



NOW

2016

NAVIGATING OUR WORLD™

THE CONFERENCE IN REVIEW

Brown Advisory recently hosted NOW 2016 in Washington, our biennial forum bringing our clients together with provocative thought leaders to learn in depth about tough political, social and national security issues. Subtitled “Moral Courage in a Time of Disruption,” the conference gave us an opportunity to explore with our clients several high-impact trends so that we can be better prepared both as citizens and as investors. In the following pages, we offer summaries and our thoughts about 13 panel discussions and keynote presentations.

A Note from Michael Hankin, *President and CEO of Brown Advisory*

I love our NOW conferences. NOW, which is short for “Navigating Our World,” is a forum in which we join with clients and friends to learn from thought leaders about some of today’s most profound changes in technology, geopolitics and other fields. The conference is an important part of who we are as an investment firm. Our consideration of external viewpoints is a critical element of Brown Advisory’s culture, reflecting our belief that thoughtful attention to diverse perspectives helps us make better decisions for our clients.

We held our first NOW forum in 2008 to mark our 10th anniversary as an independent firm. Since then, we have hosted the conference every other year in Washington, D.C., and, beginning last year, in London as well. NOW is embedded in our firm’s DNA, and is one of our most cherished shared experiences with clients.



MICHAEL HANKIN

On April 25, we held our fifth NOW conference with the theme, “Moral Courage in a Time of Disruption.” At NOW, we do not promise answers. Instead, we tackle issues with the goal of helping us enlarge our contributions as citizens and

investors. Some of these issues are familiar, such as the latest advances in the battle against cancer. Some challenges require courage, such as how we should address rising inequality in the U.S. All of the issues we discuss are provocative. At the end of the day, we come away with a firmer grasp on the range of possible outcomes generated by several powerful forces for change.

In this review, Brown Advisory analysts summarize the themes discussed in most of the NOW sessions. The presentations provided ample food for thought, including possible investment opportunities and implications for client portfolios.

We hope you enjoy this special publication. Please share with us any thoughts or questions that you may have on the topics covered in these pages.

Sincerely,

A handwritten signature in black ink that reads "Mike Hankin".

Mike Hankin

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Innovation, Disruption and the ‘Super Convergence’



A revolution from new technology is creating ways to generate, access and learn from data that will sweep many businesses into obsolescence and clear the way for the rise of digital powerhouses. The new technological paradigm—perhaps the most profound shift in history—will generate massive amounts of wealth, but require courageous decision-making, according to Manoj Saxena, founding partner of The Entrepreneurs’ Fund and former general manager of IBM Watson.

Throughout history, innovation has usually progressed at a measured pace. Today, however, we are witnessing a “super convergence” of six simultaneous trends in a short period—cloud computing, mobile devices, social media, artificial intelligence, big data and the rise of the millennial generation, Saxena said. These



MANOJ SAXENA

forces may synergize into a “smarter society” with tremendous potential.

Progress may blossom in many forms as the various components of our life become more connected. Greater connectivity will streamline daily tasks, enabling us to better control the comfort and security of our homes and workplaces. Vastly stronger computational power will improve health care. Meanwhile, the cost of computing will plunge, pushing back limits on capacity year after year with no increase in cost, Saxena predicted. Here are some of the building blocks for future advances:

Intelligent devices, and the networks on which they operate, are progressing so quickly that, in the near future, the world will become one’s Internet browser, with each individual a “cursor,” Saxena said. Knowledge from the Internet will be at one’s fingertips via smartphones, watches and eyeglasses.

Artificial intelligence may prove to be the most sweeping development, with investors funding thousands of companies to pursue it. Yet 90% of the companies will probably fail because, as they rush into the field, investors will overlook business model weaknesses.

Data will become the new oil—an increasingly essential driver for the economy. Computers will soon be able to understand much of the “dark data” that is currently beyond their ken. Programmers have already unlocked music and video to computational power. Tomorrow,

SPEAKER:

MANOJ SAXENA

*Founding Partner,
The Entrepreneurs’ Fund,
Former General Manager, IBM Watson*

financial statements, news articles and lengthy reports will be subject to computation. Before long, people will be able to harness machines to aid their thinking like never before, Saxena predicted.

The companies most likely to succeed will harness these forces to provide customers with solutions rather than just new technology, Saxena said, referring to the rapid rise of some digital giants. He noted that Uber, the world’s largest taxi company, does not own any cabs just as AirBnb, the world’s largest hotel company, does not own a hotel. The two companies have thrived by using technology to strip away layers of infrastructure, Saxena said. They have “unbundled” their industries while focusing on improving the customer experience.

With data as the grist for this radical change, the current challenge lies in understanding and leveraging the avalanche of information, Saxena said. Roughly 90% of the world’s data was created in the last two years, and 80% of it cannot yet be understood by computers. Only 29% of companies say that they can make use of the understandable data. Consequently, humans are awash in exponentially rising volumes of information while lacking the “refineries” to process it. That, according to Saxena, offers entrepreneurs and innovators a substantial opportunity.

—Edward H. Lamade
Portfolio Manager

Four Forces Fueling the Boom in Digital Innovation



Investors worldwide are seeking to find the next Facebook and Google while venture capitalists are pouring capital into companies that they predict will disrupt industries and fundamentally alter the way we live. The ability to identify the next digital juggernaut is the most sought-after skill among firms focused on finding companies with the prospect for rapid growth. Retail investors searching for the next high flier, however, do not always possess a sophisticated analytical framework usually needed to support this ability.

Meet Harry Weller. A general partner of the venture capital firm NEA, Weller has created a blueprint for understanding the emerging forces driving disruptive technologies. Speaking at the NOW conference, he focused on how fundamental changes in computing during recent decades have led to the emergence of “Four Cs” driving innovation—computing, connectivity, componentization and consumption. Every year, advances in technology roughly cut in half the cost of the devices that feature the Four Cs, Weller said.

Computing power is so robust today that it is common for multiple applications to run on a single server. Also, in recent years, connectivity among computers leaped forward, with sophisticated networks of computers that are now ubiquitous, cheap and interwoven with daily life, Weller said.

Rapid progress in computing and connectivity has led to a boom in cloud computing, or the sale of computing power and data storage through the Internet. By using the cloud, companies can save money and boost efficiency by shutting down their own data centers and calibrating their use of computing power based on their immediate needs. The cloud has encompassed millions of applications, from massive data processing to sharing photos with friends and family. “I call it the server coming out of the closet,” Weller said. “You’re no longer running your own server—you’re renting someone else’s server.”

CLOUD TITANS

Amazon.com, Microsoft and Google have emerged as the clear leaders in the business of renting out computing power via the Internet and will thrive from the migration to the cloud, Weller predicted. “In 2006, there were more virtual servers than there were physical servers, meaning this process has already occurred and it’s violent, it’s happening extraordinarily quickly,” Weller said. *(Please see the story on page 4 in the June edition of The Advisory.)*



HARRY WELLER

“Componentization”—the third C driving innovation—makes easier the scaling up of myriad component products and processes to millions of users in one application, Weller said. The simultaneous release of a new movie title worldwide by Netflix or HBO GO is one example of the profound impact from componentization.

This rising trend explains the disruption occurring in the software industry, which is automating front office systems, according to Weller. Companies such as banks, airlines and movie rental services that have relied on branches or storefronts are increasingly becoming automated through application software: one huge application running on many servers made up of multiple components. Complex examples of componentization, such as the automated driverless car, will become commonplace, Weller predicted.

SPEAKER:

HARRY WELLER

General Partner, NEA

Consumption is the final C driving innovation, according to Weller. Technology today is “injected” into everyday life through devices—Apple Watch, a digitally connected thermostat or a Tesla car. These systems advise us where to park or adjust the temperature of our homes without requiring us to log on to a computer. Consumers will also increasingly find “immersive” technology at hand, through the virtual reality of three-dimensional games or augmented reality, which casts three-dimensional images on the world around us. Computer “screens will be gone,” Weller said.

CUSTOMER FIRST

Thanks to the Four Cs, all companies are becoming “customer-facing,” Weller said. For example, Caterpillar no longer makes only tractors. To

remain competitive, its software must be equipped to relay real-time performance data to customers, he said.

The restructuring of companies to be more customer-facing will drive trillions of dollars in market capitalization and value, according to Weller. The companies that reap the majority of these benefits, he predicted, will be those which harness three factors: anti-friction, or the seamless execution of processes from the conception of a business to the satisfaction of customer demand; virality, the ability to gain appeal among millions of customers within a short period at minimal cost; and judgment, the use of neural networks and quantum computing to mimic human decision-making.

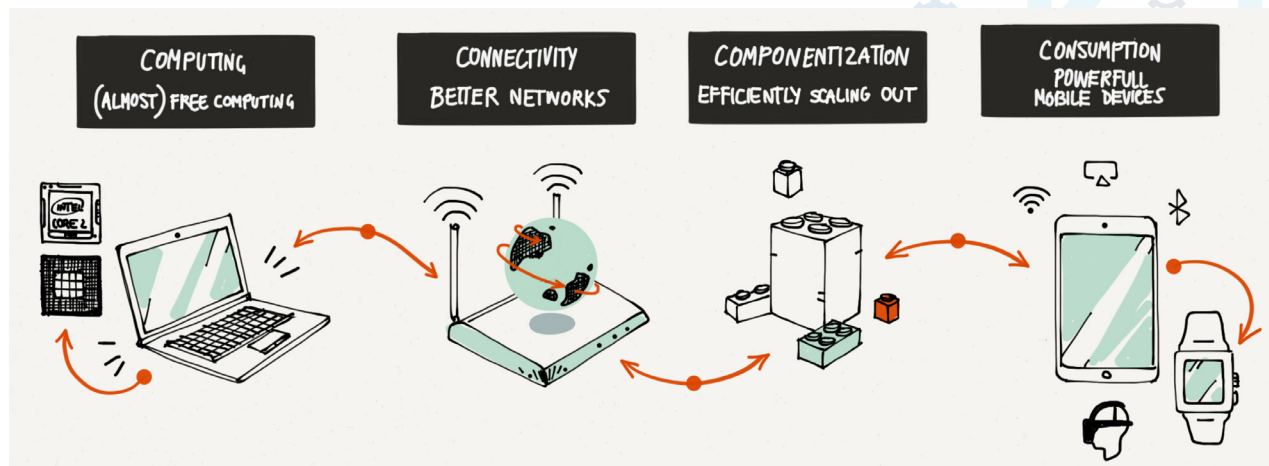
The spread of innovation and the rise of unprecedented efficiency and superior business models

bring tremendous opportunities for investors, according to Weller. For businesses today, “economies of scale are actually in the network; they’re in computing,” he said. “Innovation can happen anywhere. You don’t have to be in Silicon Valley anymore. The components are in the cloud—anyone can innovate,” he said.

At the same time, a disproportionate amount of wealth today is flowing to a company’s founders and shareholders, not distributed along its supply chain, raising “implications for income inequality.” A public policy challenge, Weller said, lies in the fact that the revenues generated by the Four Cs may not be widely shared.

—Meera Patel, CFA
*Director of Private Equity
Fund Research*

THE FOUR CS



SOURCE: NEW ENTERPRISE ASSOCIATES

Poverty's High Cost Persists Among Young Americans



The speakers for the session entitled, "Reviving the American Dream: Confronting

Inequality in the U.S.," wasted no time digging down to a bedrock question—why should Americans care about a widening gap between rich and poor?

Alexis de Tocqueville provided the answer: "self-interest rightly understood." Widening inequality, while fueling social tension and wasting human potential, erodes the relative buying power of the middle class. With consumption fueling about two-thirds of U.S. growth, stagnating wages among the core of the population could weaken economic dynamism.

Much more than a pocketbook issue, poverty exacts a huge emotional toll on young Americans, according to Jeff Duncan-Andrade, associate professor of Raza Studies and Education at San Francisco State University. U.S. data on post-traumatic stress disorder "have shown that soldiers returning from live combat are only half as likely to have the symptoms of the disorder

as a young person growing up in poverty," he said.

U.S. poverty has persisted as a college degree has grown more essential to gaining a well-paying job, according to William Julius Wilson, a professor of sociology at Harvard University and a former MacArthur Prize Fellow. U.S. workers have suffered a decline in incomes as the strength of organized labor has waned. Also, pressures from trade have dimmed prospects for low-skilled labor, Wilson said.

Social inequality reinforces economic inequality, according to Wilson. For example, schools in lower-income neighborhoods may have trouble attracting and retaining teachers. Moreover, as socioeconomic segregation increases, both between and among racial groups, parents with low incomes may have trouble making strong bonds with parents in higher strata. Consequently, disadvantaged children have limited opportunity to see a link between academic achievement and success in the job market.

U.S. poverty is extensive and entrenched. About one out of five U.S. children lives below the poverty line, and 43% of the families in the bottom decile of income fail to advance to a higher decile, according to Robert Doar of the American Enterprise Institute. A fight against poverty must not treat employment, family and education as separate

SPEAKERS:

WILLIAM JULIUS WILSON, PH.D.

Lewis P. and Linda L. Geyser University Professor, Harvard University

ROBERT DOAR

Morgridge Fellow in Poverty Studies, American Enterprise Institute

JEFF DUNCAN-ANDRADE, PH.D.

Associate Professor of Raza Studies and Education, San Francisco State University

spheres, said Doar, whose policy experience includes work in social services in New York.

Duncan-Andrade highlighted how some schools in poor communities have defied conventional wisdom by having success with low-income students, citing a lab school he opened in Oakland, California. Teachers at such schools can be effective and satisfied if they approach teaching differently than their counterparts in more affluent areas. For example, Duncan-Andrade said, at an Oakland school he visited, 19 out of 20 first-graders had at one point heard gunfire in their neighborhoods. To succeed, teachers in such schools need to know how to help children address chronic insecurity.

Asked to identify effective ways to combat poverty, Wilson advocated universal preschool education, while Doar stressed more effective early education. Duncan-Andrade asked the audience to support innovation and research while underscoring the power of hope in poor neighborhoods. He said he tells his students that rather than emulate their neighborhoods' dope dealers, they should follow his example as a "hope dealer." According to Duncan-Andrade, "this problem can be solved—I'm certain of that."

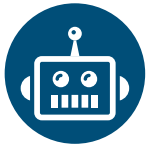
—Josh Perry

Fixed Income Research Analyst



FROM LEFT: MODERATOR CHIP LINEHAN, WILLIAM JULIUS WILSON, JEFF DUNCAN-ANDRADE, ROBERT DOAR

The Ethical Challenges From Breathtaking Innovation



The limits to what humans can create seem bound only by the limits of human imagination.

Advances in computing and connectivity have thrust us into a new world of increasingly sophisticated robots and other “autonomous systems.” Such progress, while exciting, can provoke anxiety and pose ethical challenges. Erin Hahn, a senior national security analyst at The Johns Hopkins University Applied Physics Laboratory, described the challenges that she has identified in research with the U.S. Defense Department. Rather than explore the vast possibilities of what can be built, she focused on determining what should be built.

Autonomous systems can apprehend complex environments and react without human intervention. Hahn began her session with videos of robots created by Boston Dynamics showing a robotic dog, “Spot,” and humanoid, “Atlas,” performing everyday tasks. The images underscored the range of emotions prompted by autonomous systems. While initially we may find the robots’ capabilities exciting—even feeling sympathy when they are pushed and prodded by humans—eventually we may feel alarm when considering the long-term risks posed by such lifelike machines. This same range of emotions has found expression in popular culture. On the one hand, there are C-3PO and R2-D2, the friendly autonomous robots who help Luke Skywalker save part of a galaxy in

“Star Wars.” On the other hand, there are the lethal autonomous systems in “The Terminator” that threaten to destroy the world.

Given the broad spectrum of associations, Hahn emphasized the imperative of aligning government policy with public attitudes. We must responsibly create systems so that we can trust the technology that we develop as we interact with it and deploy it on a large scale. Hahn highlighted four elements of trust when considering mobilizing autonomous systems for military purposes:

We must determine how the system handles intent. When a system operates without human direction, we must ensure that it can identify an enemy’s unarmed surrender. Such a safeguard would ensure we meet our commitments to international law.

We must determine who is accountable if something goes wrong. Who is ultimately responsible for the actions of an autonomous system? Can autonomous systems fully understand commander intent? Are developers at fault if there is a failure?

We must ensure that autonomy will not desensitize us to violence. Will it be easier to hit the “kill button” with these technologies than to pull the trigger on a pistol? Will our behavior and ethics change as we mobilize machines on military missions?

We must ensure that autonomous machines will not lead us to dystopia. Some experts in technology, including Bill Gates and Elon Musk, believe that if not properly controlled,

SPEAKER:

ERIN HAHN

*Senior National Security Analyst,
The Johns Hopkins University
Applied Physics Laboratory*



sophisticated autonomous systems and artificial intelligence could spell the end of the human race. Are we thinking through the potential consequences of what we are building?

Hahn emphasized the importance of setting standards to ensure the systems we create are worthy of our trust over the long term. With a steady pace of innovation, generations will be born that know only a world with autonomous technology. Their dependence may help speed creation of more adept autonomous systems. Eventually, humans may deploy systems that could operate beyond our control. If we were to create machinery that crosses that threshold, would we be able to rein it in? The question underscores the essential distinction at the core of Hahn’s research—not what can we build, but what should we build.

—John Canning
Equity Research Analyst

Deploying Computer Games to Speed Recovery From Stroke



Stroke persists as a scourge even in countries with the most advanced medical care. In the U.S., one out of every five people between the ages of 55 and 75 suffers a stroke, and currently there is no option available to treat or reverse the resulting damage to the brain. A stroke occurs in the U.S. every 40 seconds, making it the leading cause of long-term disability, with 75% of patients homebound within a year.

John Krakauer, director of the Johns Hopkins Brain, Learning, Animation and Movement (BLAM) Laboratory, has sought to revolutionize treatment of stroke patients by assembling an eclectic team: animators, computer gamers, Disney/Pixar engineers and dolphin experts from the National Aquarium in Baltimore.

He centers his approach on an appreciation for the link between the brain and physical movement, and for the brain's capacity for post-injury healing. Ultimately, Krakauer leverages the human brain's "plasticity," or inherent changeability throughout a lifetime.

Clinical studies on mice provided early validation for Krakauer's ideas. The BLAM lab found that a week after a stroke, intense training and rehabilitation could at best recover about 70% of the rodents' potential abilities.

Researchers then induced a second stroke and immediately began retraining the mice, rather than impose a one-week delay. The contrast was dramatic: Intense retraining following the stroke helped the mice regain nearly 100% of prior potential. The results affirmed Krakauer's view

that the longer training is delayed, the less a stroke victim would recover in brain function. Immediate and intense training, in his view, is the best way to leverage the brain's receptivity to healing.

Krakauer's approach defies current post-stroke therapy, which usually entails two weeks in a hospital bed, in which 60% of the patient's time is spent alone, with 85% of the time spent immobile.

SPEAKER:

JOHN KRAKAUER, M.A., M.D.

*Director, Brain, Learning, Animation and Movement Laboratory
The Johns Hopkins University School of Medicine*

This treatment regimen persists even though data suggest that the brain's ability to recover atrophies four weeks after a stroke.

Under current techniques, rehabilitation fails to challenge the brain sufficiently in both range and intensity of movement. Much of the rehabilitation is focused on coping with the loss of brain function rather than the retraining of the brain, according to Krakauer.

As an alternative, Krakauer has created an exoskeletal robotic arm that enables stroke patients to play a video game with their arm in which they mimic the movements of a dolphin through water. The semi-autonomous computerized machine and image challenge the brain to make the movements of a multitasking, skilled animal. While the approach has yet to be tested fully in a clinical setting, Krakauer said the device has increased patients' intensity of movement by two orders of magnitude compared with current rehabilitation techniques.

Through his research, Krakauer is pushing back the boundaries on knowledge of the relationship between human movement and cognition. His findings may reshape current business models for aiding stroke patients and help advance the treatment of Alzheimer's and other neurological disorders.

—Sung Park, CFA
Equity Research Analyst



Creating Benefits, Posing Risks Through Genetic Engineering



Through genetic modification, humans are taking the reins from Mother Nature, making huge strides in fields such as human nutrition and health. Editing genes can help parents with genetic diseases bear healthy babies. Such technology can also lead to the creation of higher-yielding crops and cure cancer with immune cells that are injected into the human body. As our speakers noted, this work also raises the risk of unintended consequences and bears thoughtful consideration by a wide set of stakeholders.

The biggest recent advance accelerating the pace of biotech research is known as CRISPR (clustered regularly interspaced short palindromic repeat), according to Edison Liu, president and CEO of The Jackson Laboratory, which focuses on genomic research. Using CRISPR, scientists target and modify specific genetic sequences in our DNA. By changing the sequences, scientists using CRISPR can accomplish incredible things: cure many genetic diseases, or modify plants to increase production or resistance to disease or pests.

CRISPR has dramatically boosted the efficiency of genetic modification while reducing the cost by about seven times, according to Liu. "This speed, precision and comprehensiveness has never been seen before," he said. "What is exciting is that the technology has the promise of absolute precision."

Scientists could use CRISPR technology to target human cells that carry mutated genes, such as cells infected with viruses similar to HIV, Liu said. Already, the technology has been used to genetically engineer mosquitoes, proving extremely effective in combating mosquito-borne illnesses, such as malaria. Still, Liu noted the potential negative consequences from annihilating an entire species, even one harmful to humans, such as mosquitoes.

Andrew Hack, chief financial officer at biotech startup Editas Medicine, said his firm plans to use CRISPR technology to perform precise genetic modification to treat a wide variety of human diseases. For example, the company, which raised \$100 million in an initial public offering and \$120 million in a Series B round led by Bill Gates's advisor, aims through genetic research to find techniques for restoring vision for people who suffer from a form of leber congenital amaurosis (LCA), a disorder of the retina that can lead to severe visual impairment or blindness.

Editas also plans to collaborate with Juno Therapeutics, a leading biopharmaceutical company focused on re-engaging the body's immune system to combat cancer. Editas' mission is to translate its genome editing technology into a new class of drugs that enable precise molecular modification to treat a broad range of diseases at the genetic level.

Liu and Hack said that the ethical challenges posed by editing of human genes is limited to some degree

SPEAKERS:

EDISON T. LIU, M.D.

*President and CEO,
The Jackson Laboratory*

ANDREW HACK, M.D., PH.D.

Chief Financial Officer, Editas Medicine



FROM LEFT: MODERATOR GEORGE SAKELLARIS, EDISON LIU, ANDREW HACK

because such activity focuses on somatic cells that will not be passed on to future generations. Indeed, a core aim of gene editing is to treat human diseases without altering the genome, they said. Some scientists believe that current technology could also help parents who are carriers of genetic diseases to have healthy babies.

The public conversation over genetic engineering should focus on the point of view of the patient, Hack said, noting that biomedical companies are devoted to treating patients, not altering genetic fate or changing the genetic traits of future generations.

Liu said the discussion about the future of bioengineering should occur throughout society and not just among scientists. "I don't believe that with powerful tools like this, it can only rest in the hands of scientists," he said. "It has to be a societal discussion and one that has both thoughtful governance as well as controls within the system."

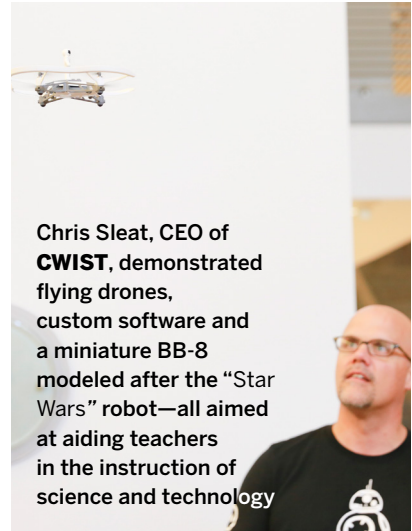
—Sheryl Zhou, Ph.D.

Equity Research Analyst

INNOVATION SHOWCASE



Representatives of **HYDROSWARM** described how “Eve,” the company’s underwater smart drone, moves independently through water, pushing back the boundaries of underwater exploration.



Chris Sleat, CEO of **CWIST**, demonstrated flying drones, custom software and a miniature BB-8 modeled after the “Star Wars” robot—all aimed at aiding teachers in the instruction of science and technology



Chris Haid demonstrated a megaphone produced by **NVBOTS**, an early-stage 3-D printing company. The “factory in a box” designed by NVBOTS printed whistles throughout the day.



Larry Grumer, CEO of **ENERGY HARVESTERS**, described the design of boots with devices in the sole that capture and store the energy expended while walking.



Tom Baran, CEO of **LUMII**, explained how his display creates lifelike, high-definition images without the use of 3-D glasses.



NOW 2016 guests immersed themselves in the audio content created by **EARPLAY**. The software enabled them to join a fictional narrative, talking to characters and influencing their actions.



At the display hosted by **VRSE.WORKS**, guests using the company's headsets and software entered an alternative reality made up of original audio and images.



A NOW 2016 guest, wearing a **MINDGRUB** headset, takes a virtual reality bike ride through a city's streets.

The Sweeping Benefits From the Shale-Oil Boom



The benefits to the U.S. from its “revolution” in shale oil production have been far-reaching. The industry generated millions of jobs in the aftermath of the Great Recession. Indeed, former Federal Reserve Chairman Ben Bernanke called the shale boom one of the biggest boosts to the U.S. economy since 2008.

Moreover, U.S. oil output nearly doubled from 2008 until 2015, and production now exceeds that of every member of OPEC except Saudi Arabia. Drastically less dependent on oil imports, the U.S. has gained diplomatic leverage in the Middle East and elsewhere. Indeed, without the surge in domestic production, the U.S. would have likely been unable to secure a deal to curb Iran’s nuclear capabilities because oil sanctions

would have failed, according to Daniel Yergin, vice chairman of IHS, a global research and information company with 9,000 employees in 33 countries.

Thanks to shale, the U.S. is now a “short-cycle producer,” and many production companies in the U.S. can ramp up or wind down output quicker than most competing sources of oil. Over time, such flexibility will help keep prices relatively low or moderate, though with a potential for volatility, Yergin predicted at the NOW 2016 conference. Major disruptions in supply could change that outlook.

Although other countries are stepping up efforts to tap energy from shale, they are unlikely in the foreseeable future to challenge the pre-eminence of North American producers, Yergin said. The U.S. holds advantages that are difficult to

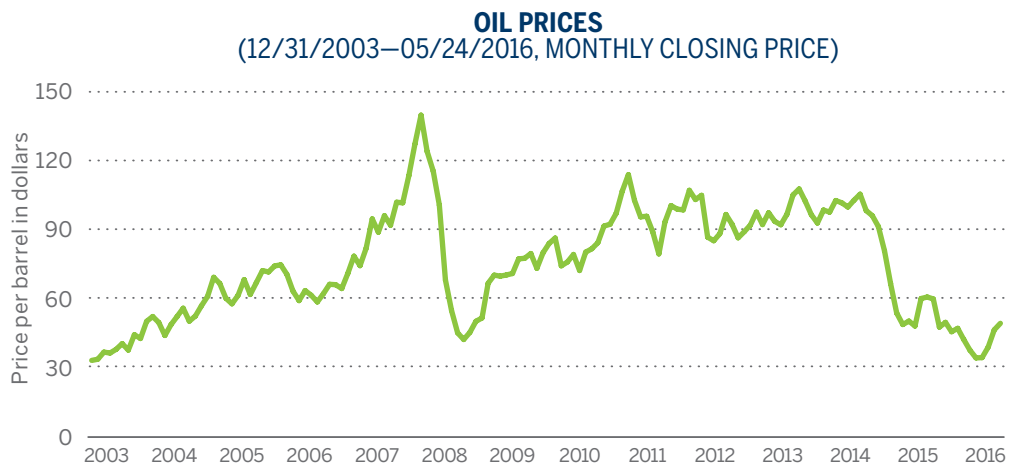
duplicate, including its approach to regulation and its laws that give landowners mineral rights, he said.

At the same time, Yergin said, producers need to pay close attention to the public’s environmental concerns, while noting that shale production is a highly regulated activity. Yergin cited a report by the Obama administration’s committee on the environmental aspects of shale—on which Yergin served—which found that the environmental aspects are generally appropriately managed.

Yergin is one of the most sought-after thought leaders on the interplay of energy, international politics and the global economy. His book—*The Prize: The Epic Quest for Oil, Money and Power*—won the Pulitzer Prize. His most recent book, *The Quest: Energy, Security and the Remaking of the Modern World*, describes the new

Off Peak

The price of oil hovered at around \$100 per barrel for several years before plunging in November 2014. In May, the price ranged from about \$45 to \$50 per barrel.



SOURCE: BLOOMBERG

SPEAKER:

DANIEL YERGIN, PH.D.

Vice Chairman and Founder, IHS Cambridge Research Associates and Pulitzer Prize winning author of The Prize and The Quest



FROM LEFT: MODERATOR ERIC GORDON, DANIEL YERGIN

geopolitics of energy, the emergence of new sources of energy and competition among nations to achieve energy security.

Even Yergin is reluctant to forecast the price of oil. Anyone tracking the oil industry needs to be prepared for “the inevitability of surprise” from forces including geopolitics, major economic shifts and technological change, he said. Still, he said, he expects to see a better balance in 2017 between oil supply and demand. Oil would need to rise to about \$60 per barrel to induce an increase in production, he said, predicting that \$100-per-barrel oil is

unlikely to be the norm. The wild card would be a major disruption of supply from exporting countries.

Oil prices peaked at \$147 per barrel in the summer of 2008. For several years, prices hovered around \$100 a barrel until the OPEC meeting in November 2014. Since then, the price of oil has fallen, hitting a low of \$26 in February 2016 before recovering in May 2016 to a range of \$45 to \$50. Lower prices have compelled U.S. producers to improve efficiency and accelerate innovation. Yergin estimated that a dollar invested in oil production

today has twice the impact of just two years ago.

While gas-powered cars are unlikely to disappear anytime soon, Yergin said he expects that public attitudes and regulation will lead to greater use of hybrid and electric-powered vehicles. Tesla has changed public perceptions of the electric car, he said, from the “egg on wheels” of the 1990s to an attractive, stylish and high-tech vehicle. With its Model 3, Tesla aims for volume, supported by the construction of its Gigafactory battery facility. Yergin noted the irony that the first lithium ion battery was developed by Exxon in 1975, when it was thought that the world was soon going to run out of oil.

At Brown Advisory, we seek to partner with innovators in the energy industry and companies that show promise of long-term success. Yergin said that pioneers behind the shale revolution showed what Walter Isaacson’s biography of Steve Jobs calls a “reality distortion effect”—a combination of focus and willpower that broke through established wisdom, skepticism and institutional obstacles. Their boldness vaulted the U.S. among the world’s top three oil producers, reducing its imports from 60% of total supply to 25%—an achievement that, a decade ago, seemed definitely out of reach.

—JJ Baylin
Private Equity Analyst

The Promise of Cars Without Drivers



Driverless cars will vastly improve what it means to be “on the road,” according to Lawrence Burns, advisor to Google on the Future of Transportation and Mobility. So-called autonomous vehicles could reduce the 1.2 million annual fatalities on world roads by 80%. Compared with current vehicles, a two-person electric “pod” could be 10 times more energy efficient and dramatically cut per-mile travel costs. Cars would also be used far more efficiently. Currently, the typical vehicle is unused about 90% of the time, logging just 15,000 miles per year compared with the 70,000-mile-per-year average use of a New York City taxi.

The radical change in mobility has five concurrent themes—connected, coordinated, shared, driverless and tailored, said Burns, citing his insights from four decades of research at General Motors and his current position as an advisor to Google. The introduction of autonomous vehicles may begin on a large scale as early as 2018, he said.

It is easy to lose sight of how far human mobility has progressed. In 1903, crossing the U.S. took 63 days. Thirteen years later, the trip took just five days. Today, Google’s autonomous vehicle has logged more than 1.5 million fully autonomous miles.

While consumer demand is fueling the growth of driverless car technology and services such as Uber, regulation is the main force behind

development of the electric car, according to Burns. The electric vehicle—including advanced electric and fuel cell drive trains—will probably become commonly used in 2020-2025, he said. The gasoline-powered engine will not be supplanted in the near term.

FAST LANE

Burns suggested that investors get in front of the driverless trend and the need to proactively manage risks. That requires an understanding of what is possible with new technology and new business models, as well as the potential hazards from computer-operated vehicles. He said businesses and investors should keep in mind a maxim—“Do unto others before others do unto you.”

Incumbent auto companies face disruption on many fronts. Companies such as Uber, Lyft and Zipcar are changing ownership needs and the use of cars. Tesla is pushing

SPEAKER:

LAWRENCE BURNS, PH.D.

Advisor to Google on the Future of Transportation and Mobility

electrification into the mainstream. Google and Apple, and suppliers such as Mobileye, Delphi and NXP Semiconductor are bringing autonomous vehicles within reach. The traditional automakers are racing to catch up. GM has built a partnership with Lyft and is making its first serious foray into mass-market electrification with the Chevy Bolt, which it rolled out before Tesla’s Model 3. At Brown Advisory, we have taken a selective approach to investing in autonomous cars, mindful of the high levels of disruption. We have invested in companies that have enabled greater technological sophistication in cars, including NXP Semiconductor, Amphenol and TE Connectivity. Meanwhile, we are looking for new winners in the transition to a digital auto, as well as the dinosaurs that fail to evolve.

—*Simon Paterson, CFA*
Equity Research Analyst



Sino-U.S. Tensions Will Persist as China Gains Strength, Osnos Predicts



Friction will probably persist in Sino-U.S. relations as China grows increasingly assertive and discards its long-standing strategy to “hide strength and bide time,” according to Evan Osnos, a China specialist and correspondent with *The New Yorker*. “We are in an era of strategic anxiety with China,” Osnos said in a NOW presentation. “It’s not at all clear what the intentions of each side is with respect to the other,” and “there will almost certainly be much more friction to come in the next few years.”

Beijing has taken a more aggressive stand beyond its borders than any time in decades, rapidly enlarging contested reefs and islands in the South China Sea for military purposes, Osnos said. Still, China does not aim to replace the U.S. overnight as the dominant global power because it recognizes the high cost of leading the world against such threats as Ebola and ISIS. Instead, China wants to rise to the status as one of several great powers in a multipolar world, Osnos said.

Washington needs to pursue a nuanced policy as it sustains beneficial contacts in trade and other fields while resisting disruptive moves by Beijing, including its buildup in the South China Sea, Osnos said. “We sometimes use a blunt instrument when we need a scalpel.”

Based in Beijing from 2005 until 2013, Osnos won the National Book Award in 2014 for *Age of Ambition*:

Chasing Fortune, Truth and Faith in the New China.

The U.S. and China should seek to avoid the “Thucydides Trap,” in which an incumbent power and newly emerging rival fail to resolve differences and eventually clash, Osnos said. Thucydides, a fifth century B.C. historian, chronicled hostilities between Sparta and Athens in *History of the Peloponnesian War*. Outright conflict has flared in 11 of the 15 cases in history in which a rising power has challenged an incumbent, Osnos said.

Growing bilateral competition coincides with an intertwining of interests in such areas as finance, trade, non-proliferation and anti-terrorism, prompting contradictions in the U.S. perception of China, according to Osnos. Americans simultaneously view China’s economy as both strong and vulnerable, while in geopolitics, they see Beijing as both a partner and an adversary, he said.

As President Xi Jinping more aggressively pursues China’s global interests, he has amassed more power in domestic politics than any other Chinese leader since Mao Zedong, Osnos said. Xi aims to avert disorder at all costs, having grievously suffered with his family at the hands of the Red Guards during the Cultural Revolution (1966-1976).

China’s president, according to Osnos, aims to overcome three challenges to stability:

Economic stagnation. China’s economy has slowed after decades of rapid growth, and public

SPEAKER:

EVAN OSNOS

Staff Writer, The New Yorker;
Author, Age of Ambition: Chasing Fortune, Truth and Faith in the New China



dissatisfaction may swell as expectations for greater prosperity go unmet. Xi recognizes that transitioning from an export- and investment-oriented economic policy toward reliance on services and consumption would likely spur growth, Osnos said.

Corruption. Xi has launched the harshest crackdown against graft in decades, mindful that crooked officials undermine the Communist Party’s credibility and the effectiveness of the government, according to Osnos.

Foreign influence. Xi sees threats to political order from new technology and Western concepts, such as individualism and democracy, Osnos said. He believes a firm hand is the best way to avert such tumult as the collapse of the Soviet bloc more than two decades ago, unrest in Tibet in 2008 and Xinjiang Province in 2009, and the Arab Spring uprisings in 2011.

Xi aims to pose a “counterargument to the allure of Western ideas” by promoting the notion of a “Chinese Dream,” in which an increasingly prosperous China becomes a dominant civilization, according to Osnos.

—*Jim Tyson*
Editor

The Importance of Understanding ‘Putin’s World’



On Feb. 27, 2014, unidentified troops, referred to as “little green men” in news reports, stormed the Crimean peninsula. Within days, the soldiers occupied the Crimean Parliament prior to a vote by lawmakers to replace the regional prime minister with a member of the Russian Unity party and hold a referendum to join Russia.

There was little doubt about the allegiance of the little green men. They appeared shortly after Ukrainian President Viktor Yanukovich, an ally of Russian President Vladimir Putin, fled to Russia and was replaced by Arseniy Yatsenyuk, a proponent of Ukrainian integration into the European Union. Although Putin’s opposition to the leadership change was predictable, his invasion of a sovereign nation and annexation of the peninsula was a shock that provoked condemnation from several nations.

Inside Russia, the story was very different. According to a poll by the All-Russian Center for Public Opinion Research, 90% of Russians supported the annexation. Putin’s approval rating surged 10% in February and March of 2014, to 71.6%. He had convinced many Russians that their country was strong and impervious to foreign condemnation. Putin also distracted the public from the flagging Russian economy. The upshot—the incursion into Ukraine was a success, at least by the rules of Putin’s world, according to Angela Stent, director of the

Center for Eurasian, Russian and East European Studies at Georgetown University.

In describing Putin’s world, Stent compared how Russians and the West hold completely different views on historical events. For instance, many Russians believe that the Soviet Union fell not because of economic decay and mismanagement, but because U.S. infiltration and espionage exploited weak leadership, Stent said at the NOW 2016 forum. For his part, Putin sees efforts by the European Union and NATO to expand economic and political cooperation as part of a campaign to isolate Russia and challenge it militarily.

Stent served in the State Department during the Clinton and Bush administrations, and has taught at the Moscow State Institute of International Relations, gaining a rich perspective on Putin and the future of his foreign policy. She likened Putin to a modern-day czar. Although the leading lights in the upper echelons of Russian society are often called oligarchs, “everything they have—it is at the pleasure of the czar,” Stent said. Political power in Russia is more centralized in one individual than at any time in the Soviet era. Putin is popular among the masses, who view him as a strong leader who will return Russia to its rightful place as a major global power. Putin’s political opponents are either disorganized or imprisoned, according to Stent.

But all is not well in Putin’s world. Russia’s economy is highly dependent

SPEAKER:

ANGELA STENT, PH.D.

Director, Center for Eurasian, Russian and East European Studies, Georgetown University



MODERATOR BERTIE THOMSON AND ANGELA STENT

on natural resources, oil being one, and is under tremendous stress because of weak commodity prices. Russia is also suffering from capital flight and brain drain. Russians with substantial intellectual or financial resources are leaving Russia or trying to exchange their rubles for other currencies. The Russian economy needs to diversify and modernize, but government constraints prevent such a growth-friendly transition. After all, capital controls and state ownership further the interests of Putin and his political allies.

The mix of an unstable economy amid apparent political stability makes Putin’s future moves difficult to ascertain. “We are dealing with a Putin who is unpredictable,” Stent said. Investors should take a very cautious approach toward Russia and monitor potential flashpoints closely, including Afghanistan, Moldova and Ukraine. The size of Russia’s economy, exceeding \$1 trillion, and its significant role in global commodity markets make understanding Putin’s world essential.

—Taylor Graff, CFA

Head of Asset Allocation Research

Misperceptions Prompt Missteps in Diplomacy Toward Arab World



The Middle East, although torn by conflict, shows long-term promise, with a proportionally large and growing population of youth that is online, tech savvy and eager to find economic opportunities. Indeed, the misperception that Arab youth are hostile militants prompts diplomatic approaches to the region that are detrimental to people both within and outside the Arab world, according to the panelists at the NOW 2016 session, “Hope Versus Fear: Winning the Hearts and Minds of Arab Youth.”

Young people across the region seek to educate themselves and to break free from schooling that is aimed at creating obedient citizens who lack skills in critical thinking, according to Nadia Oweidat, a fellow with the International Security Program at New America. Youth express their autonomy and individuality online in ways as simple as posting comments in a chat room or creating their own Facebook page, said Oweidat, who has researched the impact of social media in the region. “You cannot undo the individualism

among Arab youth,” she said. “The citizenry is completely different from what the regimes want to control.”

Arab youth have the same aspirations as their counterparts in the West—a job, marriage and family, according to Rami Khouri, director of the Issam Fares Institute for Public Policy and International Affairs at the American University of Beirut. Yet most countries in the region lack the political and social structures that can help youth reach their goals. Consequently, the younger population has splintered—a small number of terrorists make up one extreme, and a small number of entrepreneurs pursue their ambitions on the other extreme. In the middle, youth seek to emigrate, or they create parallel lives on the Internet or through social life at a mall, according to Khouri. Among some youth, the United Arab Emirates has become a magnet for entrepreneurs and venture capitalists, thanks to a legal system that protects private property, according to Chris Schroeder, an investor and author of *Startup Rising: The Entrepreneurial Revolution Remaking the Middle East*.

Still, the region is hamstrung by oligarchies that for years have counted on the support of foreign powers, Khouri said. The rulers tolerate initiatives such as literacy programs or entrepreneurship while tightly controlling access to political and economic

SPEAKERS:

RAMI KHOURI

Director, Issam Fares Institute for Public Policy and International Affairs, American University of Beirut

NADIA OWEIDAT, PH.D.

Smith Richardson Fellow, International Security Program, New America

CHRISTOPHER SCHROEDER

Author, Startup Rising: The Entrepreneurial Revolution Remaking the Middle East

power. With roughly 40% of the region’s workforce employed in the gray-market economy, tens of millions of citizens are stuck at a subsistence level with little hope of advancement. The region needs political reform and economic policies that spur job creation and productivity, according to Khouri.

The U.S. and other foreign powers need to recognize that the region can be most effectively influenced through so-called soft power rather than through military action, Khouri said. Washington should advocate that the rule of law apply to all the parties in a dispute, leveraging the fact that many people in the region admire U.S. ideals, he added.

While acknowledging challenges across the Arab world, Khouri said he sees reason for optimism in the Vision 2030 announcement in April by Saudi Arabia’s Deputy Crown Prince Mohammed bin Salman. The package of economic and social policies was presented as a way to free the kingdom from dependence on oil exports. Yet, according to Khouri, the plan is also a tacit indication that the government knows it can no longer expect to have the same degree of power over people’s lives.

—Priyanka Agnihotri, CFA
Equity Research Analyst



FROM LEFT: MODERATOR MICK DILLON, RAMI KHOURI, CHRISTOPHER SCHROEDER, NADIA OWEIDAT

Low College Graduation Rate Compounds Costs of Student Debt



The payoff from higher education is clear—college graduates generate 65% more in lifetime earnings than people with only a high school diploma. Their advantage has more than doubled since the 1980s, largely because innovation has increased demand for highly skilled workers. Still, such gains require a large upfront investment that for decades has increased faster than inflation. This rising cost of a college diploma has helped fuel the growth in student debt.

to \$10,000 per year, achieve an average graduation rate of just 9%, largely because of the composition of the community college population. Many students are adult learners, transfer students or they are enrolled under an ESOL (English for Speakers of Other Languages) program. The comparatively high student-to-advisor ratio also elevates the dropout rate, according to Philip Bronner, CEO of American Honors.

In contrast, private colleges charge as much as \$60,000 per year but achieve an average graduation rate of 59%. Catharine Bond Hill, president of Vassar College, said her institution annually spends about \$80,000 per student, exceeding the college's tuition of \$52,000. The college fills the gap to meet its commitment to a low student-teacher ratio and to maintain well-regarded faculty and staff. Vassar's graduation rate is around 90%.

U.S. college dropout rates are elevated in part because lenders and colleges do not accurately determine the probability of graduation among student borrowers. Colleges receive payment from lenders regardless of the success rate among students,

SPEAKERS:

PHILIP BRONNER

CEO and Co-Founder, American Honors

RAJ DATE

*Managing Partner, Fenway Summer;
Former Deputy Director, Consumer
Financial Protection Bureau*

CATHARINE BOND HILL, PH.D.

President, Vassar College

according to Raj Date, managing partner at Fenway Summer. With both lenders and schools paying insufficient attention to graduation rates, debt will probably persist as a significant challenge for many students, Date said. The fact that student loans are not forgiven in the event of bankruptcy makes the burden especially onerous.

If graduation rates remain low and college costs continue to rise, students and their families will have to become more selective. During the next 20 years, some 500 to 1,000 of the 4,500 colleges and universities in the U.S. will probably consolidate or close down.

Restricting student loans is not a reasonable way to push up graduation rates and reduce costs, Hill said. Such a move would put students from lower-income groups at a disadvantage. Instead, institutions could increase affordability by providing online courses. Also, educators should shift the incentive structure to ensure that students, lenders and institutions are accountable for their choices. Promoting responsible decision-making would curb debt, improve graduation rates and ensure that more students graduate onto a path toward prosperity.

—James Stierhoff
Research Analyst



FROM LEFT: MODERATOR KEVIN O'KEEFE, PHILIP BRONNER, RAJ DATE, CATHARINE BOND HILL

While the burden of such borrowing is widely known, low graduation rates make the debt especially ill-advised, according to the speakers at the NOW 2016 panel titled, "The Future of College: Is It Worth the Money?" For example, community colleges, while charging a student just \$6,000

China Plays Vital Role in Global Campaign to Halt Climate Change



A change in climate caused by a buildup in greenhouse gases may bring a host of afflictions, including a reduction in crop yields and mass migration of people in several regions, according to the speakers in the NOW session titled, “The Reality of Climate Change: Impacts on Health, Food, Water and National Security.” Disruptive events triggered by climate change in countries with weak governments, fragile economies and crude infrastructure could lead to political instability and a reduction in worldwide trade, according to Sharon Burke, a senior advisor at New America. Global economic growth would slow, harming industrialized as well as developing countries.

China holds an especially central role in global warming and efforts at regulating greenhouse gases, both

at the domestic and international level, according to Kate Gordon, the vice chair of climate and sustainable urbanization at the Paulson Institute. The country’s regulatory weaknesses and counterproductive business incentives are slowing efforts outlined by China’s government to limit climate change, she said.

Beijing is currently focused on shifting the world’s No. 2 economy to be based on services and consumption rather than on industrial manufacturing and government investment. As China’s steel production declines, such industrial output may shift to emerging economies with weaker environmental regulation, Gordon said. Indeed, China’s steel output increased during the 1980s amid a decline in U.S. coal and steel production stemming in part from tougher regulation. In other words, in the absence of effective global measures

SPEAKERS:

SHARON BURKE

Senior Advisor, International Security Program and Resource Security Program, New America

KATE GORDON

Vice Chair, Climate and Sustainable Urbanization, Paulson Institute

MARK TERCEK

President and CEO, The Nature Conservancy

to limit climate change, China’s reductions in greenhouse gases could lead to increases elsewhere.

That said, there are many reasons to be guardedly optimistic that the world may begin to curb climate change, according to Mark Tercek, president and CEO of the Nature Conservancy. This progress was evident in diplomacy leading up to an agreement by 195 countries in December to take steps limiting climate changes. Under the pact, signed in Paris, the signatories pledged to reduce reliance on fossil fuels in favor of more sustainable technologies such as wind and solar power.

The campaign against climate change should move forward simultaneously across many fronts. Stepped-up research into energy-efficient batteries could help realize the goal of sustainable transportation, Gordon said.

Tercek, while stressing the importance of protecting biodiversity and promoting sustainability in urban areas, said he sees reasons to be “cautiously encouraged about the likelihood that humanity is going to finally get its act together” and begin to slow the growth in greenhouse gas emissions.

—Emily Dwyer
Equity Research Analyst



FROM LEFT: MODERATOR DUNE THORNE, MARK TERCEK, KATE GORDON, SHARON BURKE

OFFICE LOCATIONS

BALTIMORE

(410) 537-5400
(800) 645-3923

BOSTON

(617) 717-6370

CHAPEL HILL, NC

(919) 913-3800

LONDON

+44 203-301-8130

NEW YORK

(212) 871-8500

WASHINGTON

(240) 200-3300
(866) 838-6400

WILMINGTON, DE

(302) 351-7600

brownadvisory.com

brownadvisory@brownadvisory.com

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