liemandt had seen the future and decided to get out in front of it. In 2006 he quietly began building an enterprise software empire where innovation and growth take a back seat to sheer profitability.

Using his closely held ESW Capital, Liemandt began buying dozens of business-software firms with values ranging from $10 million to $250 million. Ever heard of Nextance, Infopia, Kayako or Exinda? Not many have, but these are the types of firms that run things like customer service and document management, humming in the background of an untold number of businesses.

These days it's standard for U.S. tech companies to have a foreign workforce strategy. The gig economy has also produced freelancer hubs like Amazon's Mechanical Turk marketplace and Upwork. But Liemandt's software roll-up takes this idea to its extreme.

His workers must agree to install spyware on their computers so Crossover's productivity team can track the number of times they click their mouse or stroke their keyboard. The tracking software takes screenshots every ten minutes and, in some cases, snaps photos from PC webcams. Spyware or not, programmers are applying in droves, and it's made Liemandt richer than ever. At age 50 he's back on The Forbes 400, with a net worth of $3 billion. But rather than celebrate his return, he refused to speak to *Forbes* for this article. "I am very private; I am an introvert," Liemandt said to *Forbes* in 2017.

Twenty years ago, Liemandt was the life of the tech party. Wall Street was in a frenzy over tech stocks that soared higher every day. Inspirational computer programmers like Bill Gates, Marc Andreessen and young Liemandt were the new masters of the universe.

Trilogy had become a recruiting machine for talented programmers fresh out of Harvard, Stanford, Carnegie Mellon and MIT. A job at Trilogy meant long hours, but the money was good, and the perks—like beer parties on the patio every Friday—made it like campus life without midterms or finals. "Everyone was very young, and all we did was work hard and play hard together," says Rishi Dave, who worked at Trilogy in business development.

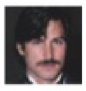
Trilogy's recruiting weekends were legendary. Wild parties were thrown at Austin's hotels and 6th Street bars, and beautiful women were hired to help recruit. Liemandt was known for doling out lavish signing bonuses and gifting Porsches and BMWs.

"We kind of felt like celebrities," says Russell Glass, who started his career at Trilogy and went on to found an ad platform that he sold to LinkedIn for $175 million. "They got these nice-looking, young, fun recruiters, and if you are a dorky engineer or product guy you fell in love with the entire thing."

UNDER 30 AND ON THE FORBES 400

WHEN THE FORBES 400 LIST OF THE RICHEST AMERICANS WAS FIRST PUBLISHED IN 1982, IT FEATURED A 27-YEAR-OLD STEVE JOBS. SINCE THEN, ONLY EIGHT OTHER SELF-MADE PEOPLE HAVE MADE OUR LIST OF RICHEST AMERICANS BEFORE TURNING 30—SOMETHING EVEN BILL GATES, WHO MADE OUR 1986 FORBES 400 AFTER HIS 30TH BIRTHDAY, WAS UNABLE TO DO.

STEVE JOBS, 27 CLASS OF 1982



The Reed College dropout cofounded Apple and launched its IPO in 1980. Jobs made it onto the inaugural Forbes 400 list in 1982 with a net worth of $100 million. His widow, Laurene Powell Jobs, is worth **$20.6 billion** today.

MICHAEL DELL, 26 CLASS OF 1991

The kid from Houston who ultimately turned computers into commodities landed on The Forbes 400 with a net worth of $300 million. Current net worth: **$26.7 billion**.

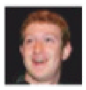
JOSEPH LIEMANDT, 28 CLASS OF 1996

In 1996, Joe Liemandt stared back at us from the cover of *Forbes*—twice—first, at age 27, when his Trilogy Software was featured and then a few months later for The Forbes 400. His 2018 net worth: **$3 billion**.

JERRY YANG, 29 CLASS OF 1998

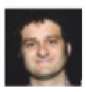
Yahoo was the internet's most widely used search engine in 1998, and that put its cofounder Jerry Yang on our list with a net worth of $830 million. Current net worth: **$2.4 billion**.

MARK ZUCKERBERG, 24 CLASS OF 2008



Facebook's founder was the youngest self-made person to ever appear on The Forbes 400 with a net worth of $1.5 billion. A decade later it has grown to **$56.1 billion**.

DUSTIN MOSKOVITZ, 26 CLASS OF 2010

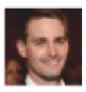


Eight days younger than his Facebook cofounder and former Harvard roommate Mark Zuckerberg, Moskovitz took two extra years to get on The Forbes 400, with a net worth of $1.4 billion. His current net worth: **$10 billion**.

EDUARDO SAVERIN, 28 CLASS OF 2010

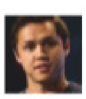
The Facebook cofounder famously had to fight Mark Zuckerberg to hang on to a piece of the company. By 2010 his Facebook ownership was worth $1.15 billion. Current net worth: **$8.8 billion**.

EVAN SPIEGEL, 25 CLASS OF 2015



Spiegel first appeared on The Forbes 400 four years after he cofounded Snapchat while at Stanford University. His net worth was $2.1 billion, which is higher than today's **$1.6 billion**.

BOBBY MURPHY, 27 CLASS OF 2015



Like his Stanford pal and Snapchat cofounder Evan Spiegel, Murphy made The Forbes 400 in 2015, with a net worth of $1.8 billion. Snapchat's shares have fallen, and so has his worth, to **$1.6 billion.**

Occasionally there were impromptu corporate off-sites to places like Las Vegas, where Liemandt would book suites at Luxor and charter a 737 to fly his team out after work. According to the 2018 bestselling book *Brotopia*, which focuses on the male-dominated corporate culture in technology, Trilogy "wrote the bro code" that would infect Silicon Valley and make tech hostile for women. Liemandt's formula—misogynistic as it was—worked well. When it came to hiring top programmers, Microsoft's Steve Ballmer once said he worried about Trilogy as much as Oracle.

Unlike Microsoft, however, Trilogy didn't base its success on continual innovation, new products or brand marketing. Liemandt's genius was turning the once manual process of keeping track of sales configurations into a complex combination of constraint-based equations and rule-based software programs. Say HP was selling a computer system with a different video card or printer. This might require a different specification or an additional cable and thus change the price of the package. The software Liemandt developed could handle thousands of combinations in minutes, saving money and costly mistakes.

Liemandt and Trilogy's other founders developed their software as undergraduates at Stanford. The young Liemandt seemed destined for business success. His father, Gregory, worked directly under legendary GE executive Jack Welch, and the Liemandts vacationed with the Welches. After his father left GE to be CEO of a mainframe software company in Dallas in 1983, Liemandt began programming but also took a strong interest in entrepreneurship. As a Stanford economics major, he was determined to create the kind of business that either Jack Welch or his father would want to buy.

His obsession with sales efficiency spawned Trilogy, and in 1990, at age 21, he defied his parents' wishes and dropped out of Stanford to build his software company.

Six years later his sales were some $120 million and he was on the cover of *Forbes*. Much of Liemandt's initial wealth came from spinning off a Trilogy unit called pcOrder.com, which sold thousands of computer parts via the internet to resellers and individuals. In 1999 pcOrder.com went public. Soon after, Trilogy, which was mostly owned by Liemandt, sold $124 million of pcOrder.com stock in a secondary offering.

Liemandt set up other subsidiaries like carOrder.com, but he was unable to IPO his flagship Trilogy before the internet bubble burst in early 2000. The stock market crash forced Liemandt to rethink his strategy. He shed most of Trilogy's employees and bought back the shares of pcOrder that Trilogy didn't own at $6 each, for $32 million. Liemandt began to shun publicity.

Amid the wreckage, Liemandt set his sights on a tech model he had long admired. Across the country, Charles Wang of Computer Associates had become a billionaire by methodically buying enterprise software companies (including Liemandt's father's in 1987), cutting costs and controlling big industry segments. Liemandt consolidated control of Trilogy and went to work.

Trilogy still produced cash thanks to its software maintenance contracts, particularly with auto manufacturers like Ford. It also had software patents. In 2006 Trilogy bought Versata, a beaten-down data management software outfit, for $3.3 million. After the deal closed, Versata merged parts of Trilogy into the company, and Liemandt began using Versata for acquisitions and to sue companies like Sun Microsystems, Sears and Toyota for infringing on Trilogy's various software patents.

"For a time they were certainly more successful with their patent litigation than their product delivery," says Tom Melsheimer, a trial lawyer who battled against Liemandt and Versata.

Versata, which like all other Liemandt entities became part of ESW, launched a flurry of patent lawsuits between 2006 and 2013. Most of the cases were settled. But some went to trial. In 2011 a federal jury delivered a $391 million judgment to Versata in a patent case it filed against the German software giant SAP. The case was ultimately settled during SAP's appeals. Some companies, like the software outfit Zoho, successfully defended themselves against Versata's patent assault. But Liemandt's other legal wins, plus income from his remaining software contracts, provided ample firepower for his new business scheme.

In May 2017, Scott Brighton, chief executive of Aurea, an ESW portfolio company, walked into the Portland, Oregon, offices of intranet-collaboration software maker Jive Software. ESW had just agreed to buy Jive for $462 million in cash and fold it into Aurea. Brighton was there to give senior management a message: Jive's work environment was about to change drastically.

"They were pretty clear their model was to reduce costs as much as possible, and with the engineers they said their goal was within a year everyone working at global competitive rates, which is like Bangladesh or Egypt rates," says Sid Bos, vice president of engineering and one of 250 employees in Jive's Portland office. This fall ESW closed Jive's main Portland office, and after a mixture of buyouts, layoffs and voluntary exits, nearly all its 250 employees are gone. Less than a dozen remain as contract employees working from home.

"Almost everybody is a foreign contractor," says Jim Janicki, who was CEO of Dallas-based Ignite Technologies when it was purchased by ESW in 2013. "They keep some and they let most go, and those they keep they turn into contractors."

As with virtually all of Liemandt's companies, Ignite's headquarters were promptly moved to ESW's Austin offices, and its founder and CEO was replaced by one of Liemandt's key lieutenants. Then ESW's Crossover recruited foreigners working from home to service the maintenance and support contracts in force.

For many people living outside the U.S., Crossover's compensation is a dream. Software engineers with two years of experience make $15 an hour; those with five years, called software architects, earn $30 an hour. For engineers with eight years of experience, called chief software architects, the rate is $50 an hour, or $100,000 a year based on a 40-hour workweek. This compares to starting programmers at Google, for example, which Payscale reports earn about $130,000 per year fresh out of college.

For ESW's contractors, there are no paid vacations, healthcare benefits or bonuses. There aren't even company-issued PCs. Contractors use their own hardware. And when it comes to paperwork and regulations, it's up to the contractors to report and pay taxes in their local jurisdictions. Crossover administers tests to determine whether a recruit can handle the work and would be a good fit, and often new recruits spend days working online during a boot camp to standardize workflow processes.

Not all of Crossover's cloud-wage earners are happy. It was Alejandra Marquez's job to find coders for Crossover while working from her home in Buenos Aires in 2015. "People who lived in Venezuela and Ukraine really needed the money," Marquez says. "They would do anything to get a U.S. dollar job." But Marquez took issue with the tracking software. "You don't have any privacy. They can see through your desktop camera. They track everything," she says.

Others say Crossover is running the cloud equivalent of a software sweatshop.

Alan Jhonnes spent a year as a Crossover chief architect working out of his home in Brazil, making $50 an hour and having a good experience until his group started doing work for Aurea. WorkSmart's webcam tracking feature, previously disabled by his manager, needed to be turned on. "It bothered me because sometimes I am with my wife here because everyone works from home," Jhonnes says.

But what really bothered Jhonnes was Aurea's requirement that he work harder to achieve productivity metrics within time limits that didn't account for the complexity of tasks like building a certain number of pages or closing a number of tickets. "It was impossible to meet the metrics within 40 hours, even 50 or 60 hours," says Jhonnes. Any unauthorized overtime he did was unpaid, and Jhonnes worried that his contract would be terminated. In June he quit and took another job.

IN THE PAST 12 YEARS, ESW HAS QUIETLY ACQUIRED SOME 75 SOFTWARE COMPANIES, MOSTLY IN THE U.S., AND IT EXPORTS AS MANY AS 150 HIGH-TECH JOBS EVERY WEEK.

Crossover CEO Andy Tryba, who happens to be the CEO of 12 ESW companies, has no qualms about Crossover's tactics, including its WorkSmart productivity tracking tool, which Tryba calls "a Fitbit for how you work."

Tryba, whose latest side gig in Liemandt's expanding empire is running Think3, a $1 billion fund for busted software startups, argues that the data WorkSmart generates will actually improve the work experience. A company spokesperson points out that all contractors authorize the use of tracking software. "It provides visibility but also provides actionable coaching [tools] on how to actually solve problem areas," Tryba says in his YouTube video.

Disgruntled employees be damned—the pool of skilled workers in emerging countries appears to be bottomless. That's great news for ESW's 75 portfolio companies and its clients, but not so much for software salaries, which could be facing some serious headwinds. Denizens of Silicon Valley, take note.

STARS ALIGN FOR Galaxy

BY MUHAMMAD COHEN

Francis Lui's Galaxy Entertainment Group is on a winning streak.

ANTHONY KWAN FOR FORBES ASIA

Francis Lui next to
Galaxy Macau.

For a billionaire who runs one of the most successful casinos in the world's biggest gaming center, Galaxy Entertainment Group's Francis Lui keeps a low profile. Passengers on the ferry ride to Macau from Hong Kong may find themselves rubbing elbows with him, literally, in economy class. Make no mistake, though: 63-year-old Lui has emerged as a big winner in Macau, succeeding the legacy of legendary casino magnate Stanley Ho as the local face of gambling in the former Portuguese enclave.

The numbers tell the story. Galaxy is expected to earn HK$13 billion ($1.7 billion) in 2018, more than double what the Ho family-linked companies SJM Holdings, Melco Entertainment and MGM China are forecast to post—HK$6.2 billion in net profits combined, according to JPMorgan and Sanford Bernstein reports. Galaxy also challenges and sometimes bests former partner-turned-rival Sands China, controlled by U.S. billionaire Sheldon Adelson, for dominance in Macau. "We let our results speak for themselves," says Lui, in a rare interview. Lui isn't slowing down. He has launched a two-phase development that could double the footprint of his flagship Galaxy Macau in Cotai.

COMMON TOUCH


Lui Che Woo

Aside from taking economy class on the Hong Kong-Macau ferry, Lui has long maintained a common touch. He spent years working for his father's K. Wah construction company, where, despite being the son of the boss, Lui Che Woo (No. 6 on our list), he was known for eating a box lunch with construction crews on work sites and taking a bus home after work. Lui's father built the family's first fortune with K. Wah, a company that started out supplying gravel to construction companies in Hong Kong's 1950s building boom using trucks and bulldozers left behind by the U.S. Army after the Korean War. K. Wah later ventured into property development, building hotels in Hong Kong in the 1970s and by the 1980s was expanding into North America, Southeast Asia and China, becoming a pioneer in the mainland property market, according to the company's website. A Hong Kong stock market listing in 1987 saw the company morph into K. Wah International Holdings. In 1991 the family secured a separate stock-market listing for K. Wah Construction, which in 2005 it renamed Galaxy. The Lui family still owns a roughly 50% stake in both K. Wah and Galaxy.

Galaxy has excelled by leading Macau's transition from hunting for high-rolling whales to hauling in a far larger, more lucrative, wave of middle-class gamblers from mainland China. The shift is by design: Macau and Beijing authorities have long sought to diversify Macau's economy and have decreed that the city should become a "world center" for tourism and leisure. They have encouraged casinos to supplement gambling with other attractions, such as shopping, restaurants and entertainment.

That model has already transformed Las Vegas, where two-thirds of the city's revenue comes from non-gaming, and to a lesser extent in Singapore, where non-gaming revenue accounts for a fifth of revenue. Macau has a long way to go, with non-gaming representing just one-tenth of its revenues—meaning Galaxy has plenty of room for growth.

Lui realized early on that, while gambling would continue to drive Macau's tourism for

ANTHONY KWAN FOR FORBES ASIA (TOP), BILLY H.C. KWOK/BLOOMBERG

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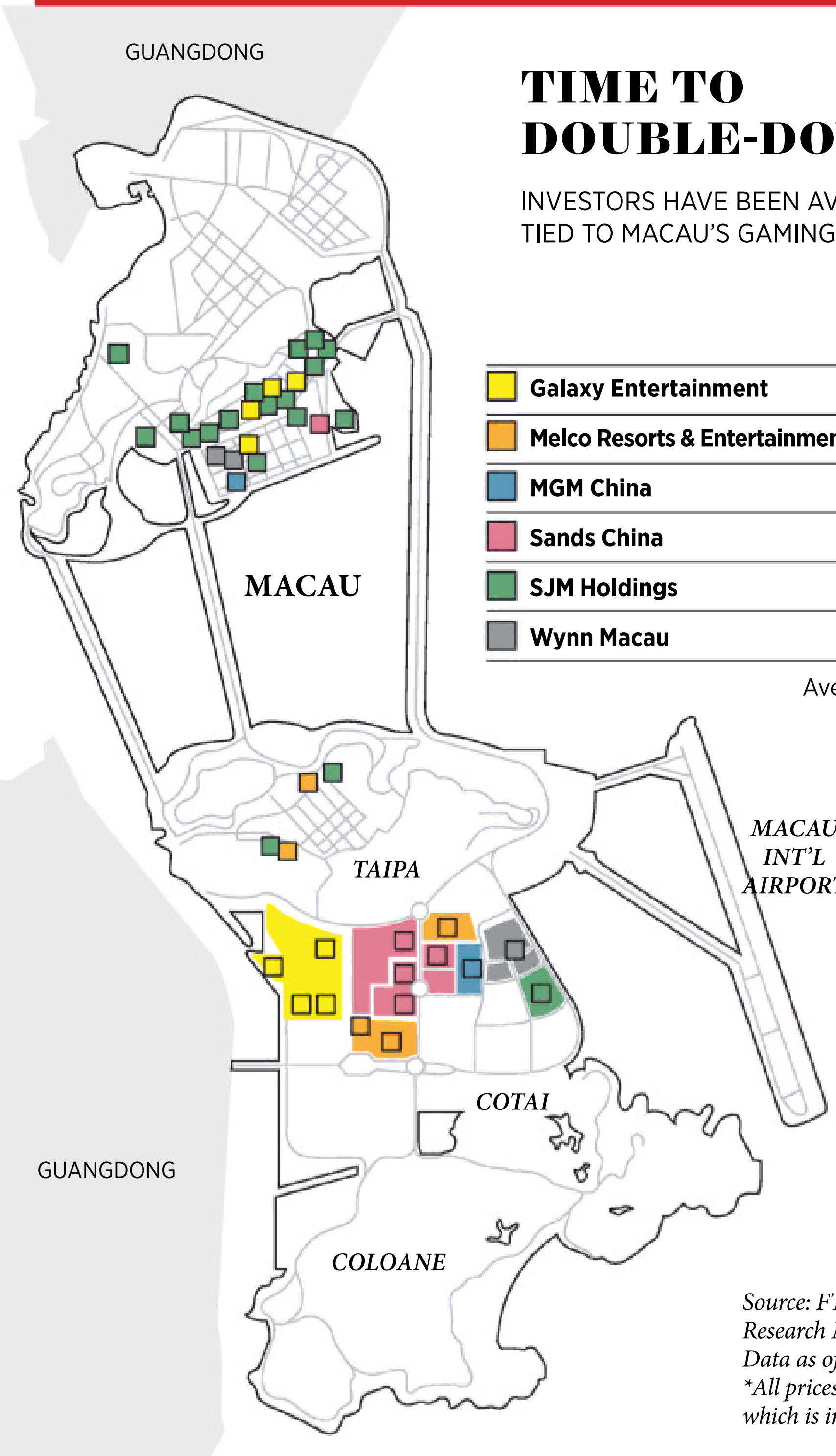


TIME TO DOUBLE-DOWN?

INVESTORS HAVE BEEN AVOIDING STOCKS TIED TO MACAU'S GAMING SECTOR.

	Stock price*	52-week change
Galaxy Entertainment	51	-21%
Melco Resorts & Entertainment	21	-25%
MGM China	14	-41%
Sands China	37	-23%
SJM Holdings	8	-3%
Wynn Macau	18	-36%
Average decline:		-25%

Source: FT.com, Union Gaming Research Macau (map)
Data as of Jan 25, 2019.
**All prices in HK$, except Melco, which is in US$.*

SOLID FUNDAMENTALS

Macau's gaming revenues slumped every month from June 2014 through July 2016 as China stepped up its corruption crackdown. Since then, business has been steadily recovering—gaming revenues climbed 14% to $38 billion in 2018. Although that's about six times the Las Vegas Strip's gaming revenue last year, it's still below Macau's 2013 peak of $45 billion.

Despite the recovery, investors continue to shun Macau's six casino stocks amid uncertainty over the looming expiry of casino concessions starting in 2020 and fear that Macau's heyday may have passed. That's sent the six stocks down an average of 25% over the past 12 months (*see chart*). Analyst Umansky says investors should take a second look at what they may be missing, and in particular at Galaxy.

"Fundamentally, the Macau industry looks pretty solid," Umansky says, noting that fourth quarter gaming revenue was stronger than anticipated. In his view, casino shares have been beaten down as part of a wider China sell-off. "Long term, Macau is about capacity expansion and operations, the ability to execute. No doubt Galaxy can execute. They're optimizing the utilization of their gaming capacity because they play in all segments."

the foreseeable future, increasingly sophisticated mainland customers would want more. "We believe that the mass market would be a growth point for the future, driven by mainland China's emerging middle class and other market segments such as MICE [meetings, incentives, conventions and exhibitions] customers," says Lui, who is Galaxy's deputy chairman. "At day one, when I sat down to plan the strategy for Galaxy, one of the things [we decided was], we do not want to replicate what other people have been doing, we want to be truly ourselves."

In addition to gaming, therefore, Galaxy Macau focuses first and foremost on food. Chinese travelers, though willing to sample a few international dishes, tend to stick with the familiar. Galaxy Macau offers visitors 16 Cantonese dining options, nine other Chinese choices, plus nine Macau specialties, in total representing 18 provincial cuisines. Rival Wynn Palace, meanwhile, has 15 restaurants, and MGM Cotai has ten.

Galaxy Macau also offers unique entertainment, such as its 75,000 square meter rooftop water park, the Grand Resort Deck, which features a wave pool surrounded by a 150-meter-long artificial beach made from 350 tons of white sand, complete with beach chairs shaded by large umbrellas. The Grand Resort Deck also has geysers, waterslides, waterfalls and a children's water park. "Against a lot of people's recommendations, we decided that we basically wanted to build the biggest resort deck in town," Lui recalls. "Most of the mainland Chinese at the time hadn't really seen the beach, and never really gone swimming in clear water."

The resort also features Macau's largest cineplex, with 10 screens, giving mainlanders a chance to watch international movies unavailable at home due to import quotas. It also has a 200-outlet mall showcasing mid-tier brands catering to the tastes and budgets of China's middle class.

Mass-market visitors are a good bet, analysts say, because they provide more stable revenue and higher margins than VIP gamblers. And unlike high rollers, who expect casinos to "comp" them with free rooms, meals and credit, mass-market gamblers pay their own way, says Vitaly Umansky, senior analyst at Sanford Bernstein in Hong Kong.

Galaxy Macau and its Grand Resort Deck.

ANTHONY KWAN FOR FORBES ASIA

Galaxy overcame the odds itself to win its 20-year Macau casino concession in early 2002. It had no gaming experience and had to rebound from a short-lived partnership with U.S. billionaire Sheldon Adelson's Las Vegas Sands—developer of the Venetian Macao and now its rival. Lui says he and his 89-year-old father, Lui Che Woo, the billionaire chairman of Galaxy, turned the company's inexperience into an asset. "We didn't have a legacy, we've no fixed way of doing certain things," he says. To learn gaming, Galaxy in 2004 began setting up four so-called City Clubs—casinos inside hotels owned by other parties.

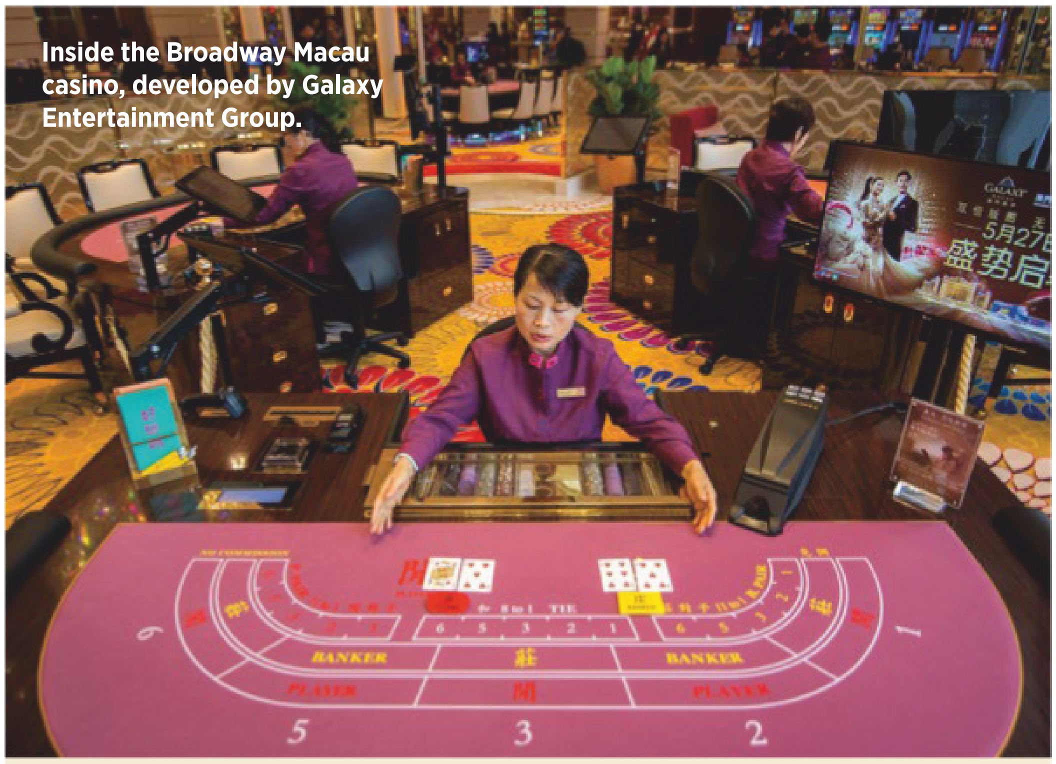
Galaxy's first casino hotel StarWorld opened in October 2006 across the street from Wynn Macau in the peninsula's downtown gaming hub, focused on high rollers. "It's a small one-dimensional experience," Lui says of StarWorld. "All the amenities are built truly for gaming customers."

After splitting with Adelson in 2002, Lui set Galaxy's sights on Cotai, becoming the third casino in the area with an investment of HK$14.9 billion. Building Galaxy Macau on a 4.27 million square foot plot in Cotai gave Lui a game-changing opportunity to create a resort that appeals to both high rollers and mass-market gamblers. Galaxy built its Cotai complex in phases: the first was completed in 2011; the second, in 2015, bringing total investment to $5 billion and guest rooms to 3,800 from 2,300.

Galaxy's casino license is set to expire in 2022, but Lui is confident his company's good relations with the Macau government will result in a "win-win" for Galaxy and the government. The company is already building the third and fourth phases of Galaxy Macau, which will add 4,500 more guest rooms. The third phase is aimed at capturing the MICE business, with 400,000 square feet of conference space and a 16,000-seat arena. The newly opened Hong Kong-Zhuhai-Macau Bridge gives Macau direct access to the 80 million visitors passing annually through the Hong Kong International Airport.

While focused on Macau, Lui has also been making moves abroad. In March last year, Galaxy paid $928 million for a 4.9% stake in Wynn Resorts. "It's a well-run company, we like their future, we like their management team, and we have so much in common," Lui says. Galaxy's stake in Wynn,

"We don't have a legacy, we've no fixed way of doing certain things."



Inside the Broadway Macau casino, developed by Galaxy Entertainment Group.

BILLY H.C. KWOK/BLOOMBERG

ROLLING THE DICE

When it applied for a Macau casino concession in December 2001, Galaxy was just an empty box in the organization chart for the Lui family's Hong Kong property firm K. Wah. Among 21 bidders for three Macau casino concessions, Galaxy stood out for having no gaming experience. Fellow bidder billionaire Sheldon Adelson's Las Vegas Sands had a different deficiency—the company was suffering from the slowdown in travel after the 9/11 terrorist attacks. Sands—like fellow Las Vegas operator MGM—was unwilling to provide the $500 million bank guarantee a concession bid required, so made its application as the casino manager for Taiwan's China Development Industrial Bank, with connections to the island's Kuomintang Party.

That pairing was a nonstarter for Macau officials, who nevertheless wanted Sands in the mix, largely for its convention business expertise. Sands president William Weidner and lawyer David Friedman were summoned to Macau in January 2002 to find a solution. With the government's support, they met Galaxy and the two companies hurriedly cemented a partnership agreement that in February 2002 was awarded a casino concession along with Wynn Resorts and Stanley Ho's SJM Holdings. Galaxy—using plans formulated by Sands for their initial partnership—agreed to develop what would become the Venetian Macao, a supersized version of the Las Vegas Strip original.

But the Sands-Galaxy partnership didn't last. Adelson had been largely absent during the final stages of the Macau bidding as he grappled with the onset of peripheral neuropathy, a muscular disorder that makes it difficult for him to stand and walk. By early 2002, he had found medication that enabled him to resume work, Las Vegas was bouncing back from 9/11 and Weidner and other lieutenants convinced Adelson of Macau's enormous potential. Sands wanted to spend more of Galaxy's money faster than Galaxy wanted. The differences proved irreconcilable.

Macau solved the rift in December 2002 by splitting the Sands-Galaxy casino concession in two, giving Sands a "subconcession" that let it operate independently. Macau eventually granted the other concession holders subconcessions of their own. SJM sold its subconcession to Pansy Ho and MGM for $200 million, while Wynn sold its subconcession to Melco for $900 million. Adelson and company went full speed ahead, opening the $265 million Sands Macao in 2004 with 277 gaming tables and 405 machines, twice as big as any casino in Macau at the time. Seven weeks later, Galaxy opened its more modest first casino in downtown Macau's Hotel Waldo with 35 tables and 75 slot machines. Both casinos are still running today.

which also owns Wynn Macau, falls just under the 5% threshold that would require Nevada Gaming Control Board licensing for Galaxy.

Also in March, Galaxy won preliminary approval from Philippine authorities to build a $500 million casino resort with a local partner on the resort island of Boracay. Philippine President Rodrigo Duterte, however, denounced the project on concern it might damage the island's environment. Duterte then closed Boracay to tourism for six months. The island didn't reopen for business until October; Galaxy's project is still on hold. "A lot of people might have misunderstood that we want to bring Galaxy Macau to Boracay," Lui says. Galaxy has a much more modest project in mind—only 100 villas. "It's going to be a high-end, low-density eco-friendly beach resort," he says, suggesting Galaxy is hoping the government will still give the project a greenlight.

In Japan, where authorities recently passed a bill legalizing casinos, Galaxy is pursuing a license with Monte Carlo casino operator Société des Bains de Mer et du Cercle des Étrangers à Monaco, in which it bought a 5% stake in 2015. The two companies plan to showcase European luxury and royalty should they win one of the three licenses up for grabs. In April 2018 Galaxy hired former Melco executive Ted Chan as chief operating officer for its Japan development.

Even as he looks for opportunities overseas, Lui says he remains optimistic about Macau's prospects. Still, he won't say whether Galaxy will build or buy new properties in the former Portuguese enclave. "We will just continue to follow what the government and the community is telling us," says Lui.

"Macau's gaming economy is driven by public policy, so it is difficult to predict how much supply will be needed in the future," says Las Vegas-based casino consultant Andrew Klebanow. Understanding and accepting such limits may prove easier when you're holding a winning hand. F

"We believe that the mass market would be a growth point for the future."

BY JOHN KOPPISCH

Tough Year

Fighting multiple headwinds, many of the city's richest are less rich this year.

When Apple catches a cold, its suppliers catch pneumonia. And the tycoons behind those suppliers watched their wealth plummet. That was the case with **Yeung Kin-man** and **Lam Wai Ying**, the husband-and-wife team who own Biel Crystal. It's the world's largest maker of iPhone glass screens, but with iPhone sales slowing, especially in China, the couple's net worth plunged by $6.4 billion, or 58%. The company postponed a $1.5 billion listing and says it's monitoring market conditions.

Yeung and Lam weren't the biggest losers in our annual ranking of Hong Kong's wealthiest. It was **Pollyanna Chu**, No. 28, whose fortune fell 73%, to $3.3 billion. Slumping share prices for Macau casino stocks naturally hit their owners, including No. 6 **Lui Che Woo**, No. 20 **Pansy Ho** and No. 34 **Lawrence Ho**. Overall, 23 fortunes sank while 20 rose, thanks to the 9.4% drop in the Hang Seng Index since our last list, the softening property market and other factors.

Five sets of newcomers make the list, and most of them are members of the Kwok family. After the death of former Sun Hung Kai Properties chairman Walter Kwok, his sons **Geoffrey** and **Jonathan** inherited much of his wealth. Meanwhile, **Kwong Siu-hing**, the widow of company co-founder Kwok Tak-seng and chairwoman from 2008 to 2011, has emerged as the owner of the largest stake. At 89, she debuts at No. 5 with a $15 billion net worth. Three of her other grandchildren also join the list, in addition to her two surviving sons, **Thomas** and **Raymond**.

Oil magnate **Daniel Chiu**, at No. 47, rounds out the newcomers. No. 48 **Lo Siu-tong**, with a boost from his mainland hotels and real estate, returns after a one-year absence. Tang Hsiang-chien, who built a fortune in textiles and then with printed circuit boards, died last March at 94. He left a $1.5 billion estate that was split among his wife and children.

Several business leaders who had been fixtures on the list for years didn't make the cut. The net worth of brothers Victor and William Fung has been shrinking as their company, Li & Fung, sees its position at the middle of the supply chain between China and the West continue to erode. They, along with drop-offs VTech co-founder Allan Wong and property mogul Lo Ka Shui, fell below the $1.27 billion cutoff to make the list. Net worths are based on share prices and currency rates as of the close of markets on Feb. 1.

Reporting by Shu-Ching Jean Chen, Muhammad Cohen, Alex Fang, Russell Flannery, Jane Ho, Joyce Huang, Sean Kilachand, Luisa Kroll, Suzanne Nam, Linh Nguyen, Robert Olsen, Sheela Sarvananda, Jessica Tan, Yue Wang and Jennifer Wells.


Yeung Kin-man

EDMOND SO/SCMP/GETTY IMAGES

Kwong Siu-hing

DAVID WONG/SCMP/GETTY IMAGES

GEOFFREY & JONATHAN KWOK

Taking the Baton

FOLLOWING THE DEATH in October of billionaire property mogul Walter Kwok at age 68, his two sons—Geoffrey and Jonathan—inherited their father's fortune, including a stake in **Sun Hung Kai Properties**, that helped put them on this year's list at No.12. Their 89-year-old grandmother Kwong Siu-hing, Walter's mother and widow of Sun Hung Kai's co-founder Kwok Tak-seng, also joins the list for the first time at No. 5.

The brothers inherited a 7.3% stake in Sun Hung Kai, which is Hong Kong's largest property firm by market capitalization. Elder brother Geoffrey, 33, is on the company's board as nonexecutive director. Through several trusts, Kwong controls 27% of Sun Hung Kai, according to recent stock exchange filings.

Geoffrey's rise marks the end of a decade-long feud between his father and uncles, Thomas and Raymond, over Sun Hung Kai's management and family assets. He joined Sun Hung Kai in 2008 and was a director in a subsidiary managing the group's hotels and serviced apartments in Hong Kong and mainland China. Three of Geoffrey's cousins also serve on the board as executive directors.

Born in 1950, Walter was the eldest son of Sun Hung Kai's co-founder and became chairman and chief executive when his father died in 1990. His brothers Thomas and Raymond were appointed co-vice chairmen and together the three steered the company's rapid growth and built some of Hong Kong's tallest skyscrapers.

While Walter was renowned for his aggressive marketing, he is best remembered for being kidnapped in 1997 by local gangster Cheung Tze-keung, who kept Walter in a crate for a week until a ransom of about $77 million was paid. After his release, Walter suffered from depression and his relationship with his brothers soured. Thomas and Raymond ousted Walter in 2008, claiming the trauma had made Walter erratic and unfit to lead the company. That year, Sun Hung Kai's board replaced him as chair with his mother, appointing Thomas and Raymond as co-chief executives.

Walter retaliated with legal actions against Thomas and Raymond. The three eventually settled a defamation lawsuit Walter filed in 2008, but not before Hong Kong authorities in 2012 launched a graft investigation against Walter's brothers. Thomas was later found guilty of bribing a government official and in 2014 was sentenced to five years in prison. He is still serving that sentence. Raymond was acquitted.

In 2017, Walter mounted an unsuccessful suit over $5 billion in family assets. In May 2018, he dropped an appeal and sought instead to reconcile with his brothers, only to suffer a heart attack in August and die less than two months later. Aside from his sons, Walter is survived by his wife Wendy and daughter Lesley. Geoffrey and Jonathan also now helm Empire Group Holdings, a private property company their father started in 2014.
—Joyce Huang

THE LIST

1.
LI KA-SHING
$32 BILLION ▼
CK HUTCHISON, CK ASSET HOLDINGS
AGE: 90

2.
LEE SHAU KEE
$30 BILLION ▼
HENDERSON LAND DEVELOPMENT
AGE: 91

3.
LEE MAN TAT
$17.1 BILLION ▲
LKK GROUP
AGE: 89

4.
JOSEPH LAU
$17 BILLION ◀▶
CHINESE ESTATES HOLDINGS
AGE: 67

5.
KWONG SIU-HING
$15 BILLION ★
SUN HUNG KAI PROPERTIES
AGE: 89

6.
LUI CHE WOO
$14.8 BILLION ▼
GALAXY ENTERTAINMENT GROUP AGE: 89

7.
PETER WOO
$10.8 BILLION ▼
WHEELOCK & CO.
AGE: 72

▲UP ▼DOWN ◀▶FLAT
★NEW TO LIST ↻RETURNEE

THE LIST

8.
JOSEPH TSAI
$9.5 BILLION ▼
ALIBABA GROUP
AGE: 55

9.
MICHAEL KADOORIE
$8.5 BILLION ▲
CLP HOLDINGS, HONGKONG & SHANGHAI HOTELS
AGE: 77

10.
FRANCIS CHOI
$6.7 BILLION ▲
EARLY LIGHT INTERNATIONAL
AGE: 71

11.
LAW KAR PO
$5.4 BILLION ▲
PARK HOTEL GROUP
AGE: 70

12.
GEOFFREY & JONATHAN KWOK
$5.35 BILLION ★
SUN HUNG KAI PROPERTIES
AGES: 33, 30

13.
RAYMOND, EDWARD & CHRISTOPHER KWOK
$5.3 BILLION ★
SUN HUNG KAI PROPERTIES
AGES: 65, 37, 32

14.
TUNG CHEE HWA & CHEE CHEN
$5.2 BILLION ▲
ORIENT OVERSEAS
AGES: 81, 76

PHILIP FONG/GETTY IMAGES

LAWRENCE HO: RISING SON

Lawrence Ho, son of Macau gaming tycoon Stanley Ho, is busy spreading his legacy across Asia and Europe. Having successfully expanded **Melco Resorts & Entertainment** beyond Macau, he is now trying to enter Japan. After a decade-long courtship by Ho and the world's gaming giants, Tokyo legalized casinos in July 2018 but has yet to decide which companies will get the three licenses on offer. Ho predicts a decision won't come until 2020.

"The five or six of us can all write that check, easily," Ho says, alluding to Melco's biggest U.S. and Asian rivals—such as Las Vegas Sands, Genting and Galaxy Entertainment. To compete with them, Ho is going all in. Though he has said previously that he plans to invest as much as $10 billion in Japan if he wins the license, he now says he is willing to invest more. "There's no upper limit," says Ho.

To prepare, he's reorganizing his assets to avoid any perceived conflicts of interest. In mid-2017, the 42-year-old billionaire gave up a controlling stake in Russian casino operation Summit Ascent. He later reportedly said that was done to improve his profile in Japan, given the country's long-unresolved territorial disputes with Russia and international sanctions from Russia's annexation of Crimea.

Last June, Lawrence launched the $1.1 billion luxury property Morpheus in Melco's massive City of Dreams development on Macau's Cotai Strip. "Everything we built up until now has been to build up a great showcase to Japan," he says. Named after the Greek god of dreams, Morpheus was designed by the late architect Zaha Hadid to reposition the Melco brand after its split from Australia's Crown Resorts.

Ho is no stranger to international markets, having in 2018 won a 15-year monopoly gaming license in Cyprus, where he is now investing $700 million to build Europe's biggest integrated resort. In 2015, Melco opened the City of Dreams Manila with the late Philippine billionaire Henry Sy's Belle Corporation. Japan is the biggest jackpot, though, given its rank among the world's largest economies and limited number of licenses.

His chances of winning the license, Ho says, could be enhanced by his vice chairman's seat in China's de facto chamber of commerce—the All-China Federation of Industry and Commerce—as this would allow him to foster stronger business ties between China and Japan. Ho regularly commutes between Macau and Osaka, where Melco opened a regional office last April to seek partnerships. Those partnerships will come in handy should Melco win a Japanese license: if he does, Ho has pledged to move Melco's headquarters to Japan. —*Pamela Ambler*

POLLYANNA CHU

Queen of Shells

POLLYANNA CHU FELL from her spot as Hong Kong's richest woman after shares of her company **Kingston Financial** lost three-quarters of their value last year on a warning in January 2018 by the city's Securities and Futures Commission (SFC) that Kingston's shares were overly concentrated among a small group of investors.

Kingston's plunge wiped out almost three quarters of Chu's fortune, slashing it to an estimated $3.3 billion from her net worth in 2018 of $12 billion. Chu, Kingston's largest shareholder and CEO, earned the sobriquet "queen of shells" for her company's role in helping clients acquire small, largely inactive companies already listed on Hong Kong's stock exchange, known as shell companies, for back-door listings of private companies.

Chu and her husband Nicholas launched Kingston in 1992 as a securities brokerage. It merged in 2011 with her father Lee Wai-man's listed company, Golden Resorts Group, resulting in a combined entity with Macau gaming operations, hotels, stockbroking, a margin-financing business and its own back-door listing on the stock market. Nicholas remains chairman.

The SFC investigated Kingston after its shares more than tripled between Aug. 11, 2017, and the end of November that year for no apparent reason other than a report that its half-year net profit had risen 22%. Its shares then fell 22% the following month. On Jan. 29, 2018, the regulator said it had found that Chu and 19 other shareholders controlled 92% of Kingston's issued shares.

IMAGINE CHINA/NEWSCOM

Concentrated shareholdings are nothing new for Hong Kong stocks. Since 2009, the SFC has issued warnings to about 140 companies, with some getting more than one warning.

Kingston's financial controller, Ronald Chan, says the company will seek to broaden its shareholder base as it looks for new investment opportunities. It is also considering roadshows to identify new shareholders, he says. Kingston, however, has problems other than the SFC warning. Revenue from its Macau casinos fell 4% last year to HK$474 million ($60 million) despite a 17% jump in Macau's overall gaming revenue. In Hong Kong, Kingston's brokerage also faces tougher competition from both traditional and online China brokerages.

A softening economy may also hurt Chu's fortunes. She has been dabbling in property in recent years and last May joined a group in a $5.2 billion deal to purchase 48 floors of the Center skyscraper in Hong Kong from billionaire Li Ka-shing's CK Asset Holdings. The deal was financed by a syndicated loan that falls due in November. "If they cannot sell their properties or find new financing support, they would have to sell at lower prices at the end of the 18 months," says Jacinto Tong, CEO of property investment firm Gale Well Group.
—*Shu-Ching Jean Chen and Robert Olsen*

15.
TANG SHING-BOR
$5.1 BILLION ▲
ETS GROUP
AGE: 85

16.
PAN SUTONG
$5 BILLION ▼
GOLDIN PROPERTIES, GOLDIN FINANCIAL HOLDINGS
AGE: 55

17.
THOMAS & ADAM KWOK
$4.9 BILLION ★
SUN HUNG KAI PROPERTIES
AGES: 67, 35

18.
ROBERT MILLER
$4.8 BILLION ▲
DFS GROUP
AGE: 85

19.
YEUNG KIN-MAN & LAM WAI YING
$4.7 BILLION ▼
BIEL CRYSTAL

20.
PANSY HO
$4.62 BILLION ▼
MGM CHINA, SHUN TAK HOLDINGS
AGE: 56

21.
RICHARD LI
$4.6 BILLION ▲
FWD GROUP
AGE: 52

▲UP ▼DOWN ◀▶FLAT
★NEW TO LIST ↻RETURNEE

THE LIST

22.
PATRICK LEE
$4.39 BILLION ▼
LEE & MAN PAPER MANUFACTURING
AGE: 76

23.
EDWIN LEONG
$4.2 BILLION ▲
TAI HUNG FAI ENTERPRISE
AGE: 67

24.
ANGELA LEONG
$4.1 BILLION ▲
SJM HOLDINGS
AGE: 57

25.
RITA TONG LIU
$4 BILLION ▲
GALE WELL GROUP
AGE: 70

26.
SAMUEL TAK LEE
$3.9 BILLION ▼
LANGHAM ESTATE
AGE: 79

27.
RONALD MCAULAY
$3.8 BILLION ▲
CLP HOLDINGS
AGE: 83

28.
POLLYANNA CHU
$3.3 BILLION ▼
KINGSTON FINANCIAL GROUP
AGE: 60

PROPERTY MARKET

Don't Look Down

OVER HALF OF HONG KONG'S fifty richest owe their fortune to real estate, seven of whom are among the top ten wealthiest billionaires in the city's rich list. Higher interest rates and the U.S.-China trade war are sending tremors through Asia's priciest property market that stand to hit them hard. The most recent sign of trouble came in August last year: after racking up HK$403.7 billion ($51.5 billion) worth of transactions in the first half, sales started to slow in August for the first time in 28 months. Then in December, property sales fell 58% from the same month in 2017 to the lowest in 28 years, according to local property broker Midland Realty. Residential prices have now dropped 7% since peaking in July, according to data from Hong Kong's Rating and Valuation Department.

Fears of a looming correction have been weighing on shares of Hong Kong's big developers. Chinese Estates Holdings, which counts billionaire Joseph Lau and his family as its biggest shareholder with a 75% stake, was the hardest hit, tumbling roughly 33% in the year to December 2018. In July, it announced unrealized losses of more than HK$900 million on investments including its 6.5% stake in mainland developer China Evergrande Group. Shares of Lee Shau Kee's Henderson Land Development and Peter Woo's Wheelock Properties both declined at least 18% in the year to December 2018. Li Ka-shing's CK Asset Holdings, Lui Che Woo's K. Wah International Holdings and the Kwok family's Sun Hung Kai also weren't spared, dropping more than 13% in the same period.

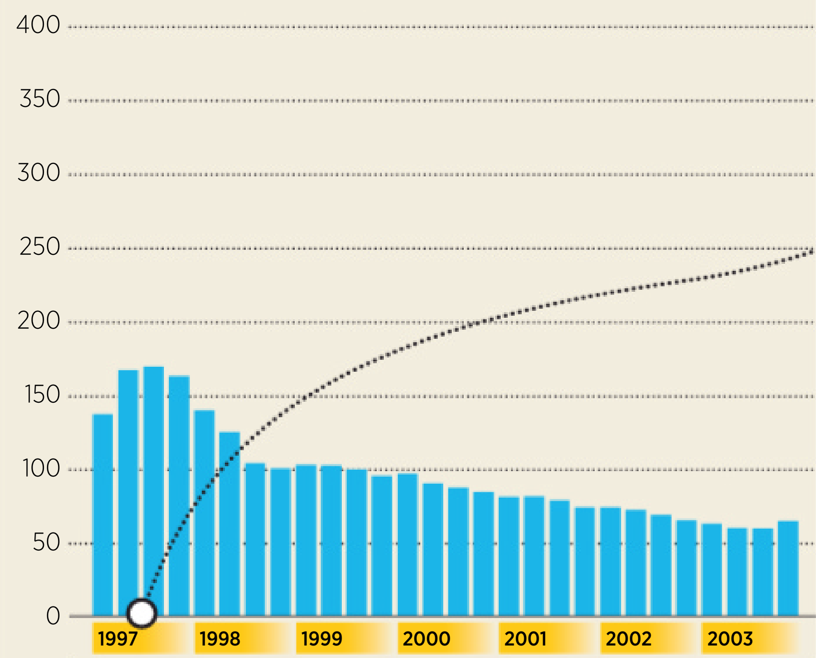
Hong Kong's property market has been skyrocketing for the past decade, as money from mainland China poured into a market where supply is carefully restricted by the government. After slumping 15% during the global financial crisis in 2008 and 2009 (*see chart*), prices for residential property have nearly quadrupled. Homes in Hong Kong are the most expensive in the world, costing on average $4,900 per square foot, compared to $2,500 in London and $2,000 in New York, according to the latest data from German research firm Statista.

China's economic slowdown—exacerbated by heightened trade tensions with the U.S.—stands to spook mainland investors in Hong Kong's property market. Housing prices in Hong Kong could fall as much as 10% this year from an estimated 3% rise in

UP, UP AND AWAY

Hong Kong home prices have surged since the global financial crisis.

PRIVATE DOMESTIC PRICE INDEX
(1999 = 100)



SOURCE: HONG KONG RATING AND VALUATION DEPARTMENT

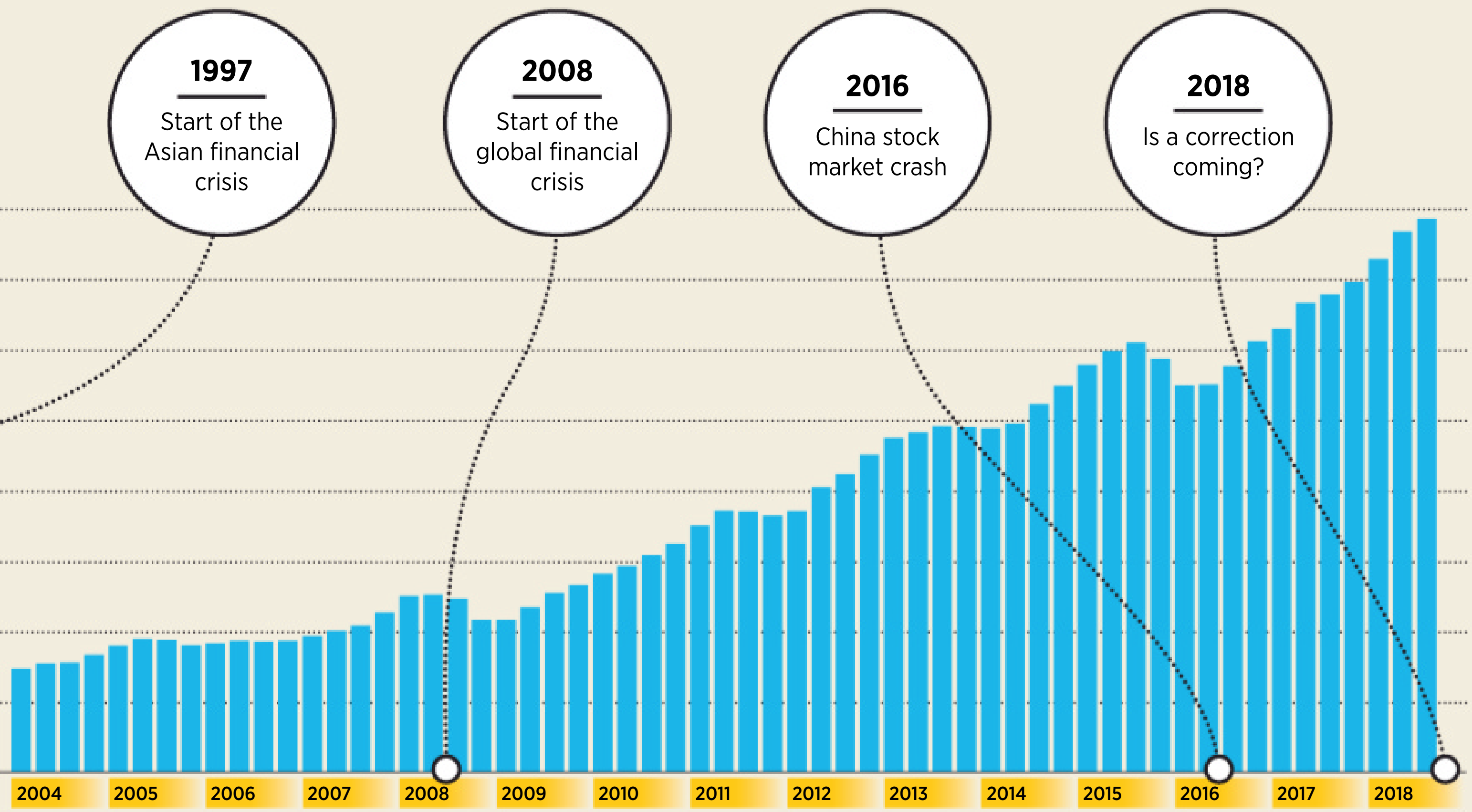
2018, says David Ji, head of greater China research at Knight Frank in Hong Kong.

A survey by Citigroup in the second quarter of 2018 revealed that 57% of the city's residents believe home prices will fall this year. A government auction of prime land on Hong Kong's Peak was scrapped in October after bids did not match the minimum price.

That doesn't mean Hong Kong faces a meltdown like the one after the Asian financial crisis of 1997 and 1998, when prices fell by two-thirds. Analysts say developers will find ways to mitigate or even avoid the impact. Like many cities, Hong Kong can count on a reservoir of natural demand. "Prices won't fall off the cliff," says Ji at Knight Frank. "There are buyers every time prices correct."

Yet higher interest rates add to the downward pressure by raising the cost of mortgages. Hong Kong pegs its dollar to the greenback and so must follow the Federal Reserve's monetary moves almost identically. The Hong Kong Monetary Authority raised the city's benchmark lending rates four times in 2018, in lockstep with the Fed's own rate hikes.

Faced with pressure over housing affordability, the Hong Kong government is also considering a tax on vacant properties to discourage property speculation. Under the proposal, new flats that remain unoccupied for more than six months out of every year would be subject to an annual tax equivalent to 5% of their value. That could force developers—and property investors—to avoid the tax by dumping new apartments.
—*Preya Shah and Jonathan Burgos*



29.
LI SZE LIM
$3 BILLION ▼
R&F PROPERTIES
AGE: 61

30.
FONG YUN WAH
$2.8 BILLION ▲
HIP SHING HONG GROUP
AGE: 94

31.
OR WAI SHEUN
$2.6 BILLION ▲
KOWLOON DEVELOPMENT
AGE: 67

32.
HORST JULIUS PUDWILL
$2.55 BILLION ▼
TECHTRONIC INDUSTRIES
AGE: 74

33.
HELMUT SOHMEN
$2.5 BILLION ▲
BW GROUP
AGE: 79

34.
LAWRENCE HO
$2.3 BILLION ▼
MELCO INTERNATIONAL DEVELOPMENT
AGE: 42

35.
VINCENT LO
$2.25 BILLION ▼
SHUI ON LAND
AGE: 69

▲UP ▼DOWN ◀▶FLAT
★NEW TO LIST ↻RETURNEE

Hong Kong's 50 Richest

THE LIST

36.
MICHAEL YING
$2.1 BILLION ▼
ESPRIT **AGE:** 69

37.
MARTIN LAU
$2.02 BILLION ▼
TENCENT **AGE:** 45

38.
TANG YIU
$2 BILLION ▼
BELLE INTERNATIONAL
AGE: 84

39.
CHAN TAN CHING-FEN
$1.95 BILLION ▼
HANG LUNG GROUP

40.
JEAN SALATA
$1.9 BILLION ▲
BARING PRIVATE EQUITY ASIA **AGE:** 53

41.
THOMAS LAU
$1.85 BILLION ▲
LIFESTYLE INTERNATIONAL HOLDINGS
AGE: 64

42.
VIVIEN CHEN
$1.8 BILLION ▼
NAN FUNG GROUP
AGE: 60

43.
GORDON WU
$1.65 BILLION ▲
HOPEWELL HOLDINGS
AGE: 83

VICTOR LI: OUT FROM SUPERMAN'S SHADOW

Victor Li took over Hong Kong's biggest family fortune in May last year when his father Li Ka-shing stepped down as chairman of **CK Hutchison** and **CK Asset Holdings** just two months shy of his 90th birthday. The elder Li will stay on as senior advisor to a business empire that employs 323,000 people across more than 50 countries.

Long revered as one of the most-respected businessmen in Asia, the elder Li is also one of Asia's greatest rags-to-riches stories. A native of Guangdong, China, Li and his family fled Japan's advancing forces to settle in Hong Kong in 1940 when he was 12. His father died of tuberculosis after they arrived and Hong Kong fell under Japanese occupation. Li started working in a plastics factory when he was 15 to support his family.

In 1950, Li started his first company—plastic maker Cheung Kong Industries. Over the years, Li assembled a network of businesses that today control a huge swath of Hong Kong, handling much of its port traffic, building many of its landmark skyscrapers and earning Li the nickname "Superman" in the local press for his dealmaking savvy.

Victor, 54, has been groomed for three decades to carry his father's mantle. A Stanford University-educated engineer, he has already earned a reputation as a dealmaker in his own right after spearheading the group's push into utilities in Australia, Canada and Europe. His younger brother Richard, 52, runs Pacific Century Group, an investment firm with interests that spans property, media, telecom and insurance.
—Robert Olsen

GORDON WU: BUYING LOW, BUILDING HIGH

Billionaire Gordon Wu has a solution for the slump in shares of his flagship development company, **Hopewell Holdings**—buy them all. Amid signs Hong Kong's property market is softening, he plans to take the company private after nearly a half century as a listed firm. Wu is offering to buy the 63.1% of Hopewell he and his family don't own for HK$21.3 billion ($2.7 billion), or HK$38.80 a share—nearly 50% above where Hopewell was trading in December when he made the offer.

The mastermind behind many of China and Hong Kong's landmark projects, including the Guangzhou-Shenzhen Superhighway, Wu has a reputation for being ahead of the curve. It was Wu who in 1983 proposed building a bridge between Hong Kong and Macau. Rejected at the time, Beijing and Hong Kong eventually adapted his concept; the 55km Hong Kong-Zhuhai-Macau Bridge opened last October.

Not everyone is impressed with Wu's latest proposal. David Blennerhasset, an analyst at hedge fund Ballingal Investment Advisors in Hong Kong, says Hopewell's stock is worth as much as HK$50 a share if Hopewell Centre II, a 55-story skyscraper Hopewell is building, is factored in. Hopewell has spent HK$5 billion building the office tower, which when it opens in 2021 will include a mall and hotel with more than 1,000 rooms. Says Blennerhasset: "The offer is by no means a knockout."

Still, Wu's deal looks likely to get done. Hopewell's second-largest shareholder, U.S. investment firm Southeastern Asset Management, has said it won't block his offer, which will result in Hopewell being delisted from Hong Kong's stock market after trading there for 47 years. *—Sheela Sarvananda*

ANTHONY WALLACE/GETTY IMAGES, DICKSON LEE/SCMP/GETTY IMAGES

CHEN XIAOMEI/SCMP/GETTY IMAGES

SPENCER FUNG

Trading Places

Li & Fung CEO Spencer Fung has been steering his 113-year-old company through one of the roughest patches in its history. The company's stock had fallen to a near 20-year low of HK$1.30 on Feb. 1, down 63% over 12 months. His father Victor and uncle William, who ranked last year at No. 27 with a $3.3 billion fortune, have now fallen off this year's list because their wealth is now below the minimum cutoff of $1.27 billion.

After four years of declining earnings, Li & Fung posted a loss of $309 million in 2017. It bounced back last year with first-half net profit of $50 million, but this figure was still down 19% compared to the same period in 2017.

Online merchants such as Amazon have been strangling Li & Fung's biggest customers, among them Wal-Mart and Macy's. The escalating U.S.-China trade war also poses a new threat. To counter these, Fung is now spearheading an effort to develop advanced technologies such as 3D-aided designs and digitalizing supply chain operations to help both traditional brick-and-mortar retail customers and online merchants track inventory in real time and quickly adjust to shifting consumer trends.

The key to surviving the trade war, Fung says, is diversification. Li & Fung's strategy has long been to offer back-up manufacturing facilities that customers can turn to if the situation sours at a main production base. In Asia, Li & Fung has suppliers not only in China, but also in Bangladesh, India, Indonesia and Vietnam—all countries where in August it said it would "continue to expand."

Fung remains optimistic that the venerable Li & Fung can bounce back, and with it the possibility that his family will return to the ranks of Hong Kong's 50 richest. Li & Fung is familiar with geopolitical disturbances, Fung says. Whether it's in China, Southeast Asia, India or Africa, the company has long operated in volatile economies and has seen many market cycles over its long history. Fung is the ninth CEO of the company his great-grandfather Fung Pak-liu founded in 1906 with partner Li To-ming (the original Li & Fung). "What is happening now is something that we've experienced for the last 40 years," Fung said in a July interview with *Forbes Asia*. *—Pamela Ambler*

44.
JIM THOMPSON
$1.6 BILLION ▲
CROWN WORLDWIDE GROUP
AGE: 79

45.
KENNETH LO
$1.45 BILLION ▼
CRYSTAL GROUP
AGE: 80

46.
HENRY CHENG
$1.4 BILLION ▲
KNIGHT DRAGON
AGE: 72

47.
DANIEL CHIU
$1.36 BILLION ★
CHINA GAS HOLDINGS
AGE: 58

48.
LO SIU-TONG
$1.34 BILLION ↻
YU TAI HING
AGE: 88

49.
ALBERT YEUNG
$1.3 BILLION ▼
EMPEROR GROUP
AGE: 75

50.
WONG MAN LI
$1.27 BILLION ▼
MAN WAH HOLDINGS
AGE: 53

▲UP ▼DOWN ◀▶FLAT
★NEW TO LIST ↻RETURNEE

FOR METHODOLOGY AND ALL BIOS, GO TO FORBES.COM/HONGKONG

Gaa's Rising Star

Garima Arora is the first female Indian chef to earn a Michelin star.

BY ANURADHA RAGHUNATHAN

Chocolate betel leaf

Garima Arora

PATRICK BROWN FOR FORBES ASIA

Garima Arora recalls making risotto at age 16 for her father's dinner party at their Mumbai apartment. She didn't cook the rice *al dente* and her father sent it back to the kitchen. Arora learned her lesson well, and now, at 32, is the first Indian woman chef to receive a Michelin star—in November last year—for her Bangkok restaurant Gaa. Since it opened in April 2017, Gaa has become one of the Thai capital's hottest restaurants, attracting celebrity diners such as Hollywood director Michael Mann and Bollywood star Sunil Shetty.

Gaa's website describes its dishes as being derived from "techniques from around the world" and using indigenous Thai ingredients. Serving only 10 or 14 set course menus, either regular or vegetarian versions, a typical menu might include duck doughnut and organic, burnt coconut sugar ice cream. Arora's own favorite is crab in cold macadamia milk. "When you bite into the crab you are hit with the flavors of peppercorn and jaggery," says Arora. "It embodies everything we're trying to do here at Gaa."

Her signature dish is inspired by the Indian street snack *bhutta*: grilled young corn, seasoned with black salt, chili and lime and then served with corn milk on the side for dunking. Another favorite is called simply "jackfruit," and incorporates both ripe and unripe samples of the giant tropical fruit. The unripe fruit is served with pickles and an Indian bread made from ripe jackfruit.

For inspiration, Arora travels every two months to northern Thailand to source new ingredients. Among her


Gaa's bright interior

more unusual finds: canistel (also known as eggfruit, similar to an avocado); *hor wor* (an herb with lemon verbena flavors) and salad root (a vegetable that looks like licorice).

Arora inherited her love of cooking and her entrepreneurial ambitions from her parents. Both are also entrepreneurs, running their own event management company. Arora recalls from her childhood that, whenever her father came home from business trips, he would immerse himself in the kitchen, whipping up new dishes. "He'd be happy and smiling and cooking and having fun," she says. "I started thinking, 'This could be something I could do.'"

Arora went first into journalism, studying mass media at Jai Hind College in Mumbai and then working briefly as a reporter at the *Indian Express* in Mumbai. Even though she loved cooking, it wasn't as respected a vocation as jour-

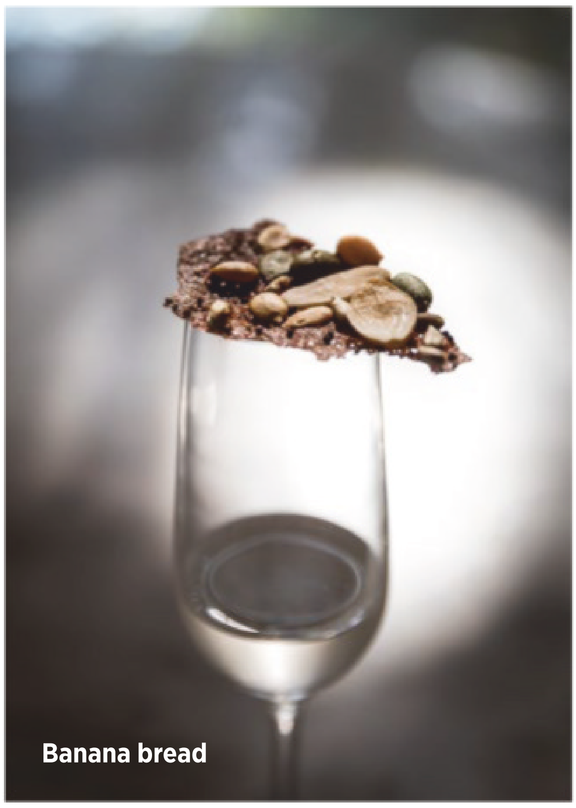

Savory betel leaves served on a miniature tree


Chilled soup of pink guava, roselle and fermented mulberries

PATRICK BROWN FOR FORBES ASIA

Garima enjoys spending time in the kitchen

Unripe jackfruit, roti and pickles



Banana bread

FOR INSPIRATION, ARORA TRAVELS EVERY TWO MONTHS TO NORTHERN THAILAND TO SOURCE NEW INGREDIENTS.

nalism. In 2008, she took the plunge, left journalism and moved to Paris to attend the legendary Le Cordon Bleu cooking school. From there, she has had a star-studded career, working with some of the world's best chefs. After graduating in 2010, she got a job with celebrity chef Gordon Ramsay in Dubai at Verre (later renamed Table 9).

Working under Ramsay's famously brusque management was a painful initiation, she says. "I was in my early 20s and had a huge sense of ego and entitlement," she recalls. "I learned a lesson in humility." Next came a three-year stint at Noma in Copenhagen—a two-Michelin star restaurant ranked as the best restaurant in the world by William Reed Business Media, the UK-based publisher of *The World's 50 Best Restaurants*. Its celebrity chef René Redzepi taught her that cooking can be an "intelligent exercise," as she puts it. "You start questioning—where can I source this herb? Why am I using this herb? How can I use it in this dish?" she says.

In 2015, Arora moved to Bangkok to work as a sous chef for India's superstar chef Gaggan Anand at his eponymous restaurant Gaggan—which from 2014 to 2018 was ranked by William Reed as Asia's best restaurant. Anand was planning a new restaurant in Mumbai and Arora was slated to be its head chef. After financing for that venture fell through, Anand and some of his investors asked Arora if she would be interested in launching her own restaurant down the street from Gaggan.

The result was Gaa. Arora holds a 20% stake, with the remaining 80% held equally by Anand and three Gaggan investors—two Bangkok tailors and an IT professional. "They let me be and let me run this by myself," she says. The restaurant is named after her, too: Gaa is derived from the first two letters of Arora's first name and the first letter of her surname.

The investors have little reason to interfere—Arora says Gaa has already broken even. The biggest transition for her from chef to restaurant entrepreneur was learning to put her staff first. "You're responsible for 30 other people," she says. Arora's 12-member kitchen staff includes chefs from eight countries, including Bolivia and the Philippines. Despite their diversity, she has succeeded in creating such a tightly knit team that they do high-intensity interval training together to stay fit—sometimes right in the kitchen.

She says she has so far managed to avoid importing the tyranny and drama of celebrity chefs she experienced elsewhere (hint: Ramsay). Instead, music plays in the kitchen to soothe frayed nerves. Her only regret, she says, is that running a restaurant means spending less time in the kitchen. As Gaa is open seven days a week, Arora spends all her waking hours there. "You're cooking all this glorious food," she says. "But you never have the time to enjoy it." F

Porsche 356's Allure

Pamela Brundage with her 1962 Porsche 356B S90 Coupe after driving it from Chicago to New York for an auto show.

Steve McQueen, Janis Joplin and one woman's quest to find the one that got away.

BY CHUCK TANNERT


ANDREW FLORIN

Longtime Chicago resident Pamela Brundage is not your average vintage sports car owner. There are mainly two types: hoarders and drivers. Brundage is the latter. "I understand the reasoning behind never driving a vintage car," says the fashionable American Airlines flight attendant. "That type of owner is doing the world a favor by preserving the car in its most pristine state for future generations. However, they aren't enjoying it. They aren't using the car for what it was made for—to drive. It's sad."

Brundage drives her vintage sports car, a 1962 Porsche 356B Super 90 coupe, as often as possible. "Not every day," she admits. "But as often as the harsh Chicago weather will allow." If it gets dirty, she cleans it. If it gets wet, she dries it off. But she doesn't want it to rust and fade away.

Though Brundage has only been collecting for a few years, her love affair with the 356 dates back more than four decades, ever since her mother, Jean, bought a used 1961 356B Coupe in the late 1960s. However, unlike most collectors who wait a lifetime to find that one car, that Holy Grail that elevates their collection, Brundage found hers several months ago. That very same 356B her mother owned all those years ago. The car in which she actually learned to drive.

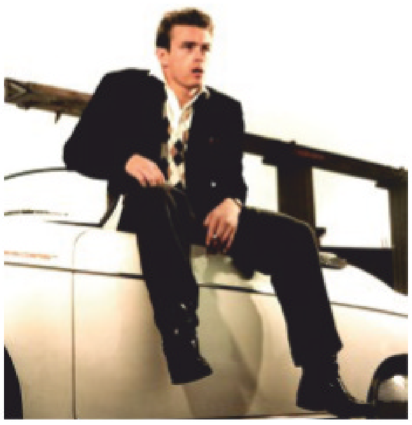
Brundage's most recent road trip brought her from Chicago to Long Island, New York, in October last year for *Driven to America 2*, an annual celebration of air-cooled Porsches built between 1948 and 1998 (of which the 356 is one), and the man responsible for introducing the Porsche marque to America in 1951, Max Hoffman. Making the journey meant driving her silver 1962 356B Super 90 more than 1,200 kilometers, and each time behind the wheel reminds her of the inspiration for her Porsche passion—her mother.

"My mother, Jean, worked for Lockheed Missiles and Space Corporation in Sunnyvale, California, during the space race," Brundage recalls. Hailing from the San Francisco Bay Area, her mom was a secretary in the reception area of the budding aerospace company. Part of her job was to greet astronauts and other VIPs from the space program. As it happened, most of the engineers at Lockheed owned Porsche 356s. They were so easy to wrench on, so easy to tweak into a race car. The engineers couldn't resist.

The first 356s first rolled off the "assembly line" in 1948 and immediately set the bar for every Porsche that followed. It made the German automaker synonymous with top-notch craftsmanship, outstanding road manners, and minimalist aesthetic. Designed by "Ferry" Porsche, the son of company founder Ferdinand Porsche, the 356 is actually quite a simple car. Though it is the first roadster to bear the Porsche name, the 356 was essentially a souped-up Volkswagen Beetle.

Ferry's father had designed and built the iconic "People's Car" at the behest of Adolf Hitler, before World War II, and had always wanted to make a small sports car out of it. So did Ferry, and he made it happen. Using many VW parts—suspension, brakes, and a rather anemic 40-horsepower, four-cylinder engine—the first 356s made were aluminum-bodied two-door coupes. After hand-building a run of these cars

Pamela Brundage (left) on the day she was reunited with her mother's 1961 Porsche 356 in August 2018; A 1960 Porsche 356B 1600 Cabriolet in excellent condition costs upwards of $80,000 (below).



James Dean with his Porsche 356, and Janis Joplin with hers.

at its wartime factory in Gmund, Austria, the Porsche engineering company moved back to Stuttgart, Germany. Once there, it started building the diminutive sports car using less expensive steel rather than aluminum so the savings could be passed on to potential buyers.

The air-cooled, rear-wheel-drive two-seater wasn't exactly fast, especially compared with Alfa Romeo or Jaguar sports cars of the day. Nor was it as affordable, costing nearly $4,000 (or about $42,000 today), twice as much as the inexpensive British roadsters from Austin-Healy and MG. But the 356 was nimble and responsive and, thus, a hoot to drive. A few tweaks were all you needed to turn a stock 356 into a legitimate race-worthy automobile.

Although the basic design was never altered during the vehicle's 18-year run, a few functional enhancements were made through the generations, such as better aerodynamics, curved windshields, and several interior additions. The car was also made available in a variety of body styles, including the extremely rare split roof, the cabriolet, the convertible and the roadster. Even so, Porsche always managed to maintain the car's minimalist design, elegant and comfortable, and sporty demeanor. These characteristics are also found on the 356's replacement, the legendary Porsche 911.

The 356 was popular in the 1960s with the in crowd. Actor Steve McQueen owned one. So did singer Janis Joplin. Hers recently sold at auction for $1.76 million. Today they're still prized by celebrities. Patrick Dempsey purchased a 1963 Porsche 356 with his first real paycheck as an actor. In 2016, Jerry Seinfeld sold several of his Porsches, including a 1958 Porsche 356 A 1500 GS/GT Carrera Speedster that went for $1.5 million at auction. Classic car specialist Hagerty Insurance Agency values a 1961 356B, similar to Jean Brundage's, at around $113,000 in Concours condition and the 1962 356B Super 90 at $159,000 in the same condition.

"Mom said the Lockheed parking lot was like a sea of them," recalls Brundage. "All different types, too." So Jean got it in her head that she needed to buy one and did, just before leaving Lockheed to go work as the executive secretary for casino magnate William Harrah in Reno, Nevada.

In addition to founding Harrah's Hotel and Casinos, Harrah was an avid car collector, owning about 1,400 vehicles of all makes and models before his death in 1978. "Not one Porsche in the whole collection when my mom worked for him, though," Brundage jokes. "I used to hang out at [Harrah's] restoration facility when I was young. It was so clean and beautiful."

When Brundage got her driver's permit in the early 1970s, that sporty little 356 was the family's only vehicle. "So, that's the car I learned to drive in," she says with a laugh. "Mom took me out to the Centennial Coliseum parking lot in Reno when it was empty and taught me to work the clutch, the gas, and the brake. I can't believe how hard I was on that gearbox." When other teenagers were driving Mustangs, Thunderbirds and other American-made muscle to school, Pamela would drop her mom off at Harrah's and roll up to high school in the 356. "The kids were, like, 'Whoa, what is that?' It was a hit—especially with the boys."

When her mother announced that she was going to sell the car, Pamela was heartbroken: "Not this car!' I love this car. Absolutely love it." It wasn't until 40 years after her mother sold the 356 to a classmate that Pamela considered buying it.

Ironically, she had the chance thanks to a run-in she had with a random Porsche 356 owner three years ago. The encounter rekindled her love for the 356. "I was walking through

CHUCK TANNERT, NATIONAL MOTOR MUSEUM/GETTY IMAGES, GETTY IMAGES, REDFERNS

A fleet of Porsche 356s at the 2018 *Driven to America 2* auto show in Old Westbury, New York.

CHUCK TANNERT

my neighborhood and came across a local car show, and all of these feelings came rushing back," she explains. "Then, I came across this guy with a 356, and I was hooked. Mom owned a lot of cool cars back then. A Lincoln Continental with the suicide doors, a [Volkswagen] Karmann Ghia, even a Porsche 912. However, there was something special about the 356."

After listening to her story of love and loss, the stranger urged Pamela to go looking for her mother's car. "Not being in a vintage car circle, I thought, 'What a crazy idea,'" say Brundage. Then she figured why not. It turned out her mother still had much paperwork from the old car, giving her a place to start.

Three years and lots of internet sleuthing later, her grail quest ended. "Some guy on Porsche 356 Registry ran the [vehicle identification number] we had for my mom's car about a month ago and found it in California," says Brundage, still stunned that she actually found the car, which was delivered to Chicago just before Brundage left for Long Island.

"Mom's car," as Brundage calls it, currently sits at Classic Remedy autos in Addison, just outside of Chicago. The shop specializes in iconic Porsche restorations. "I had the work done on my 356 there," says Brundage. The previous owner did the paint, interior and changed the brakes from drum to disc for safety reasons. She had the engine rebuilt in winter 2018, changed the wiring harness and connections, and

THE FIRST 356S FIRST ROLLED OFF THE "ASSEMBLY LINE" IN 1948 AND IMMEDIATELY SET THE BAR FOR EVERY PORSCHE THAT FOLLOWED.

changed the electrical system back to the original six-volt. "I've put 7,000 miles [over 11,000 kilometers] on the car since May," boasts Brundage. And she hasn't had a single oil leak.

Brundage has no idea what to do with her mother's 1961 356B: "I need to get my head wrapped around it. I am in no rush. But like mine, this car has some original components missing. My gut tells me to take it back to the original like when my mom had [first owned it]. A full-body restoration. I'd be happy to drive it as is for a while, though."

Unfortunately, her mother won't be around to see the car achieve former glory. "She passed away five weeks before I was contacted about the car," Brundage says, noting that it hasn't diminished her love for the Porsche. "After my son passed away in 2015, I realized if you want to do something, don't stand around and talk about it. If you can do it, do what you want to do. You don't know what will happen tomorrow." So, what's her next car? "My mom had this Porsche 912," says Brundage coyly. "It would be fun." F

30 UNDER 30 ASIA ALUMNI

Australia's **Canva** has become a unicorn by bringing online design tools to the masses.

BY JAY KIM AND RANA WEHBE

Liberation by Design

Canva co-founder
Melanie Perkins

To build a unicorn, Australian Melanie Perkins had a simple insight: make it easy for those with no design experience to create material that looks like it was done by a professional, anything from a business card to an e-book. In 2013, Perkins, with cofounders Cameron Adams and Cliff Obrecht, started website Canva, providing digital design tools and design resources. Since then, the website has grown into a platform with 15 million users in 190 countries. Based on this success, the trio last year raised $40 million from investors, including Sequoia Capital, which gave Canva a $1 billion valuation.

Perkins has another notable achievement: She was in *Forbes Asia*'s inaugural 30 Under 30 list at age 28. Now 31, Perkins' motivation for Canva came from a problem she spotted while a student at the University of Western Australia, while tutoring other students on how to use design software. Many in her class were new to design and had long learning curves, even when designing something simple.

Perkins thought there had to be an easier way for people to communicate their ideas without the hassles of using Photoshop or similar software. Her first step was Fusion Books, an online tool she cofounded with fellow University of Western Australian student Obrecht in 2007 for creating school yearbooks. They built up the company to where Fusion Books now says it has been used by hundreds of schools and helped create thousands of yearbooks.

In 2012, the pair met Adams, an ex-Google engineer, and the three of them came up with the idea of using the design principles behind Fusion Books to reach a wider market. They launched Canva the next year. It was unlike anything on the market: other solutions were fragmented, requiring users to search elsewhere for elements such as photos, layouts and fonts. After acquiring the needed resources, designers then had to use a program such as Photoshop to put their design together in a slow, complex process.

The Canva team instead created a single interface simple enough for would-be designers to achieve great results with little training. "We want to empower the world to design anything and publish anywhere," says Perkins. Perkins and her partners worried that professional designers would dislike a platform that gave the hoi polloi entrée to their exclusive domain. Yet they were surprised to find that professional designers have been overwhelmingly positive, using it themselves to collaborate with clients.

"We want to empower the world to **design anything and publish anywhere."**

Achieving scale and growth, however, has been challenging. Canva has grown from its original team of eight to over 300 employees. Every time the staff doubled, things started breaking down, says Adams, who is Canva's chief product officer. "Anyone who is new to Canva goes through a well thought out onboarding process, where we pair them up with someone on their team who looks after them," Adams says. "They have lots of sessions telling both about the little technical details of Canva as well as the broader philosophies and the values and how we make decisions."

The company says it has been cashflow positive since July 2017. Canva gets revenue from paid users, who are charged $12.95 a month per user for a "Canva for work" subscription, although a free basic version is also available. All users must pay $1 for each photo bought from the site. Fusion Books has a pay-per-print model, as well as payments for photos used. "Our focus is on continuing to grow Canva, in terms of its accessibility to more people across the globe—and also we have a lot more of our vision yet to build," says Perkins. "While we have made some great strides in realizing our vision over the last few years, we're still only 1% of the way into our plan and vision for the company and the many ways we can empower our design community."

To accelerate growth, Canva has been adapting its tools to local markets. Canva recently debuted a Chinese language version, for example, featuring local fonts, local templates and a support team in Beijing. "It's been pretty incredible to see Canva now used in 190 countries and available in over 100 languages," Perkins says. "Last year we launched in some of the more complex languages, such as Arabic and Hebrew, which required Canva to launch with the entire interface flipped as their interfaces are typically right-to-left." Of course, as it grows larger, it will become a target for larger competitors such as Adobe, the maker of Photoshop.

Canva also offers a free version of its "Canva for Work" that is being used by more than 25,000 nonprofits, so they can produce better-looking materials. "It's incredible to see the impact they're making," says Perkins.

Being selected for Forbes 30 Under 30 Asia list three years ago gave Canva an important confidence boost, Perkins says. "Graphic design has always been considered a niche skill that only certain people can master," she says. "Being on the Forbes 30 Under 30 Asia list has brought about more awareness for the need to change that perception." As it continues to evolve, Canva is tapping into the growing demand for better designed content. "Almost every single profession needs to create a lot more visual content," Perkins says. "Canva will be the platform that powers the modern workforce." F

COURTESY OF CANVA

The Young Men And The Big C

While still in their 20s, **Nat Turner** and **Zach Weinberg** built a $2 billion company to pursue an impossible dream—combating cancer with big data. They've not only made fast progress—they've also gotten rich trying.

BY MATTHEW HERPER AND ELLIE KINCAID

Zach Weinberg (left) and Nat Turner on the roof of their new offices on Spring Street in Manhattan. Flatiron Health is the third company they've started together.

MATT FURMAN FOR FORBES

30 UNDER 30 • U.S. • ALUMNI

In 2008, when he was 23, Nat Turner was on a hike in North Carolina with his 6-year-old cousin, Brennan Simkins. Brennan's legs got weak, and the weakness kept getting worse. He turned out to have a rare and deadly pediatric leukemia that kept coming back after treatment. When Brennan needed a second bone marrow transplant, several hospitals refused to do it and his family was losing hope—until they found a specialist who would help. Exasperated, Brennan's father asked Turner: Why doesn't one hospital know what others will do? Is there anyone collecting statistics?

"All right," Turner remembers thinking, "there's a ton of value for patients locked in the clinical data. We should be the ones who unlock it."

For another recent college graduate, that might have been merely a fleeting "deep thought." But Turner, along with his college friend and business partner, Zach Weinberg, was looking to start a third company. His first, an online food delivery business he and Weinberg started their freshman year at The Wharton School of the University of Pennsylvania, had failed, but a second one, an online advertising business called Invite Media, sold to Google for $81 million in 2010, when they were 24.

Free from financial concerns and still working at Google, they were filling their office whiteboard with ideas about what to do next. They were fascinated by health-care and Brennan's experience became a beacon guiding them on a new effort.

Turner and Weinberg's new company, Flatiron Health, was founded in 2012 with the goal of pooling patient data from electronic health records in a way that could answer scientific questions and improve medicine. It raised $328 million, and as a result Turner (the CEO) and Weinberg (the COO) headlined the 2015 Forbes 30 Under 30 Healthcare list. And they were just getting started. *Forbes* estimates Flatiron's annual revenue approaches $200 million. In April, Roche, the Swiss pharmaceutical giant, bought Flatiron for $1.9 billion, not including the $200 million stake it already owned in the data science company. The deal made Turner and Weinberg $250 million each, *Forbes* estimates.

Flatiron aims to overcome one of the biggest limitations on medical research. If researchers want to know whether a new medicine is effective, there is really only one option: recruit patients to volunteer for a clinical trial and randomly assign them to receive either the new medicine or a placebo. But this approach has shortcomings. Sometimes it's not ethical to make patients take a placebo. And clinical trials, for all their power, involve carefully selected patients. There is always the worry that results will be different in the real world.

But getting data from the real world is extremely difficult. At many cancer hospitals, administrators may not even know basics like how many patients have breast or pancreatic cancer. Flatiron's solution is to own the right to use data from an electronic medical record used by nearly 280 medical practices for 2 million patients. It pays 1,000 contractors to read the text notes doctors write about their patients and turn the notes into data on what medicines patients take, how well they work, and what happens next. This can be turned into a larger data set that measures how well medicines are actually working, a potential that has Flatiron collaborating with all the largest makers of cancer drugs.

"I believe that the public wants to know how patients with cancer do," says Thomas Lynch, the head of research and development at Bristol-Myers Squibb, who has been a Flatiron booster for years. "Real-world evidence is so important to understanding how to treat patients better and how to allocate resources."

It sounds great, but there are ethical pitfalls. Having contractors peer into patients' medical records, even with most identifying information removed, can seem creepy at best and an invasion of privacy at worst. And some scientists still have doubts about how useful the resulting data are. Can you really tell how good a new medicine is from Flatiron's data? Even Nat and Zach admit that the jury is still out.

FOR TURNER, IT ALL STARTED with snakes. Because his father was a geophysicist for the oil company Conoco, he moved around a lot as a kid, living in Louisiana, the Netherlands and Scotland. In Louisiana, his childhood fascination with dinosaurs led him into the neighborhood swamp to hunt reptiles. Turner started breeding them for profit. "One of my snakes had babies, and I sold the babies to a pet store for, like, $100," Turner says.

"Every bone in his body screams entrepreneur."

"As a 9-year-old, that's pretty cool." He discovered there were websites through which he could sell reptiles at a bigger scale. He kept the business up even after his family moved to Houston, Texas, when he was in middle school. By the time he was in high school, he was working with a friend who kept hundreds of reptiles in a trailer. But he didn't stop at snakes. He created a website to advertise baseball cards he was selling on Ebay, as well as websites for other reptile fans and then for other businesses.

When Turner arrived at Wharton in 2004, his Web design business was in full swing. Wharton had a program—intended for upperclassmen—that allowed undergrads to meet with entrepreneurs. Turner was so eager to meet with Josh Kopelman, a venture capitalist at Philadelphia, Pennsylvania-based First Round Capital who had founded his first successful company while an undergrad at Wharton, that he built an automated program to spam the Web-signup system so he could set an appointment. Turner brought a business idea to pitch, but instead they wound up talking about fixing First Round's website. Kopelman was blown away. "The level of curiosity, the level of maturity in his thinking, just every bone in his body screams entrepreneur," Kopelman remembers. At 7 p.m., on his way home, he offered Turner, still a freshman, an internship at First Round.

Turner made an even more consequential connection in a class he was taking only because it sounded easy. Wharton required students to take a course in writing. One that jumped out at Turner involved writing about blockbuster films. While eating catered dinners, students would watch movies and then write short essays about them. For one assignment, they were supposed to pair up with someone else. Turner was too shy to approach anyone. But another freshman in the class was going from person to person, asking, "Want to watch *Elf*?" referring to the Will Ferrell/Zooey Deschanel Christmas comedy. "I like *Elf*," Turner replied. He and Weinberg became fast friends.

They walked back to their dorms together and quickly discovered that both had been dreaming of building something from scratch. Weinberg didn't quite have Turner's entrepreneurial chops; at New York's ultracompetitive Hunter College High School, he'd had to focus on schoolwork full-time to keep up. But he found time to spend a summer playing online poker and loved what he refers to as "the high school hustle:" throwing parties and charging a cover at the door. He and a friend had an idea Turner liked: a company they'd call EatNow, which would allow college students to order food delivery over the Web. "Growing up in New York City, one of the things you get really used to is delivery food," Weinberg says. Turner adds:

December 4, 2018 • Singapore

Forbes Asia Forum: Decrypting Blockchain for Business

In Partnership with

The inaugural *Forbes Asia Forum: Decrypting Blockchain for Business* was held in Singapore on December 4, 2018. Attended by some 130 guests, the forum brought together blockchain and crypto thought leaders with Asia's most influential families, entrepreneurs and investors to explore the technology's disruptive power.

Discussions touched on business transformation leveraging existing applications of blockchain, as well as proof-of-concepts still in development. Other topics included the tokenization of various assets, examination of funding models, and monetary opportunities derived from emerging blockchain projects. Speakers also shared their views on the future growth of digital assets and adoption of cryptocurrencies as a store of value.

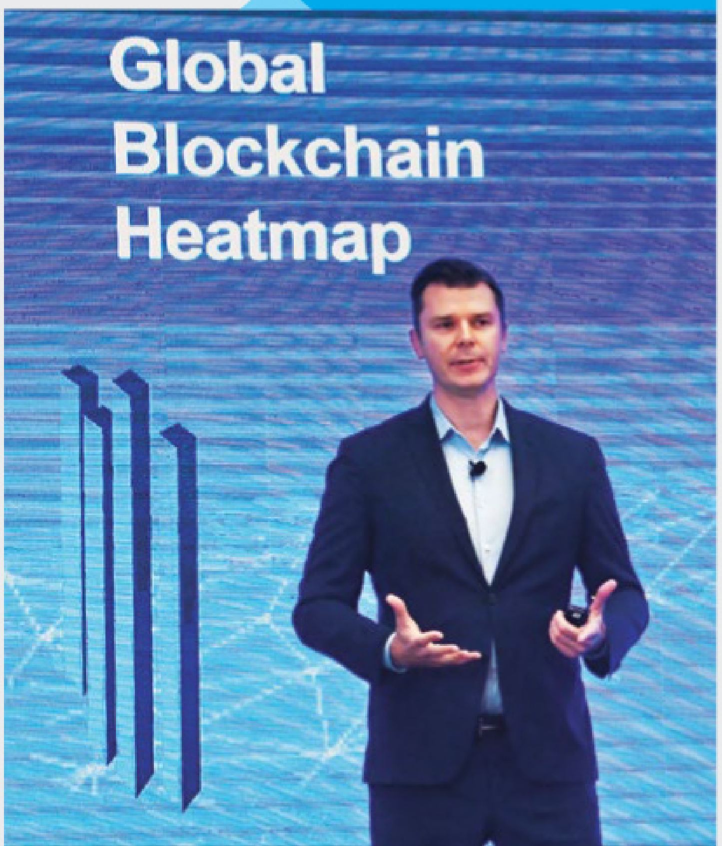
IN CONVERSATION WITH DR. JANIL PUTHUCHEARY

In a one-on-one dialogue with Justin Doebele, Executive Director – Content of Forbes Asia, Dr. Janil Puthucheary, Senior Minister of State, Ministry of Communications and Information & Ministry of Transport, discussed the potential for blockchain and distributed ledger technology to enhance Singapore's global competitiveness.

Speakers at the ***Forbes Asia Forum: Decrypting Blockchain for Business.***

Forbes Asia DECRYPTING BLOCKCHAIN FOR BUSINESS

THE STATE OF BLOCKCHAIN



Matthew Roszak, Cofounder & Chairman, Bloq

THE FUTURE OF DIGITAL ASSETS

(L-R) Zhao Changpeng, CEO, Binance; Pamela Ambler, Senior Reporter, Forbes Asia

ONCE ON THE BLOCK, FOREVER ON THE CHAIN

Anderson Tanoto, Director, RGE

CRYPTOCURRENCY – BLOCKCHAIN'S FIRST SMASH HIT

Bobby Lee, Cofounder, BTCC, Board Member, Bitcoin Foundation

Phil Yuen, CEO, Passport, Presenting Sponsor of the event, delivering welcome remarks

Forbes Asia
DECRYPTING BLOCKCHAIN
FOR BUSINESS

(L-R) William Adamopoulos, CEO, Forbes Media Asia; Zhao Changpeng, CEO, Binance; Dr. Janil Puthucheary, Senior Minister of State, Ministry of Communications and Information & Ministry of Transport; Phil Yuen, CEO, Passport

(L-R) Anderson Tanoto, Director, RGE; Dr. Janil Puthucheary, Senior Minister of State, Ministry of Communications and Information & Ministry of Transport; Bobby Lee, Cofounder, BTCC, Board Member, Bitcoin Foundation

(L-R) Loi Pok Yen, Director, Penjuru Capital; Michaela Tan, Private Wealth Management, Investment Management Division, Goldman Sachs (Singapore); Kishin R K, CEO, RB Capital

(L-R) William Adamopoulos, CEO, Forbes Media Asia; Korawad Chearavanont, Founder & CEO, Eko Communications

(L-R) Nathaniel Lee, CEO, Citypartner; Kuok Meng Yuan, Wilmar International

THE TOKEN ECONOMY

(L-R) Alex Dreyfus, CEO, Socios.com; Olga Feldmeier, CEO, Smart Valor; Tinku Gupta, EVP & Head of Technology, SGX; Julian Hosp, Cofounder & President, TenX

FUNDING MODELS - ICO, IPO, STO - WHICH ONE IS RIGHT FOR YOU

(L-R) Patrick Dai, Founder & CEO, Qtum Foundation; Mai Fujimoto, CEO, Gracone; Greg Li, Head of Asia Pacific, Bitfury; Loi Luu, Cofounder & CEO, Kyber Network

BIG BUCKS IN BLOCKCHAIN

(L-R) Jehan Chu, Cofounder & Managing Partner, Kenetic; Steve Leonard, Founding CEO, SGInnovate; Remington Ong, Partner, Fenbushi Capital

BLOCKCHAIN UNLIMITED

(L-R) Dave Chapman, Executive Chairman, OSL; Angelina Kwan, COO, BitMEX; Edward Lee, Director, LINE Tech Plus; Genki Oda, Founder & CEO, BITPoint

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(L-R) Andy Lim, Founder & Chairman, Tembusu Partners; Tony Chew, Executive Chairman, Asia Resource Corporation; Phil Yuen, CEO, Passport; Kester Tan, Special Assistant to Chairman, Alliance Global Group Inc


(L-R) Raj Kumar, Group Chairman, Royal Holdings; Lim Ming Yan, Board Director, CapitaLand


(L-R) Norihiko Ishihara, Representative Director, Sun Investment; Genki Oda, Founder & CEO, BITPoint; TC Yam, Chairman, Integrated Capital Holdings; Sammy Wong, Partner, Whale Capital; Patty Kuo, CEO, BITPoint


(L-R) Greg Li, Head of Asia Pacific, Bitfury; Dave Chapman, Executive Chairman, OSL; Michael del Castillo, Staff Writer, Forbes


(L-R) Zhao Changpeng, CEO, Binance; Olga Feldmeier, CEO, Smart Valor


(L-R) Jehan Chu, Cofounder & Managing Partner, Kenetic; Melissa Kwee, CEO, National Volunteer & Philanthropy Centre


(L-R) Jeffrey Yam, Principal, Integrated Capital Holdings; Steve Leonard, Founding CEO, SGInnovate


(L-R) Jube Zhong, Assistant CEO, Yanlord Land; Tinku Gupta, EVP & Head of Technology, SGX


(L-R) Patrick Dai, Founder & CEO, Qtum Foundation; Lim Chern Chuen, Director, Manja Technologies


(L-R) Michelle Cheo, CEO & Executive Director, Mewah Group; Kwa Kim Li, Managing Partner, Lee and Lee Advocates and Solicitors

"Campus food sucked."

That summer, while Turner interned at First Round (which, by the way, declined to invest in EatNow), Weinberg and another friend were driving from Philadelphia to Boston to New York to New Haven, trying to sign up restaurants. It was harder than they'd thought; they were sending restaurants faxes with orders on them. They also made the mistake of taking their cut from the restaurant, not from the customer at the point of sale; some restaurants just didn't pay them. At the end of their sophomore year, they sold the business in a fire sale. The assets are now part of Grubhub.

But their partnership was cemented. "One of their strengths is the speed with which they learn and willingness to appear stupid when they start," Kopelman says. They are two guys willing to tell each other "That's the dumbest idea I ever heard." Their next idea came as they watched basketball and saw small ads popping up in front of the game. Initially, Kopelman told them it was an idea he was in no way ready to fund. But they went into a meeting with Andrew Boszhardt, a fund manager who had just made a big profit by funding StubHub. After just a few minutes, Boszhardt asked how much money they needed. The two had not even discussed it between themselves. "$250,000," Turner blurted out. "Okay," Boszhardt said. Turner and Weinberg hugged for the first time in the fund's fancy elevator.

Invite Media would pivot at least eight times. At first they thought they'd build a company that helped other people build ads. But Weinberg says they spent hours and hours with Brian O'Kelley, the chief executive of the ad network AppNexus, who explained to them that advertising was moving toward an automated process. It was their first experience parachuting into a complicated business and figuring out how to create a product in it. And it worked: Invite allowed advertisers to buy ads across multiple networks. First Round eventually did invest. "It was really a bet for us on Nat and Zach," Kopelman says. Invite raised a total of $4 million and was sold to Google in 2010 for $81 million. As soon as they moved into the Google offices, Turner and Weinberg started thinking about what they were going to do next. One thing was certain: It wasn't going to be in ad tech.

"It's stunning how far behind banking and manufacturing **medicine is."**

SEEING GOOGLE'S WELL-OILED ad-tech machine highlighted "all the things that we did wrong [at Invite] that we definitely don't want to do again," Weinberg says. It also gave them time to think, because the integration was so smooth that they were soon "irrelevant." They didn't want to go back into ad tech, partly because they figured Google had it locked up and partly because they wanted to do something more meaningful.

Turner says Google asked them to stick around before starting another company, offering to shorten their stay from three years to two and allow them to work on other projects so long as they gave Google Ventures a chance to fund their new ideas. At Google's offices in New York's trendy Chelsea district, they filled a whiteboard with ideas for their next venture. Healthcare—and particularly cancer care—kept floating to the top. Part of the reason was that it was an area where they thought technology could make a difference. Part of the reason was Turner's experience with his cousin. And it just kept coming up. One of the Google executives on the other side of the table during the Invite Media sale had a daughter with leukemia. (She's now in remission; the executive, Jason Harinstein, recently became Flatiron's chief financial officer.)

Krishna Yeshwant, a partner at Google Ventures, says he met Turner and Weinberg because the search giant always wants to give a second look to entrepreneurs who were smart enough to sell their companies to Google the first time. He became one of their tour guides in the world of health. The pair had learned in ad tech to listen to the ideas of people who were really experts, and their two years at Google turned into a listening tour. "When Google Ventures makes an intro to someone, usually that person is taking the meeting," Weinberg says. At first they planned to create a nonprofit that would help patients get second opinions, in-

Nat Turner bred snakes as a preteen and turned his love of reptiles into a business in high school.

spired by Turner's cousin's journey. But there was a problem with the nonprofit idea. "Great engineers don't work at nonprofits," Turner says. "They tend to go to places like Facebook." And the more they talked to doctors, the more they worried that the idea wouldn't scale.

Instead, they became infatuated with the data behind those doctor-patient interactions. Yeshwant introduced Turner and Weinberg to a company he was backing, Foundation Medicine, a biotech in Cambridge, Massachusetts, that sought to help cancer patients by sequencing their DNA. But Foundation told them it was having trouble following patients to find out how they did, because the medical system did not keep track of them. Turner also remembers a meeting with David Altshuler, then a genetics researcher at the Broad Institute of MIT and Harvard and now the chief scientific officer at Vertex Pharmaceuticals, a big-cap biotech in Boston. Altshuler told him not to focus too much on genetics research, known as genomics. "I remember he said Foundation Medicine and all these companies are doing genomics, but no one's aggregating clinical data," Turner says.

"Let's see if Google Ventures is willing to **write the check."**

Turner and Weinberg started Flatiron Health in June 2012, two years after they joined Google, and in January 2013 they raised $8 million from Google Ventures, First Round Capital and individual investors such as 23andMe's Anne Wojcicki, plus some of their own cash. The idea was to create software that would run on top of electronic medical records to give hospitals an idea about how their business was working. Things went so well that within a year Nat and Zach were negotiating the sale of their company not to Roche but to Foundation. When there was a handshake agreement on the deal, they hugged for the second time. But the deal didn't go through, because Flatiron saw even bigger opportunities. The two companies would eventually end up together, though. In June, Roche, the same drug giant that had acquired Flatiron, purchased Foundation in a deal that valued it at $5.3 billion.

WHAT WAS DIFFICULT was getting their nascent product—basically a glorified dashboard—into medical centers. Their first deal, with the University of Pennsylvania, dragged on for more than a year, mired in university bureaucracy. The first major cancer center to adopt their early product was Yale University. When asked why it happened, Weinberg gives a two-word answer: "Tom Lynch." Lynch, the head of R&D at Bristol-Myers, was then the physician-in-chief of Yale's Smilow Cancer Hospital. He remembers being introduced to Nat and Zach by other doctors he'd known since his medical residency. He was blown away by their ideas.

"It's stunning how far behind banking and financial transactions and manufacturing medicine is," Lynch says. "Seven years ago, I couldn't tell you how many patients at Yale were being treated for pancreatic cancer, real time. I could tell you when the information was filed with the state or when it was filed years later with the National Cancer Institute. But the ability to tell in real time how many patients had a certain disease or, more important, how were we treating them? How were they doing? Were we offering clinical trials that met the needs that the patients had? When a company like Bristol-Myers or Roche would come to me at Yale and say, 'We have a clinical trial on a certain disease. How many patients do you think you guys might have that could be eligible?' I didn't have that kind of information."

Flatiron did better at signing up cancer hospitals and doctors' offices that were not linked with universities, accumulating about 20 by 2014. But when Weinberg and Turner met with drug companies, they still found that the data they had were insufficient. Turner remembers a meeting with Roche's U.S. unit, Genentech, as one of the low points at Flatiron. He and Zach went to meet with researchers there and were told that their technology and data processing were "awesome," but that they just did not have data from enough patients in their system to be useful.

That led to an even bolder gambit: buying an electronic-medical-records company. Most of the health-records business is locked up by giants like Epic Systems of Verona, Wisconsin, and Cerner of North Kansas City, Missouri. But cancer doctors used four smaller specialty products, and three of them were owned by companies for which health records were a side business: Palo Alto, California-based Varian Medical Systems and Sweden's Elekta Medical Systems, which focus on building machines for zapping cancer patients with radiation, and McKesson, the medical-products distributor based in San Francisco. The fourth, Altos Solutions, based in Los Altos, California, was solely in the electronic-medical-records business. Weinberg remembers having the idea of buying it with Nat in the car in Palo Alto. What would it cost? they wondered. Maybe $80 million? "Nat said, 'Let's go see if Google Ventures is willing to write the check,'" Weinberg says, "and I remember saying, 'We should ask them, but there's no way in hell they're going to do it.'"

That was Google Ventures' reaction, too. Yeshwant, the partner Turner called, had just put his infant daughter to bed in his new house in Cambridge. "I think at that time I might have actually laughed," he says. Turner responded: "I know you think I'm kidding, but I'm not. We're going to do this." In parallel, Turner and

Weinberg convinced Altos to sell, saying they would make their electronic medical records even better, and persuaded Google Ventures to lead a $130 million financing round, of which $100 million went to buying Altos. The deal closed in May 2014. In a year, Flatiron went from having 17 employees, all in New York, to 135, in more than a dozen states. But it also meant that the company had added electronic medical records from thousands of patients to its database.

AS THEY WERE CLOSING the Altos acquisition, Turner and Weinberg were negotiating a hire that would transform their data business. Amy Abernethy had been trying to get real-world evidence about cancer out of electronic medical records for more than a decade. She ran a program to do so at Duke University in North Carolina, which is one of the top hubs for conducting clinical trials in the U.S., and chaired a similar effort for the American Society of Clinical Oncology. The now-50-year-old oncologist instantly saw the potential in the data Flatiron had presented but declined an offer to be its chief medical officer. Nat and Zach roped her into helping them interview potential job candidates. One of them said to her, "If this job is so great, why don't you take it?" Finally, in 2014, she did.

Flatiron has made great progress in finding uses for its data. Turner remembers that one of the high points of his time at Flatiron was when one of Abernethy's researchers took Flatiron's data and replicated exactly the results of a clinical trial. Flatiron says it has been able to replicate what happened in the control arms of existing studies with its own patient population more than a dozen times. Flatiron has even worked directly with the Food & Drug Administration.

But not everyone is satisfied with the company's direction. Ezekiel Emanuel, a University of Pennsylvania bioethicist who helped craft the Affordable Care Act, was one of the doctors who introduced Flatiron to Tom Lynch, the company's big customer at Yale. While he still admires what Turner and Weinberg have tried to do, Emanuel doesn't think they have succeeded in creating a system that uses data to improve care for patients. The worry is that instead of helping hospitals get better, Flatiron has basically become a data collection service for the pharmaceutical industry. "They didn't crack that nut," Emanuel says. "They still don't have a company helping all those oncology groups to be much more efficient and consistently higher quality. I had hoped they would do more of it, [but] they never went that way."

"What about the next company who gains access to the data **and is not responsible?"**

And not every customer is happy. Barbara L. McAneny, the chief executive of New Mexico Cancer Center, wanted Flatiron to help her center move toward being paid for medical care only if patients do well. "They won't let me have all the data I need to move into value-based care, even though it was promised," she says. She also says the Flatiron product is "very good" for day-to-day use. Harlan Krumholz, director of the Center for Outcomes Research & Evaluation at Yale-New Haven Hospital, has another worry: "I think the question is: What about the next company who gains access to the data and is not responsible?"

Certainly, it's possible to find patients who feel they should be getting a cut of any money Flatiron makes. "We're tired of having pharma and payers and all kinds of other ancillary third parties mincing, toying and making money out of our data without us getting cut in," says Casey Quinlan, a breast cancer survivor and patient activist. (Counterpoint: "I don't have the luxury to be concerned about privacy," says Ken Deutsch, a bladder cancer survivor. He wants more research now and would be fine with Flatiron using his data.)

It may all be a moot point. Flatiron does allow patients the opportunity to opt out of research and says its practices comply with the Health Insurance Portability & Accountability Act of 1996. And the Roche deal has cemented its business model in place. Roche wants to use Flatiron to create a new ecosystem for testing cancer medicines that will help the company and rivals like Bristol-Myers, which is one of Flatiron's biggest customers.

The Roche deal started with an offhand comment Turner made to Daniel O'Day, 54, the head of Roche's drug business, a Flatiron board member and one of Turner's many mentors. At "a random restaurant" on New York's Columbus Circle, Turner says, he mentioned "in a joking way" that he wouldn't be opposed to selling. At Flatiron's next board meeting last October, O'Day took Nat and Zach out to lunch at the Clocktower, a chic, sceney $30-a-plate pub directly across Madison Square Park from Flatiron's old offices on 23rd Street. Turner and Weinberg had the cheeseburger. O'Day, a triathlete who avoids gluten, had the fish. "I should have had the burger without the bun," he says. The discussion was not about financial terms but about the power of Roche's balance sheet to allow Flatiron to move faster—Turner and Weinberg think they could fulfill their five-year plan in three years with Roche's money—and about keeping Nat and Zach in complete control even after the sale. "I'm comfortable," O'Day said. "But the question is: Are you, Nat, are you, Zach, comfortable?" They were. And now Flatiron is backed by the cash, expertise and interests of the world's largest maker of cancer drugs. And, like it or not, that's how cancer research gets done in America.

THOUGHTS ON

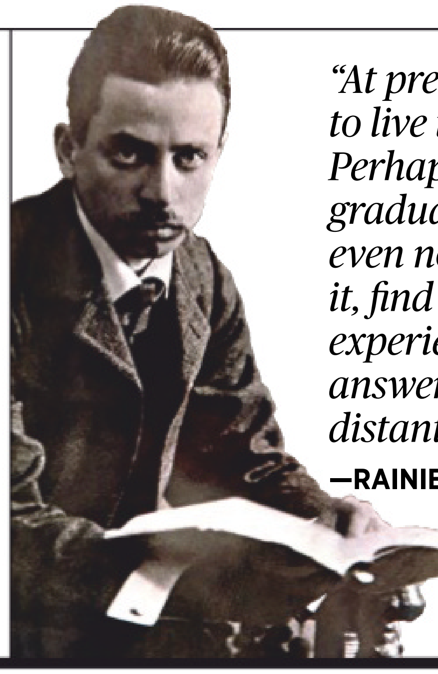
Patience

“I’M EXTRAORDINARILY PATIENT, PROVIDED I GET MY OWN WAY IN THE END.”

—MARGARET THATCHER

“Trying to understand is like straining through muddy water. Have the patience to wait! Be still and allow the mud to settle.”

—LAO TZU



“At present you need to live the question. Perhaps you will gradually, without even noticing it, find yourself experiencing the answer, some distant day.”

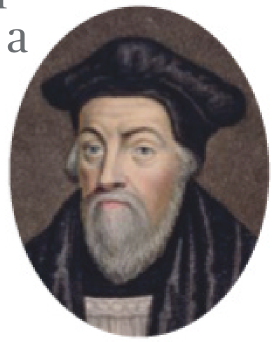
—RAINIER MARIA RILKE

“THOUGH PATIENCE BE A TIRED MARE, YET SHE WILL PLOD.”

—WILLIAM SHAKESPEARE

“The drop of rain maketh a hole in the stone—not by violence, but by oft falling.”

—BISHOP HUGH LATIMER

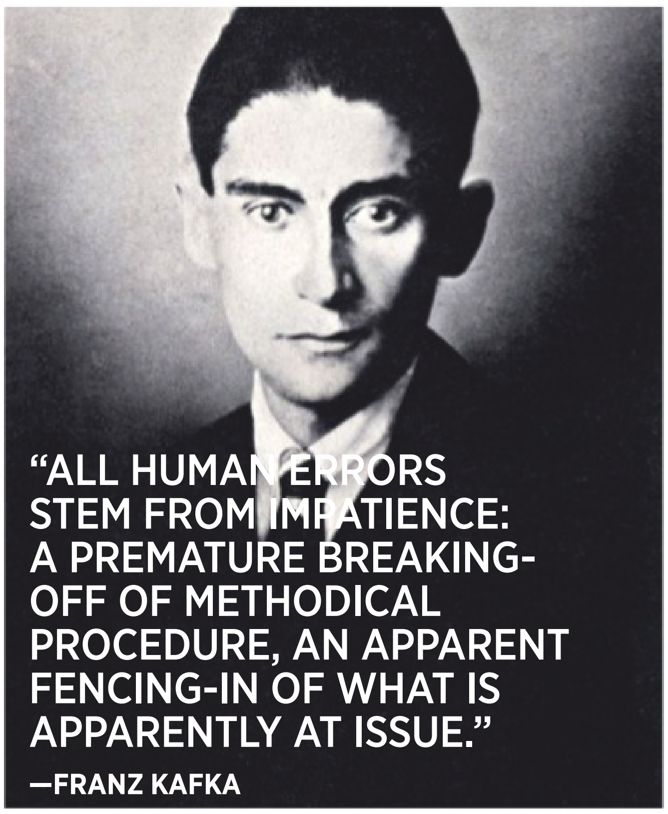


“Patience: a minor form of despair, disguised as a virtue.”

—AMBROSE BIERCE

“Rivers know this: There is no hurry. We shall get there someday.”

—A.A. MILNE



“ALL HUMAN ERRORS STEM FROM IMPATIENCE: A PREMATURE BREAKING-OFF OF METHODICAL PROCEDURE, AN APPARENT FENCING-IN OF WHAT IS APPARENTLY AT ISSUE.”

—FRANZ KAFKA

“Hope begins in the dark—the stubborn hope that if you just show up and try to do the right thing, the dawn will come.”

—ANNE LAMOTT

“TREES THAT ARE SLOW TO GROW BEAR THE BEST FRUIT.”

—MOLIÈRE

“TOLERATION IS THE GREATEST GIFT OF THE MIND.”

—HELEN KELLER

“Be worthy love, and love will come.”

—LOUISA MAY ALCOTT

“PATIENCE AND TIME DO MORE THAN FORCE AND RAGE.”

—JEAN DE LA FONTAINE

“PREACH THE WORD, BE PREPARED IN SEASON AND OUT OF SEASON; CORRECT, REBUKE AND ENCOURAGE—WITH GREAT PATIENCE AND CAREFUL INSTRUCTION.” —2 TIMOTHY 4:2

FINAL THOUGHT

“History cannot be hurried. Generations of reformers have learned this to their cost.”

—MALCOLM FORBES

SOURCES: THE CYNIC’S WORD BOOK, BY AMBROSE BIERCE; FABLES, BY JEAN DE LA FONTAINE; HENRY V, BY WILLIAM SHAKESPEARE; WINNIE-THE-POOH, BY A.A. MILNE; LETTERS TO A YOUNG POET, BY RAINIER MARIA RILKE; LITTLE WOMEN, BY LOUISA MAY ALCOTT; BIRD BY BIRD, BY ANNE LAMOTT; TAO TE CHING, BY LAO TZU; THE ZÜRAU APHORISMS, BY FRANZ KAFKA.

CLOCKWISE FROM TOP LEFT: ALEXIS DUCLOS/GETTY IMAGES; HISTORICA GRAPHICA COLLECTION/GETTY IMAGES; HERITAGE IMAGE PARTNERSHIP/ ALAMY; HISTORICAL PICTURE ARCHIVE/GETTY IMAGES; ALTO VINTAGE IMAGES/ALAMY; FINE ART IMAGES/GETTY IMAGES; KIM KULISH/GETTY IMAGES; CULTURE CLUB/GETTY IMAGES; LEBRECHT MUSIC & ARTS/ALAMY; HULTON ARCHIVE/GETTY IMAGES