ALBERT DORMAN HONORS COLLEGE

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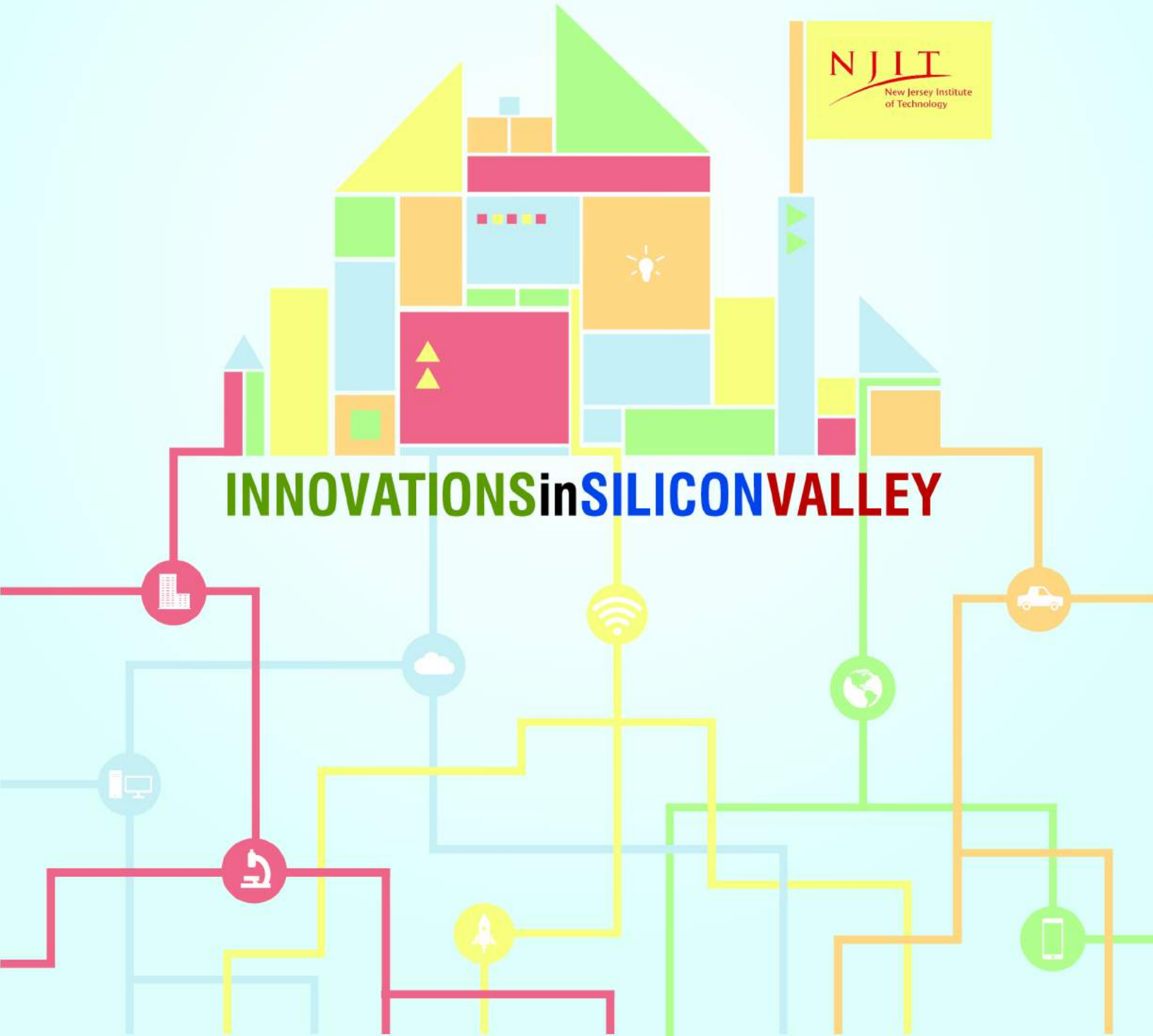

INNOVATIONS in SILICON VALLEY

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ALBERT DORMAN HONORS COLLEGE

Last year, the Albert Dorman Honors College celebrated its 20th anniversary. Named for Dr. Albert Dorman, the only person to have been voted both a Fellow of the American Institute of Architects and an honorary member of the American Society of Civil Engineers, the Albert Dorman Honors College attracts top-performing students from New Jersey and across the country.

The Albert Dorman Honors College provides a uniquely rich and challenging educational experience to its students and prepares them to be tomorrow's global leaders, problem solvers, and innovators who are recognized for their integrity, professional excellence, passion and compassion, and service to the community. Students participate in individualized curriculum rich in Honors courses, colloquia, study tours, dual degree paths, and study abroad opportunities. What will your path be?

LETTER *from* the Editors

Dear Reader,

Silicon Valley is home to hundreds of start-up tech companies as well as prominent technology giants such as Google, Apple, and Facebook. In this unique southern San Francisco Bay environment, there are always new ideas being pitched, prototypes being developed, and products being brought to market.

We are thrilled to bring you the 2016-2017 issue of the *Technology Observer*. Our theme this year, *Innovations in Silicon Valley*, discusses the ongoing projects happening in this technological hub, while providing a closer look into the novel ideas that are making huge waves in The Valley. Fueled by the desire to work on the frontlines of technology and innovation, these products not only introduce new and efficient ideas but also address issues we face as a society, such as growing environmental concerns and the need for sustainability.

We would like to thank Dr. Collins, Associate Director for Writing, Communications, and Outreach, for her support, guidance, and countless hours in bringing this issue to fruition. We would also like to express our gratitude to Dean Passerini and the Albert Dorman Honors College. And as always, this issue of the *Technology Observer* would not have been possible without our team of dedicated editors, writers, and designers.

We hope you enjoy reading this issue of the *Technology Observer* as much as we enjoyed creating it.

Sincerely,

Kevin Barretto

Mohammad Nawaz

Editors-in-Chief

LETTER *from the* Dean

Dear Reader,

In this 15th edition of the Technology Observer,
the students selected an important and timely theme: **innovation**. In particular, they centered on innovation emerging from Silicon Valley, the cradle of new ideas and entrepreneurial opportunities. And while many of the innovations described in this issue are connected to the Bay Area (read the article on Kiip's new advertising strategies; Google's Project Ara and Autonomous Car; and the green initiative to build a roof garden over a shopping mall in Cupertino), we quickly reflect on the fact that innovation '*has gone global.*' Many other locations are recreating Silicon Valley's eco-system that brings together a combination of good research universities, access to talent, access to capital (and incredibly attractive weather and an enviable lifestyle, one could say). The article on China's Silicon Valley – Shenzhen – shows examples of other successful combinations of human capital, financial capital and great infrastructure.

These examples remind us of the role that **location** still plays in innovation. Critics would say that this notion of "innovation clusters" was already explained in *The Competitive Advantage of Nations* by Harvard's Michael Porter. If we consider what is happening in NYC around Roosevelt Island, we see that choosing the right location is essential for success. The Cornell Tech Project (a partnership between Cornell University and Technion – Israel Institute of Technology) shows that major research institutions are relocating to central hubs of talent and financial access. They are building ambitious vertical infrastructure that promises to be sustainable and use only the energy it produces.

However, in a somewhat **contradictory** way, at the same time that we celebrate the importance of a good location, we look at business models that are agnostic to location boundaries and extend global and distributed reach that enables an invention built on a specific local need (finding cheap

housing while travelling) to be replicated in any other region of the world. When we read about the Airbnb model in this issue, we are reminded that successful companies are also a product of **digital networks**, and such networks can be located anywhere. The Uber driver can be in any suburban city, yet connected to anyone who has a GPS on a cell phone; your next vacation could be in a remote area you would not know about had the landlord not been able to connect to the network of information available over the Internet. So, do we need more real (and expensive) physical spaces or can we be successful with digital and intangible places? Is the real world an essential condition for success in the virtual world? If we did not build Silicon Valley, Shenzen, Cornell Tech and many other such physical spaces, would we be able to transact and thrive in the digital space?

The articles on virtual reality (VR) growth and the new biological studies on the brain and blood seem to give us an ambiguous answer: despite all of the advances in virtual reality, neurodegenerative inhibitors, and microfluidic blood tests, we are still limited by physical constraints. We use VR to expand our capacity, to simulate the "real" experience, but we still suffer from imperfect realizations. We try to slow time down by looking for cures to prevent **brain decay** (a by-product of aging), and we try to get faster and better results with minimally invasive, **microfluidic blood tests** (such as those developed by Theranos), but we are only beginning to see successes. We explore the transmission of electricity to make cheap power accessible to all, and we continue our goal of providing **ubiquitous energy** by pushing the boundaries of traditional photovoltaics, but costs are still prohibitive. Finally, we continue to reach for the stars with **reusable spacecraft** like the SpaceX Dragon Fleet, while we remain rooted to the ground. Our **quest** towards innovation is commendable, as is our focus on **sustainability**, yet all of these technologies are still years away from being available to all. I hope you will read this issue on innovation with joyful disbelief at how far we have come and caution about where we are going.

Katia Passerini

Dean, Albert Dorman Honors College, 2013-2016.

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Shenzhen:
China's Silicon Valley

Rutmi Goradia

Everyone knows what Silicon Valley is, right? It's that place where all the engineers and technology companies are. It's somewhere out in California.

Well yes, Silicon Valley is indeed the name for the southern portion of the San Francisco Bay Area in California. And yes, Silicon Valley is home to many of the largest high-tech corporations and startups in the nation, if not in the world. It is commonly referred to as the "Technology Hub of the United States," and has become a household name for the number of innovative companies it introduces and products it manufactures.

However, it no longer suffices to say that the American Silicon Valley is one of a kind. The concept of an entire region being devoted solely to technological advancement and innovation is one that is gaining popularity overseas. One particular example of the spread of "the Silicon Valley concept" is the city of Shenzhen in the People's Republic of China. In recent times, Shenzhen – home to companies such as Lenovo, a multinational computer technology company, and ZTE, a major phone company[4] – has been referred to as the "Silicon Valley of Hardware" and even "China's Silicon Valley".

Shenzhen was not always a budding tech-savvy city; just about 30 years ago it was a small fishing village on the Hong Kong-China border. Economic reforms in the area led to a rapid increase in population and in the industrialization of Shenzhen. This industrialization has been capitalized on by many U.S. startups that have transferred facilities and work to Shenzhen; one such example is Cue, a California-based startup that has developed a home health tracking system. Now, the city has left behind its seagoing history to become the "heartbeat behind much of the world's tech hardware industry."[3]

There are many reasons why startups today are opting out of setting down roots in the original Silicon Valley and are, instead, heading overseas. One reason is that Shenzhen provides a "vast, cheap, and skilled workforce, as well as easy access to materials and the infrastructure to distribute" products.[2] The city is home to Huaqiang Electronics World, a massive components emporium, giving manufacturers excellent accessibility to the materials they need to make physical prototypes and products. Shenzhen also provides a unique manufacturing system, in which the process of manufacturing is overseen by industrial engineers (engineers who increase the efficiency and cost-effectiveness of manufacturing processes) who

have years of experience with the tools that are being used in Shenzhen's labs and factories. Benjamin Joffe, a general partner and mentor with Haxlr8r (a startup that manufactures hardware accelerators and was one of the first to move to Shenzen), comments, "You have engineers in factories here, and when you show them a product or prototype they can already see how many molds you need, how much it's going to cost, which parts are going to be a problem, and how you should modify it."[2]

Executives of other startups that have taken their talents to Shenzhen have agreed on the ease of producing goods overseas as compared to at home. Will Canine – co-founder of OpenTrons, a company building an open-source liquid-handling robot in Shenzhen, commented that the ease of manufacturing goods in Shenzhen appeals to the creativity of the engineers behind the designs: the environment and ecosystem of manufacturing allows for a "dynamic flow" from the production of one idea to the next that is possible in Shenzhen, but not in the United States.[2]

However, it is important to keep in mind that the strengths of Shenzhen and Silicon Valley lie on two opposite ends of the engineering spectrum. For instance, Shenzhen is the place to be for hardware and manufacturing, but Silicon Valley is still the top dog when it comes to software engineering and entrepreneurship.

There is significant skepticism regarding whether or not Shenzhen could ever reach the level of entrepreneurial success and innovation that Silicon Valley has. Hardware entrepreneurs say that real entrepreneurship cannot flourish in China because, while the country is economically evolving, it lacks the ability to protect companies from intellectual property theft, known in China as "shanzhai"[1]. Shanzhai refers to the Chinese concept of piracy and production of imitation goods. It is especially rampant in China, encompassing imitation hotels like the Haiyatt (the Chinese imitation of the American Hyatt), corner Apple stores selling fake Apple products, copycat phones, digital cameras, and more. While shanzhai poses a major threat to the Chinese economy, it also discourages entrepreneurs from moving their businesses overseas to a place where their ideas can easily be usurped.

For all its faults and strengths, Shenzhen, at the very least, has proven to be a promising technological hub, a real home for the hardware connoisseurs of this day and age. Its popularity and success seem to be on an upward trend with no indication of slowing down. Shenzhen is definitely living up to its nickname of "China's Silicon Valley," but whether or not it will surpass the success and innovation of the original Silicon Valley, the world will just have to wait and see. ●

#OWNTHEMOMENT

Kiip, the Mobile Reward Network

Sahitya Allam

As mobile devices become cheaper and more accessible, the advertisements that accompany games and apps on these devices have become increasingly intrusive. Almost everyone with a mobile phone can relate to using an app and having an advertisement pop up on the screen, attempting to convince the user to make a purchase or download a game. Most people are simply annoyed by these ads and block them, paying little attention to the ads despite companies' best efforts to make them attractive to potential consumers. Companies often pay substantial amounts of money for ad space, so this method of advertising to potential customers is inefficient and causes companies to lose revenue. Brian Wong, a savvy young entrepreneur who graduated from college at the age of 18, claims he has the solution to convince more mobile app users to engage with ads: do not try to cajole the users into clicking on ads; instead, reward them for clicking on the advertisement at just the right moment.[1]

Brian Wong's mobile game and app ad network, Kiip, rewards mobile phone users more, the further they get inside mobile games.[1] According to Wong's description of his business model in a Business Insider interview, Kiip's advertisement banners appear in a mobile game once a user completes a level.[1] Kiip banners can be featured on games – Angry Birds and Candy Crush for example – as well as regular applications such as the MapMyFitness app. Different banners appear at specific points in the game to provide rewards that are intended to be relevant to the user, and these banners are purchased by companies as ad space.[1]

Kiip boasts big-name, multinational clients such as Pepsi, Best Buy, Carl's Jr., PopChips, and Disney.[1] These companies use the ad space to advertise their products to a user.

Brian Wong

The advertisements are meant to satisfy a need or desire of a user by providing free products or discounts - anything that would be valued by a user and convince him or her to click on the banner. If the product is relevant to the user at that point in time in the mobile game, it is more likely that the user will click on the banner and will accept the offer. In addition, the company receives user information that it can utilize for future marketing purposes.[1]

What is truly unique about this business model is not the concept of bribing people with free products and discounts, but the idea of giving people exactly what they most desire or need at the appropriate time. For example, in the MapMyFitness app, the Kiip banner allowed the company Pepsi to offer users a free bottle of Propel, a popular sports drink, for every eight miles run by the user.[1] It is no surprise that someone who has run eight miles is dehydrated

and needs a refreshing drink, making it likely that he or she will accept a coupon for a free Propel drink. Score one for Pepsi: it just marketed one of its drinks to a consumer who needed it at that moment. That person also may be more likely to buy Pepsi drinks in the future because he or she has been exposed repeatedly to advertisements from Pepsi through the Kiip app. Moreover, there is an added benefit for Kiip – Wong envisions that consumers may eventually respond to the free product samples by only playing games and using apps that contain Kiip-enabled rewards.[1] Wong reasons that, because humans are inclined to hoard basic items (such as food and clothing) that are essential to our survival, in the age of smartphones it is not a far leap in logic to assume we would also gravitate toward mobile applications that reward us with free items, especially those we find valuable.[1]

Wong founded Kiip soon after he graduated from college in 2010 and the company has done extremely well in that 5-year span.[2] Kiip has thus far raised more than $20 million from venture capital firms and brings in eight-figure revenues.[2] Its 85-person firm in San Francisco is made up of mostly software engineers.[2] Recently, Kiip has also claimed that it raised an undisclosed amount of strategic funding from Verizon Ventures, a company providing targeted resources to up and coming entrepreneurs, and from Michael Lazerow, co-founder of Buddy Media, the leading social media publishing platform used to drive brand engagement. Kiip's monumental success has allowed it to facilitate better advertising on the part of companies as well as extend its services to more apps on both Android and Apple platforms.[3] As of November 2014, the company announced that it would also be offering a loyalty platform to brands that want to utilize Kiip for their own apps, instead of purchasing ad space on another company's game.[3] This means that companies can continue to engage with people who already use their apps and have complete control over the rewards, rather than competing with other advertisers that are also using Kiip banners on the same app or game. "We took the moment concept for advertising, and now we're using the same moments for the purposes of retaining loyalty

with the existing customer," Wong said of the launch of his new loyalty platform.[3]

By offering a company full control of its rewards on all of its native apps and third-party networks, the company can provide highly contextualized rewards that promote both convenience for the consumer and brand loyalty to that company. For example, with a Kiip advertisement platform on its own mobile application, an airline can provide a free lounge pass to a passenger who checks a delayed flight status on its app. Additionally, on Twitter, a third-party social media platform, that same airline can reward a traveler who tweeted about his trip with the airline a free meal or beverage, routing the user back to its own app. The airline can also take advantage of Kiip's vast network of over 3000+ mobile apps, distributing its rewards across these distant third-party apps to gain more customers.[4]

Where is Kiip headed with its novel business plan? If its revenue figures and consumer engagement rates are any indication, Kiip is thriving and fulfilling its mission of targeting the right user with the right reward at the right moment. These figures are capturing the attention of other companies that want to emulate Kiip's "servicing the moment" philosophy. For instance, Google recently launched its Micro Moments program, which claims to "address [consumer] needs with real-time relevance."[5] Despite the new competition, especially from a Silicon Valley giant such as Google, Kiip has remained at the forefront of the mobile reward network. With the implementation of more novel ways to maintain consumer engagement and establish brand loyalty, Kiip may continue to retain its competitive advantage.

Autonomous Cars

Independently Steering Technology into the Future

John Palmieri

Do you despise driving? Fret not, because several companies including Tesla, Uber, Google, and Apple are actively involved in research regarding self-driving cars that can safely and efficiently transport passengers to their destinations without a driver. Recent technological developments in the field of autonomous vehicles indicate that self-driving cars could be the next revolutionary invention that improves the safety and convenience of transportation. [1]

"...safety and convenience of transportation."

Autonomous cars generally involve three different systems. The first built-in system involves concrete data and technology that is vital to the routine functioning of the vehicle. This includes a GPS system that provides general driving instructions to the vehicle based on its position. Because this system does not change dramatically on a daily basis, it is a static element of the autonomous system. In contrast, the second built-in system is an interactive entity that can respond efficiently to environmental factors. This dynamic system includes elements such as sensors, cameras, radar, and motion detectors that allow the vehicle to safely respond to changes in its surroundings. Motion detectors and radar incorporate spatial information into the processing center of the autonomous vehicle, reducing the risk of collision. Additionally, cameras provide the car with visual information such as the presence of important street signs, while sensors can detect the color of nearby stoplights or detect vibrations in the form of speed bumps, potholes, or other hazardous road conditions. Furthermore, Wi-Fi can be integrated into the autonomous vehicles so that they can communicate with one another to further reduce the risk of car accidents. [2] [3]

"...the input sensors...are... making the vital driving decisions..."

The third built-in system is vital to the performance of the autonomous vehicle. The controller area network (CAN) is the fundamental element that analyzes input signals from the autonomous car's many sensors and performs the appropriate output action based on this input information. The CAN gathers information from the interactive elements and the static systems (such as the GPS system) of the autonomous car in order to make a decision regarding how it should respond to stimuli. For example, the presence of a pothole or a speed bump will provide input to the CAN system, which will adjust the state of the vehicle by slowing the car down accordingly. Furthermore, the GPS system can provide the CAN with positioning information so that the car can speed up or slow down based on the local

"...financially beneficial to many companies..."

speed limit in the area. All the typical functions of an ordinary car can be integrated into an autonomous vehicle. However, the key difference is that an autonomous vehicle requires minimal user involvement since the input sensors and CAN system are operating the car and making the vital driving decisions that will ultimately determine the fate of the driver. [3]

Because they require minimal human involvement, autonomous cars may prove to be financially beneficial to many companies. Instead of hiring drivers to transport raw materials and products to their destinations, businesses could simply utilize an autonomous vehicle to safely and effectively perform the task. Although many drivers will lose their jobs, especially those who drive taxis and trucks for a living, having a cheaper and safer method of shipping will provide numerous opportunities for companies to expand. Hopefully, there will be a balance between the loss of jobs resulting from the substitution effect and the increase in jobs due to the increased efficiency of the novel technology. Despite the initial predicted increase in unemployment, the economy will adjust to the transient economic recession and we will be living in a more advanced and convenient future.

Additionally, the armed services can employ autonomous vehicles to ship supplies effectively to troops. By improving the accuracy and speed of emergency shipments, dire situations can be dealt with expediently and proper medications can be administered to soldiers in due time. Public transportation is another sector that could significantly profit from the development of an autonomous car. The availability and efficiency of autonomous taxis can make commuting simpler and more convenient, especially in densely populated urban areas.

As with all new technologies, it is important to understand the negative consequences and ethical issues that may arise from the implementation of the innovation. Putting a large vehicle in the hands of a computer program will have dire consequences if a hacker gains control over it in a terrorist attack. Furthermore, hacking vehicles could become a major form of criminal activity that will put a large number of innocent people at risk. With new technology, new methods of conducting criminal activity unfortunately arise as well.

In addition to revolutionizing how we perceive the modern world, new technologies such as the autonomous car can create many unexpected moral dilemmas.[4] When one solution leads to multiple new issues and moral dilemmas, the whole process of innovation begins to seem fruitless. However, technological progress is always a risk that we must take as innovative thinkers in order to improve the world and contribute to a purpose much larger than ourselves. Though we appear to be trapped in an ironic cycle in which our solutions create even more problems, through this cycle we develop into civic-minded individuals who are always willing to tackle ethical and societal issues with passion and dedication.

Silicon Valley:

Future Home of the World's Largest Roof Garden

Timothy Charles

When one thinks of Silicon Valley, the development of new, cutting-edge technological innovations including autonomous cars, drones and creatively designed robotics all come to mind. However, the residents of this technologically rich area are also focusing on improving the natural environment. The company Sand Hill has a reputation for being one of the successful real estate investment companies in Silicon Valley. [1] Currently, they have initiated plans to remodel and create the world's largest green roof on top of the Vallco Shopping Mall located in Cupertino, California, at the heart of Silicon Valley. The purpose of this $3 billion dollar project, called "The Hills at Vallco," is to revive the suburban Silicon Valley area and foster a sense of community. [2]

During the process of redesigning the Vallco Shopping Mall, the developer, Reed Moulds, valued community feedback; this project is based on the input of thousands of Cupertino residents. [2] The architect, Rafael Viñoly, was interested in working on the project to provide a family friendly area the community could enjoy. [3] "The Hills at Vallco" project is intended to make Cupertino a safer neighborhood, and increase the town's environmental sustainability. [2]

The renovated mall will contain many improvements and new developments including a roof garden. The roof garden will include vineyards, organic gardens, and roughly four miles of jogging and walking trails. There will be designated play areas for children and a refuge for native species of birds and plants within the roof garden. Along with these benefits, the new shopping center beneath the green roof will have a fitness center, banquet halls, and an ice skating rink. [2]

One of the main goals of "The Hills at Vallco" project is to improve local schools. The property company, Sand Hill, has been responsible for the development of many of Silicon Valley's communities. [1] They are currently leading the renovation of "The Hills at Vallco," and have announced that they will contribute $40 million worth of amenities and funding to the Cupertino School District and the Fremont Union High School District. [2] These funds will assist in the creation of a new, 700-student elementary school outside of "The

Hills at Vallco" at the former Nan Allen school site.[2] The elementary school will replace modular classrooms (portable classrooms) with permanent classrooms and expand recreation fields. New permanent classrooms will benefit the community by fostering a sense of unity among the teachers, students, and families of the new elementary school.

High school students will have access to a new 10,000-square-foot Innovation Center inside "The Hills at Vallco."[2] The purpose of the Innovation Center is to nurture the growth and creative endeavors of student-led businesses.

"The purpose of the Innovation Center is to nurture the growth and creative endeavors of student-led businesses."

Other benefits of the Innovation Center include improving the district's work-based learning initiatives, allowing students the opportunity to build projects, and hosting robotic competitions. [2]These features will enhance students' interests in entering STEM (science, technology, engineering and mathematics) fields after graduation.

Increasing environmental sustainability is another goal for the world's new largest green roof. "The Hills at Vallco" will attempt to obtain LEED Platinum certification. LEED stands for Leadership in Energy & Environmental Design. According to the online data center Tech Target, LEED is an ecology-oriented building certification program run under the auspices of the U.S. Green Building Council.[4] LEED concentrates its efforts on improving performance across five key areas of environmental and human health: energy efficiency, indoor environmental quality, materials selection, sustainable site development, and water savings.[4] One of the main advantages of LEED certification is that it saves money and resources in buildings because of the energy efficiency and water savings. It will also have a positive impact on the health of Cupertino's residents.

LEED Platinum Certification will also benefit Cupertino by encouraging the recycling of water for irrigation, heating and cooling systems. The new sustainable park located on the rooftop will feature native, drought-tolerant and climate-responsive landscaping that thrives on little to no water.[2] Rainwater will also be recaptured by the new landscaping system which will allow a reduction in water consumption.

The designs for the entire "Hills at Vallco" shopping center are currently going through a review period and will not be approved by the City of Cupertino until late 2016. The developers of "The Hills at Vallco" hope that this project will act as a catalyst that encourages other communities to undertake an organic redesigning process of their older malls. [2] The new roof garden will elevate the quality of Cupertino community life and encourage Cupertino residents to live healthy lifestyles. "The Hills at Vallco" will embrace diversity by providing a venue for family-friendly cultural events, will provide new innovations to the Cupertino School District, and will benefit the natural Cupertino environment.

SpaceX Dragon Fleet Takes Flight

Julienne Viuya

Space travel has always been a core element in science-fiction films. The Star Wars Trilogy has given humankind a glimpse of how interesting it is to engage a hyperdrive and travel to deep space in the span of a few seconds. Now, SpaceX is getting Star Wars fans a little closer to achieving their space dreams.

Although hyperdrives are not yet available in today's time, SpaceX's goal is to provide commercial space flights to consumers, bringing people to and from destinations outside Earth's orbit. SpaceX was founded in 2002 by Elon Musk. It is a private company that seeks to "revolutionize space technology with the ultimate goal of enabling people to live on other planets."[1] Currently, space travel's chief purpose is to enhance scientific knowledge, but it is limited to a select few individuals. With the "Dragon Fleet" consisting of Dragon, Crew Dragon, and Dragon Version 2, SpaceX will revolutionize space travel as a commercial service to people looking to witness the wonders of outer space.

The original spacecraft of the Dragon Fleet is the Dragon Spacecraft. Although it was initially intended to carry people to orbiting destinations, Dragon made history when it served as a payload container to the International Space Station.[10] A payload container is the area used for cargo in a ship or, in this case, a spacecraft. After the spacecraft successfully attached to the International Space Station, Sunita Williams of NASA noted: "Looks like we've tamed the Dragon."[10] This was a historical moment because, in 2012, the Dragon was the only commercial spacecraft able to provide this service to the International Space Station. Additionally, Dragon is the only type of spacecraft currently capable of carrying significant amounts of cargo back to Earth. This advanced spacecraft consists of five main functioning components: the pressurized internal section, the Draco thrusters, the navigation control, the PICA-X heat shield, and the trunk. The pressurized section, or the "capsule," is designed for both cargo and astronauts. When the Dragon is launched, the capsule has a payload mass of 6,000 kilograms and a volume of 25 cubic meters. Upon returning, its mass is reduced to 3,000 kilograms and its volume to 11 cubic meters.[5] The Draco thrusters (aptly named with the Latin name for dragon) are the rockets that allow the Dragon to move through the vacuum of space. On each Dragon, there are 18 Draco thrusters. The Draco thrusters are powered by two chemical compounds, nitrogen tetroxide (N_2O_4) and monomethyl hydrazine (MMH), producing 90 pounds of thrust per thruster. The reaction of N_2O_4 and MMH is one of the most commonly used chemical reactions for space propulsion.[2] It is comparable to the combustion of gasoline in a car to move it forward; however, this reaction creates a much greater amount of force.

To allow for navigation through space, the Dragon has an advanced Guidance, Navigation and Control system (GNC). This system operates on "optical sensors, laser-based

range sensors, and inertial sensors,"[6] because having multiple sensors permits more reliable navigation. To keep all these internal components intact and functioning properly, the Dragon has a heat shield known as the PICA-X. NASA provided SpaceX with technical knowledge and expertise of their Phenolic Impregnated Carbon Ablator (PICA) shield so that SpaceX could develop their own shield using the NASA technology.[9] The PICA-X is designed with low density material so that it does not weigh down the spacecraft, and is "slightly more dense than balsa wood,"[8] a lightweight type of wood commonly used for kites and model aircrafts. Upon reentry into Earth's atmosphere, the outside of the spacecraft reaches temperatures of more than 3,000 degrees Fahrenheit, so that without the PICA-X shield, the Dragon would burn up.[9] The shield is made to withstand multiple uses and is designed to sustain even the heat of entering the atmosphere of Mars. One of the most important components of the Dragon is the trunk, which holds cargo that does not require pressurization. Its payload volume is 14 cubic meters.[5] The Dragon in all its complexities continues to astound the space exploration community.

Under a recent contract with NASA, SpaceX is introducing improvements to the Dragon in order to carry crew and cargo comfortably during missions. This overhauled spacecraft will be named "Crew Dragon." It is designed to be a luxury vehicle for up to four passengers, each with their own window and a full view of the Earth, the Moon, and a glimpse of the solar system. The Crew Dragon is designed to be user-friendly with large monitors providing real-time information during the flight, like those found in an airplane. Passengers are even given the option to adjust the spacecraft's interior temperatures through the Environmental Control and Life Support System (ECLSS), providing passengers with the same luxury as in a high-tech automobile. This is comparable to the advanced technology in cars of Elon Musk's other company, Tesla, which allow a spectrum of control far beyond that of a normal automobile. The spacecraft has an emergency escape system to ensure safety in any unfortunate occurrences. The entire ship is autonomous and will be completely controlled by mission control in the headquarters of SpaceX in California.[3] With the promise of commercial flight, SpaceX is sure to take off with this generation of space adventurists.

The newest member of the Dragon Fleet is the Dragon Version 2, "SpaceX's next generation manned spacecraft."[7] The Dragon V2 was unveiled back in 2014; it is capable of carrying seven crew members. This revolutionary new spacecraft is able to land almost anywhere on our planet, refuel, relaunch, and then be used again. SpaceX comments that as long as rockets are regarded as disposable, "we will never have true access to space."[7] This spacecraft, like the Crew Dragon, is equipped with the luxurious ECLSS interior and a powerful emergency escape system. The thrusters used for the Dragon V2, the SuperDraco thrusters, are the next level up from the Dragon's Draco thrusters. The mechanism behind the eight SuperDraco thrusters is similar to that of the Dragon's original thrusters but with a more powerful force. The Dragon V2 is also equipped with a more advanced model of the heat shield. Thanks to all of these advancements from the already innovative Dragon, the Dragon V2 is successfully and consistently delivering cargo to the International Space Station.

As SpaceX and the Dragon fleet continue to grow, the science community looks forward to the day that regular trips to space will be possible. That once unattainable dream of being outside of earth's atmosphere is now real and achievable. For now space travel has been limited to astronauts and a very few others, but SpaceX is taking humanity one step closer to commercial space flight. The Dragon Fleet is only the beginning of the journey to widespread commercial space flight.

TMB

Blood tests have served as a vital tool in the utility belt of healthcare providers for over 80 years. A simple blood test can help a doctor diagnose a disease before the symptoms appear or correct metabolic imbalances that would otherwise go unnoticed. There is no doubt that blood testing is already an incredible technology that has saved countless lives, but the process is not free from problems. Blood tests demand that the patient undergo an uncomfortable process involving intimidating needles. The current method of blood testing also requires the patient to give up approximately 5 ml of blood for each test.

Certain tests require completely independent blood samples; for example, five test requests from the doctor may require drawing five separate vials of blood. Traditional blood testing can also take days to render results, even when the patient may need immediate care for an ailment. Although blood testing has largely stood the test of time, there is still much room for improvement in the process, and entrepreneurs in Silicon Valley are ready to do just that.

A blood test is a process that most are familiar with: a doctor or phlebotomist uses a needle to withdraw a seemingly large amount of blood from a patient's arm, depositing it into a sterile, plastic container. After the patient leaves the clinic, his or her blood samples are taken to machines that analyze the components of the blood using a variety of chemical procedures, most of which involve adding chemicals to the blood and measuring the extent of the subsequent reaction. The results of the blood test are consolidated into a variety of metrics that present the results in a way that allows a physician to make informed clinical decisions. And while the lab technology behind the blood test has vastly improved over the past few decades, the patient experience in the clinic has remained static since the advent of blood tests in the 1930s. However, innovators in Silicon Valley are looking for ways to advance the process of blood testing by making it cheaper, faster, more accurate, and more comfortable for patients.

"...INNOVATORS IN SILICON VALLEY ARE LOOKING FOR WAYS TO ADVANCE THE PROCESS OF BLOOD TESTING..."

One startup that is poised to cause a paradigm shift in the field of laboratory testing is Theranos, a Palo Alto based company founded in 2003 by Elizabeth Holmes, a Stanford dropout. The company has been valued at 4 billion dollars, a figure that reflects the impact of the potentially revolutionary technology Theranos can bring to the market.

Theranos claims to be able to conduct over 200 commonly performed lab tests on quantities of blood that are miniscule compared to traditional blood tests. Theranos purports to have the technological capability to perform all the primary blood tests required by physicians for roughly half the cost - and deliver the results of those tests faster, using only the blood that can be obtained from a finger prick.

Theranos is a paradoxical company in many ways. For example, despite being the only one of its competitors to have the exact prices of its lab tests available on its website, Theranos has kept the exact mechanism behind its tests a secret. Theranos has hidden its process from peer review, citing the need to keep its technology proprietary. The decision not to disclose the process behind their product for peer review in an academic journal has been met with a great deal of criticism from journalists and academics. The most detailed information about the process that Theranos uses comes directly from CEO Elizabeth Holmes, who stated that Theranos works by "optimizing the chemistry" and "leveraging software" to improve existing tests.

While Theranos has been taciturn about the exact mechanism behind its tests- and the recipient of heavy criticism for it-there are clues as to the nature of the tests from patents filed by the company in its infancy. These patents seem to indicate that Theranos most likely uses a microfluidic technique to manipulate and analyze small samples of blood. Microfluidics is defined as the "engineered manipulation of fluids at the submillimeter scale." Microfluidic technology takes advantage of how fluids behave differently when they are forced into small channels; these changes in behavior can be exploited to perform complex and precise operations on very small amounts of fluid. In this case, blood can be manipulated to analyze its composition. Traditional blood tests involve a lengthy centrifugation process where blood plasma and blood cells are separated before being analyzed, but microfluidic analysis can circumvent this process. In many ways, microfluidics present the ideal antidote to many of the problems associated with traditional blood testing.

The first work on microfluidic techniques was done in the 1970s, but so far the only actualized applications of the technology lie in the analysis of protein crystallization and prototype drugs. Forty years after its advent, the field of microfluidics has yet to find its so-called "killer app," an implementation of a technology that can make it viable in the marketplace. Theranos could be the first company to bring microfluidic technology to the healthcare marketplace, bringing science from the laboratory to consumers.

However, Theranos is by no means the only company working on bringing microfluidics to the market. A group of researchers associated with IBM have developed a chip that uses microfluidic technology and antibodies to detect the presence of certain particles in blood samples. The device has no moving parts, requires only a tiny sample of blood, and provides quantitative results in less than fifteen minutes. The device has the potential to make the identification and analysis of blood a quick, accurate, and painless process.

Often, the technologies that comprise the greatest consumer breakthroughs exist for many years before they become popular. Microfluidic technology has existed for many years, but it takes the innovation of companies like Theranos to deliver these technologies to the people. In doing so, Theranos could revolutionize the way in which clinical tests are performed.

A (Virtual) Look into the Future

Hiren Rana

Have you ever quickly glanced into the sky and seen a figure in the clouds, but lost it when you looked away? Our minds have the ability to not only control the things we see, but also the things we do not. In movies such as *The Matrix*, virtual reality controls what the characters see and interact with. In one particular scene, characters were put into chairs and their minds were taken to an alternate world of reality. Once thought of as science fiction, virtual reality has become possible in our everyday lives. Google launched a product called Google Glass that allows users to wear glasses that show them various facets of reality. This was the first time virtual reality was commercially used by Google to allow users to interact with their own applications. Microsoft has also been researching the virtual reality realm and they wanted their product to go beyond just a virtual interaction between user and technology. They wanted their product to be a part of the user's everyday life.

Microsoft's latest product, HoloLens, does just that. Project HoloLens, also referred to as Project Baraboo, allows a user to interact with virtual reality through a headset with a built-in computer. Currently in the final stages of development, HoloLens has drawn attention in the virtual reality community. Using advanced sensors and a 3D optical head-mounted display, HoloLens can project Microsoft's programs onto the external environment.[1] The components of HoloLens are what make the product as advanced as it is.

The headset itself is equipped with a microcomputer that allows the user to interact with the interface. HoloLens has a multitude of sensors that detect the wearer's movements in his or her environment and uses that information to create images with which the wearer can actually interact.[1] The goggles track wearers' movements through a camera and watch their gaze to transform what they see via flashing lights into their eyes. If you want to interact with something, you can simply raise your hand and "click" based on where the app is in the environment, similar to using a mouse to click on a screen. [2] HoloLens is fitted with a camera that observes physical structures in the room such as tables and chairs and uses that information to project 3D apps/images on top of them.[2] If all its components are integrated, HoloLens can be used in many applications.

While many entertainment applications are available, HoloLens can also be widely used for other purposes such as education, research, and industrial application. For example, HoloLens' ability to show 3D images and applications are great for learning anatomy. Students would be able to physically project a human body onto their environment and learn where certain bones, organs, and muscles are located. They can also rotate the images and look at these structures at different angles to get a better understanding of where they are with respect to other systems and objects in 3D.[3] Furthermore, HoloLens would allow these students to create cross-sections and learn not only what makes up the interior structure of

organs, bones, and muscles, but also observe how the organ system operates internally within the structure itself. Classes can stand around a virtual model and physically see and learn anatomy first-hand without the need to be in a clinical environment.

NASA has been a long-time supporter of HoloLens because of its applications to space research. NASA's Jet Propulsion Laboratory has been using holograms in collaboration with Microsoft to explore Mars.[3] These holograms connect scientists and engineers directly with the Mars Curiosity rover.[3] Because scientists cannot go to Mars, this technology allows scientists to virtually observe the planet. Rather than the 2D images that Curiosity sends back, the rover can use this 3D technology to project the topography of Mars and allow the scientists to see and interact with the landscape. For example, if scientists were considering a new mission or objective for the rover, they can see, firsthand, any obstacles and difficulties that the rover may encounter. This potential application can assist scientists in planning missions and efficiently avoiding obstacles.

> "Once thought of as science fiction, virtual reality has become possible in our everyday lives."

Engineers and architects are constantly striving to design and create new and improved innovations. Three-dimensional CAD (Computer Aided Design) models are often used in the industry to portray structures but complex designs are difficult to visualize on a computer screen.[3] HoloLens not only offers a way to virtually project models of buildings and other complex designs but also allows engineers and architects to pinpoint specific areas of interest.[3] Civil engineers can literally immerse themselves in the virtual buildings and surroundings, allowing for more innovative and safer designs. They can also alter the data in real-time to assess the impacts of changes made to the structures.

Even though it has so many useful applications, HoloLens will not be on the market for a long time. Currently, there is no release date or estimated cost. Microsoft's CEO, Satya Nadella, confirmed that HoloLens was on a "five year journey."[4] Developers will be able to test the device by mid-2016, whereupon the feedback will lead to more changes to the device. Whatever the practical details, Microsoft has redefined how we interact with technology and with our environment, taking something that we saw only in science fiction and turning it into reality.[4]

PROJECT ARA

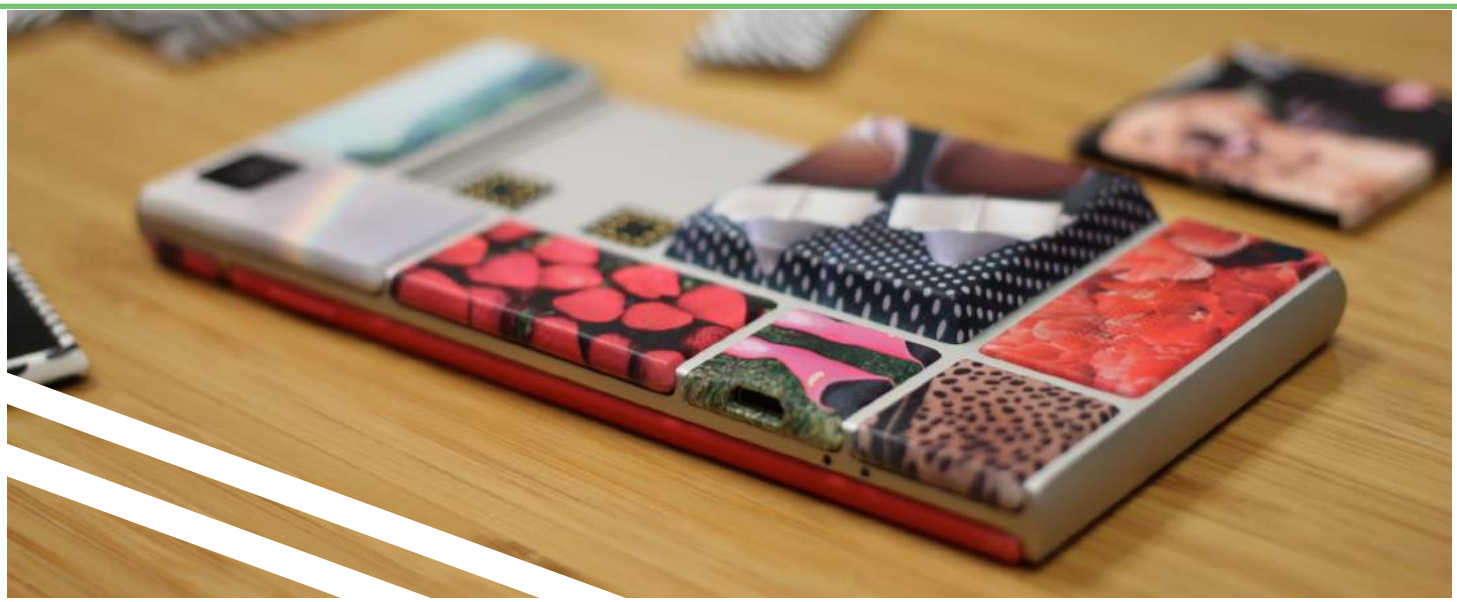
Matthew Belanger

Google's customizable smartphone, Project Ara, could be an ideal match for many different types of individuals, especially those with little technological expertise. Customizing their own phones may empower people with little experience with mobile devices, making them eager to learn more about the technology. For example, a young student who uses a Project Ara phone may become fascinated with assembling electronic devices and grow up to be a computer engineer who designs better smartphones for a living.

Project Ara will allow a person to customize the functionality and appearance of their phone through the use of modules. Modules are thin strips of hardware that can be swapped in and out of the phone (such as the screen, processor, and battery). Each module allows the phone to complete a specific task.[1] As one might imagine, this module-based system is very convenient; if the user wants a high-powered battery or an advanced camera, he can simply purchase a new module for his phone without having to buy a completely different phone.[2]

Project Ara was first explored by Google in 2012.[3] It is expected to be released in 2016.[4] Independent developers will be able to create modules using a Modular Development Kit and they will be able to distribute the modules they designed directly to consumers.[1,2] The phones will run on the Android operating system.[2]

The endoskeleton, an aluminum frame used to hold the modules, is a critical component of the phone that has separate spaces for each module. It contains a tiny back-up battery and a small number of electronics.[1] To avoid issues of module-endoskeleton incompatibility, a standard endoskeleton would be used on all of Project



Ara's modular phones.[1]

In addition to allowing the phone's functionality to be customized, Google plans to grant the user some control over the phone's aesthetics. The modules of the phone will be encased in a customizable, replaceable shell. Using the technique of dye sublimation, ink can be fused with this shell at high temperatures, allowing a high resolution picture to be produced on the phone cover.[5]

The process of swapping modules in and out will be fairly easy - modules will even be able to be swapped while the phone is on.[2] This ability will address many of the common issues with cell phones. For instance, remedying the problem of a broken screen would be as simple as going to a store and buying a new, easy-to-install screen module. More importantly, if one module becomes obsolete, it can easily be replaced by a new, updated module. Google hopes that one day it will be possible to print new modules in 3D.[6] Because modules will be interchangeable between modular phones, a consumer will be able to sell old or unwanted modules to other people.[3]

There are a few possible downsides to Project Ara modular phones. The medium-size endoskeleton of a modular phone can only hold up to ten modules at once, so a modular phone would not be able to perform as many functions as a typical smartphone at any given instant.[1] Google's modular phone will likely be inefficient compared to phones made by companies such as Apple. While the builders of Apple phones can tightly pack components into the phone, this cannot be done with a modular phone because of the independence of modules.[1] Unlike Google's Project Ara phones, Apple's iPhones and other phones use a single circuit board, which saves on battery life, weight, thinness, and cost.[7]

Google's Project Ara can revolutionize the concept of a smartphone.

In addition to offering consumers the ability to customize their phones and combat obsolescence, Project Ara could help people in developing countries obtain smartphones. The basic modular phone will only cost about $50.[1] Citizens of developing countries could customize and upgrade the phone based on their individual needs for a relatively low cost.[1]

Paul Eremenko, head of Google's Project Ara, hopes that the phone will also be useful for medical purposes, especially in developing countries.[5] In a demo of a Project Ara phone, Eremenko used a pulse oximeter module to measure blood oxygen content.[5] The types of modules that can be created are limited only by the imaginations of the module developers, meaning that Google's Project Ara could revolutionize the concept of a smartphone.

VIRTUAL REALITY:
The Dream of Yesterday

Ryan Rayman

Humans are creative creatures. We dream of doing more, being more. It is in chasing this dream that we accomplish so much. The dreams of yesterday exist today; such is the case with virtual reality. At present, millions of people can immerse themselves in programmable virtual worlds with the use of avatars or virtual characters. These avatars represent their respective users within the "other" world. Users can vicariously get involved in activities without any physical risks or participate in activities they would not normally be able to do. Virtual reality, however, blurs the line between the user and the avatar. It influences a person's perception so that the user feels as if he or she is a part of the virtual world.

Currently, there is a lot of media buzz about the many applications of virtual reality. It can influence users' perceptions to the point where they feel as if they are part of a virtual world. Projects such as PlayStation VR, Oculus Rift, and the HTC Vive are pushing the boundaries of gaming conventions. Instead of having the player control fictional characters, the idea is for the player to become the protagonist of these games. Similar in execution to the video games but with a completely different motivation, virtual reality has been propagated as an excellent training and learning tool. The military uses virtual reality so that soldiers can effectively practice maneuvering in hazardous environments without any real risk of harm. These environments include, but are not limited to, flight simulations, parachute simulations, and battlefield simulations. Different schools are also finding ways to take advantage of the opportunities virtual reality provides. Certain medical schools have incorporated virtual reality as a new way of learning to treat patients. For example, the Stanford University School of Medicine has a building, known as the Center for Immersive and Simulation-based Learning, dedicated to teaching clinical

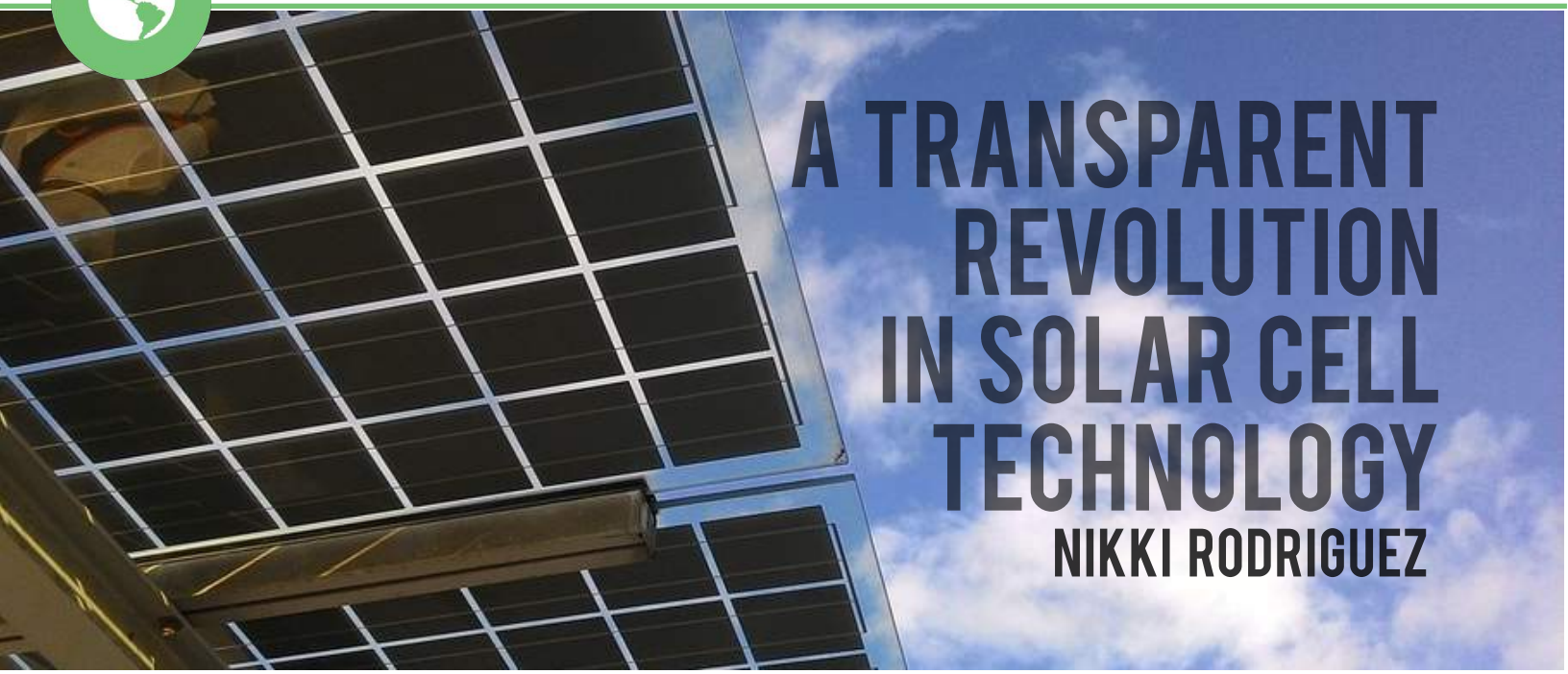
practices such as surgery with virtual reality. Through such experiences, students learn complicated surgical procedures in simulated environments. Also, the Duke University School of Medicine has a Virtual Reality Treatment Program in which patients with certain phobias can conquer their fears in a safe, simulated environment with the assistance of a therapist.

"We no longer dream about the existence of **virtual reality.**"

The virtual reality technology of today, which can entertain or teach new skills, is based on years of hard work and innovation. The beginnings of virtual reality technology took place when cinematographer Morton Heilig created the Sensorama in 1962.[4] The Sensorama could create an immersive theatrical experience by engaging senses not usually used for movies. There were body tilting seats and perfumes to add the senses of touch and smell to the theater.[5] Unfortunately, this idea did not receive enough funding to come to fruition. The next leap in virtual reality technology occurred in 1968 when Ivan Sutherland invented a head-mounted display (HMD) known as the Sword of Damocles. The person wearing the HMD would be able to view computer generated interactive images. This was the precursor to modern HMDs that virtual reality technology uses today. Then in 1984, Jaron Lanier founded VPL Research, a company that would go on to invent the Data Glove, a device that tracked the wearer's hand movements and recorded them onto a computer. In 1994, the company Sega created the Sega VR-1, a motion simulator arcade game that displayed a virtual environment made out of 3D polygon graphics.

Today, virtual reality is very well received because it effectively mimics a person's biological senses through artificial means. For example, the sense of sight is possible due to the eyes. Each human eye views a slightly different image of the same setting and the two overlap to form one image that the brain identifies. Virtual reality systems mimic this process by using a stereoscopic display, a display in which an image of the same setting is given to each eye but with slightly different viewpoints. HMDs are a key component in making this work effectively. The HMD blocks out the view of the physical world and uses OLED (Organic Light Emitting Diode) panels to display the virtual world. These panels must meet a strict list of requirements to increase realism. Because human eyes can notice action at a rapid rate, the images we view from the OLED panels need to be able to move at a rapid rate. Therefore, OLED panels used in virtual reality must have a refresh rate of at least 90 frames per second (fps). Modern tracking technology has also improved virtual reality. Accelerometers, gyroscopes, and magnetometers track a person's relative position, speed, acceleration, and more. Cameras on the HMD also check the user's position relative to various physical focal points. This tracking technology keeps the virtual world calibrated, and prevents the environment from becoming skewed to a single side.[9] As technology continues to improve, the capabilities of virtual reality will likewise improve.

We no longer dream about the existence of virtual reality. Now we dream of enhancing and improving virtual reality to greater heights than it has currently attained. Researchers, entrepreneurs, inventors, and companies have all contributed to the gradual growth and development of virtual reality over the decades. Imaging technology is improving to provide more humanlike viewing experiences. Now, virtual reality is available to the general public. Anyone can use it for many different purposes. From gaming to learning, virtual reality is here to stay. Dreams do come true.



A TRANSPARENT REVOLUTION IN SOLAR CELL TECHNOLOGY

NIKKI RODRIGUEZ

In a world of fast-paced technological advances, energy is in high demand. In the face of such demand and of increasing environmental concerns, people have turned to green energy alternatives. Solar energy, in particular, has undergone rapid development. One of solar energy's most recent advancements is notable for its potential applications and unobtrusiveness. Currently, most solar cells, or photovoltaic cells, are opaque, limiting them to areas like roofs where transparency is not needed, or, in more creative demonstrations of ingenuity, mosaic-style windows. These solar cells are easily noticeable and may detract from the aesthetic of an area. A Silicon Valley technology company called Ubiquitous Energy has a solution to this issue. Ubiquitous Energy's ClearView Power technology is a thin film that can generate electricity through solar energy, to "eliminate the battery life limitations of mobile devices and power smart glass for buildings." However, instead of utilizing the current, conspicuous solar panels, Ubiquitous Energy's transparent ClearView Power technology, and other transparent solar cell technologies that may arise in the future, would provide a seamless integration into everyday life while helping to ease battery limitations on electronic devices and lighten the energy costs of buildings.

"TRANSPARENT SOLAR CELL TECHNOLOGIES WOULD PROVIDE A SEAMLESS INTEGRATION INTO EVERYDAY LIFE."

Solar cells, or photovoltaic cells, are electrical devices that convert the energy found in light directly into electricity. Photovoltaic cells rely on the fact that all light is composed of electromagnetic radiation. This radiation spans a spectrum of wavelengths, including ultraviolet (UV) light, infrared (IR) light, and the visible spectrum. It is the visible spectrum that humans interpret as colors. Traditional photovoltaics use the energy contained in electromagnetic radiation found in the visible spectrum. These traditional solar cells absorb wavelengths from the visible spectrum and appear opaque since the human eye cannot detect the light that is not absorbed by the solar cell. Light from the sun, however, covers more than just visible light. Of particular interest are UV and IR light waves, which are invisible to the human

eye. These invisible ends of the spectrum are the key to transparent solar cells because, unlike with visible light, the human eye cannot detect UV and IR lights, so even if an object is absorbing UV and IR light, the object still appears transparent.

Another important factor in the development of transparent solar cells is the utilization of organic chemistry to design an array of molecules capable of transporting electrons and, as a result, transmitting electric currents. These types of photovoltaics are called organic photovoltaic cells (OPV). In the transparent solar cells, chloroaluminum phthalocyanine (ClAlPc) and buckminsterfullerene (C60) give a peak absorbance of electromagnetic radiation with UV and near infrared (NIR) light. This allows the solar cells to be transparent, as peak absorbance is not in the visible spectrum, but is instead at these "invisible ends" of the spectrum.

In addition, the whole process of creating the transparent photovoltaic uses room-temperature methods, and the creation of OPVs is cheaper than the creation of inorganic photovoltaics. While the whole process tries to capture as much UV and NIR light as possible, there is still the issue of power efficiencies. The Clearview Power OPV has power efficiency of about 1.7%. Despite this low number, the photovoltaic is not that far away from the 2.4% efficiency of the traditional opaque cell and, in a detailed theoretical analysis, the design may even be capable of reaching over 12% efficiency, giving it a rating comparable to that of existing commercial solar panels. Although the Clearview Power OPV does not possess 100% transparency, at a visible-transparency of about 70%, the solar cell has the transmissivity of window glass used in automobiles and in architectural installations that are typically 70%–80% and 55%–90% transmissive to visible light, respectively.

Ubiquitous Energy is currently producing its transparent solar cells in its Silicon Valley pilot production facility, and although the Clearview Power OPV is still only in pilot stages, the potential for transparent photovoltaics is enormous. While imperfect and low in power efficiency, this advancement in solar cells is revolutionary not only because it has pushed the limits of solar cell technology, but also because it has transformed the way that they can be utilized and further integrated into everyday life. Transparent solar cells may be key to truly ubiquitous energy provided by, for example, skyscrapers, with every window a hidden power source. The future would not be reliant on ever-dwindling resources but would unobtrusively be supported by homes and schools, buildings and skyscrapers, the sun and human innovation.

The Growth of Airbnb *Leslie Seby*

Around the world, hotels are becoming increasingly expensive as more and more people look for an affordable place to stay. One option has emerged for such people that provides decent accommodations for a fraction of the price. Airbnb, or Airbed & Breakfast, is a community through which people are able to rent out living spaces around the world for their travel. More people have begun to turn to Airbnb as a solution for their travel needs, and Airbnb has been growing as a result of its positive reviews.

Airbnb was founded in 2007 in San Francisco by roommates Brian Chesky and Joe Gebbia who could not afford to pay their share of the rent for the month. As a solution, they decided to rent out their place to three guests.[2] These guests were satisfied with their experience and gave such great positive feedback that it initiated the idea of Airbnb. As of now, Airbnb has expanded from the United States to Germany and six other international offices with Australia being the second largest market in the world.[3] Airbnb operates in 190 different countries, in 34,000 cities, and has accommodated about 40 million guests.[3] Due to the overwhelmingly positive feedback, Airbnb has been positively affecting numerous travelers since.

Airbnb helps people around the world find excellent rental places for a portion of the cost of normal hotels.[4] It is set up on an online website where potential customers can view what properties are available for rent at a specific location.[3] The way it works is that a host can put up a listing for an apartment, suite, or any available rooms for rent on the website.[3] Anyone looking for a place to rent can use the website to find the perfect location and living space. Renters can pay online using a credit card and the money is held for about a day before the host receives the payment.[3] Airbnb receives most of its revenue from service fees that are charged to both hosts and guests. A 3% service fee is charged to the host every time a listing is rented by someone. Also, a 6%–12% nonrefundable fee is charged to the guests.[3] Guests who are satisfied with the service then spreads the news to their friends and family, increasing Airbnb's popularity. Due to the large number of bookings, Airbnb continues to thrive as a company and is expected to experience continued success in years to come.[3]

However, controversies have started to surround Airbnb due to the legality of renting out a person's home to outside travelers. Many people worry how safe it would be to allow strangers to come into their homes, or vice

versa.[3] The website shows that there are a number of processes that allow for ultimate safety. There is a section where guests and hosts both verify their IDs and confirm personal details.[3] There is also a section where guests can access the host's reviews and details to find out if this situation is ideal for them. The final step is messaging, and this allows for hosts and guests to communicate with each other to get to know one another better.[3] This provides a safer environment and allows the person to eliminate any suspicious characters.

There is also a controversy involving the economical aspect of Airbnb. As of now, people renting out their living spaces to Airbnb are not taxed as owners of hotels and motels, which makes it cheaper for renters and creates an uneven playing field for other competition.[4] As a result, there is debate as to whether or not hosts associated with Airbnb should be taxed in the same way as owners of large chain hotels.[4]

It does not seem that Airbnb will decrease in popularity any time in the near future. It won the "Breakout App" award in 2011 and was listed as the next generation multibillion-dollar startup. Airbnb has also helped people on the brink of foreclosure.[1] Numerous people were saved from financial hardship by signing up as hosts for Airbnb. By renting out their available rooms to travelers, they were able to make a profit.[1] Airbnb helps people learn more about others by immersing themselves into different cultures, a positive outcome that is not necessarily true for those staying in hotels. With this, Airbnb can be used as a key tool that will allow modern society to grow above and beyond and evolve to its utmost potential to bring unity and hospitality together in one setting.

Bringing Technology Fantasies to Life

Tim Suchodolski

Modern technology pioneers make society feel more futuristic every day. Usually, these pioneers base their designs on fantasy. As odd as that may sound, fantasy represents a person's most outlandish desires, and catering to that desire can generate a lot of money. With that incentive, technology pioneers seek to innovate where they can. While most innovators will look to popular culture, some will look to the past for inspiration.

One famous inventor was Nikola Tesla. Tesla was a genius in the field of electricity during the time of Thomas Edison, but he did not have the same exposure and publicity. However, he had bigger plans than just light bulbs and circuits. Nikola Tesla dreamed of creating a way to supply electrical power to the world without any wires. He came close with his invention of the Tesla Coil. The Tesla Coil was the first of its kind, with the ability to transmit electricity wirelessly. Early radio antennas and telegraphy utilized the Tesla Coil, which is well known for its ability to produce lightning. However, it was too small to provide worldwide wireless power, so Tesla built the Wardenclyffe Tower in 1905.

The Wardenclyffe Tower was a wired, 187-foot-tall tower with a fifty-five-ton dome of conductive metals. Beneath it stretched an iron root system that penetrated more than 300 feet into the Earth's crust. Tesla wanted to build several of these towers around the world; they would pump electricity through the Earth's crust, electrifying both the land and the oceans. Anyone, anywhere could tap into this power. This technology was expensive for the time, so investors moved their money elsewhere. Without any finances, the tower had to be scrapped for parts, and Tesla's vision could not come to fruition. Now, over a hundred years later, new inventors and innovators are trying to accomplish Tesla's dream of worldwide, wireless power.

Four basic types of technology are vying to achieve Tesla's vision of wireless transmission. One such

technology is known as the power mat, which can be used to inductively charge devices such as smartphones. The most prominent user of this new technology is Starbucks, which utilizes power mats in some of its stores to attract customers and entice them to stay for hours. The power mat itself must be plugged in - think of a charging station for an electric toothbrush. When the station is charged up, the device can be placed in it at any time to charge, even if the station is no longer plugged in. Your devices don't need their own chargers or outlets anymore, just this power mat. The next new piece of technology is only for laptops as of right now. The relatively new company WiTricity is working with Intel-chipped laptops to create a wireless charging option. The chip will use "magnetic resonance" to effectively transmit power over distances ranging from centimeters up to a meter. While innovative, these two pieces of technology still haven't attained Tesla's vision of worldwide power, even with an additional hundred years of knowledge. It is the next two types of technology that are paving the way for the future: power transferred by air.

Engineers have been working on achieving Tesla's dream for some time, but the main issue was that they couldn't find a way to transfer enough power. However, as technology advances and batteries reduce the amount of power needed, the race to find an efficient way to transmit electricity is on. Two startup companies, Energous and Ossia, are attempting to commercialize the transmission of electricity through radio waves. Meanwhile, another company, uBeam, is attempting to utilize sound waves to transmit electricity. The current power transfer technology utilizes hubs, such as a mat or disc, on which to place your device. This new method will shoot power to a device while you are walking around with it; in a sense, you might never run out of battery life. For example, Energous has a patent on the idea of putting a power transmitter into the base of a light bulb, allowing its technology to cover an entire room.

The current target for these three companies is the mobile device market. Mobile devices are becoming power efficient, using less power and needing less time to charge. Wireless power, if achieved, could cause a new revolution in technology. The charging method, dubbed "trickle charge," would shoot a beam of power at the radio antenna in a mobile device. While the device is in a person's pocket, or just lying on a surface, it would slowly charge. As mentioned previously, the current technology can only span one room at a time. Ideal setups would be home offices or lounge rooms in the corporate environment. The main issue presently is interference from other wave technology such as Wi-Fi routers or microwave ovens. All three companies are working on resolving this issue with the goal of creating working products by the end of 2016. If the innovators can overcome the obstacles that would make the devices cumbersome to use, they will pave the way for a future where cheap power is accessible by all.

Calico's Quest For Immortality

Suraj Rajesh

For centuries, humans have tried to find the secret to immortality, consuming elixirs, potions, and herbs in vain. The biotechnology company Calico Labs recently joined this effort, using modern research to try to unveil the secrets of a longer lifespan. This Google-backed startup is quite young, having been launched only in 2013 by Arthur Levinson, the former CEO of Genentech, an established biotechnology research corporation.[2][6] Calico plans to study the biology of aging-related diseases, partnering with AbbVie—a pharmaceutical company—to fulfill this mission.

Currently, its biggest project focuses on neurodegenerative inhibitors, molecules that prevent brain cells from deteriorating and dying. Working with the University of Texas Southwestern Medical Center and the University of Iowa Carver College of Medicine, scientists isolated a family of compounds derived from a molecule known as P7C3.[1] This compound acts as a protector of the brain, preventing a certain enzyme found in the body from reducing levels of NAD, a molecule that is beneficial for cell metabolism and survival.[1][7] By ensuring that NAD levels are high, P7C3 directly contributes to increasing cell survival rates.[7]

In fact, studies in which mice were injected with doxorubicin—a chemotherapy drug that reduces NAD levels and is potentially toxic at certain doses—recovered and reached pre-injection levels of health after receiving P7C3. [7] Other studies showed that the same molecule increased neuronal survival and genesis in mice with diseases such as ALS or Parkinson's.[5] There is even evidence that compounds derived from it could be used to treat traumatic brain injury (TBI). In mice induced to experience blast trauma, P7C3 preserved motor ability, learning, and memory, and prevented axon degradation. [3] Axons are nerve fibers that act like highways, allowing electrical impulses to travel away from neurons to terminals in the body. By protecting these communication lines, P7C3 allows the brain to remain in contact with the rest of the body, making sure that all systems are in order.

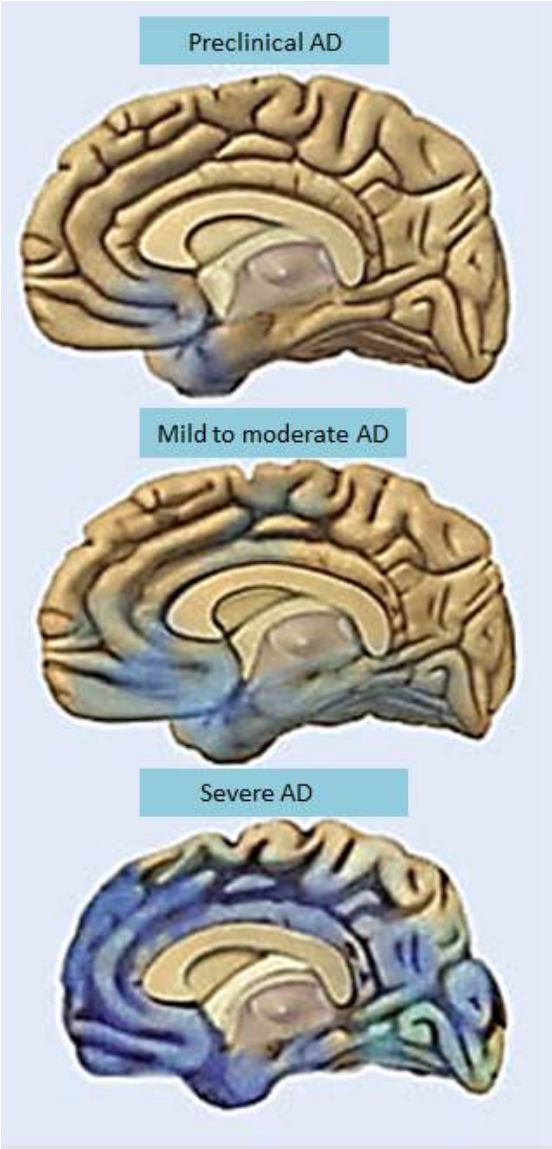
> "While Calico's research might not result in some elixir that instantly heals old age and disease, its breakthroughs still have significance because of their implications. "

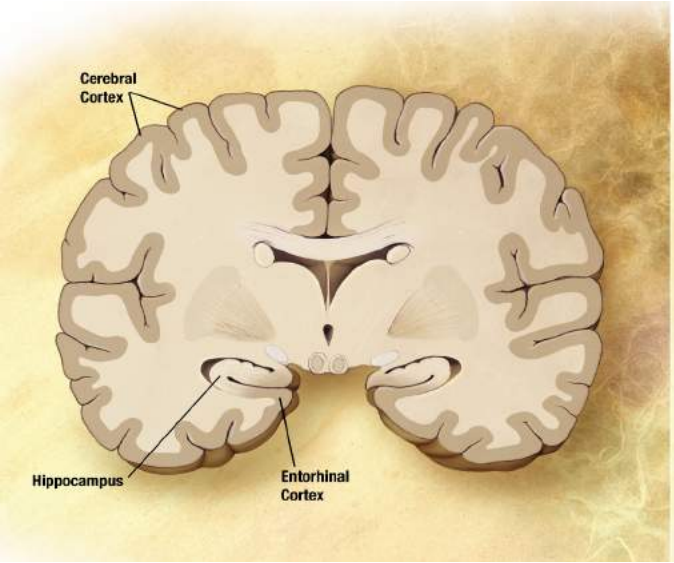
Even with such promising results and significant benefits, scientists are cautious to declare P7C3 a miracle compound. This is because it chemically resembles Dimebon, a Pfizer-developed drug that was supposed to treat Alzheimer's and Huntington's, yet failed during FDA trials. Later analysis found that the chemical structure of Dimebon was just slightly incompatible with certain receptors in the body. Given this history, scientists are wary of false hope, but they are still trying to tweak the structure of P7C3 to find something that

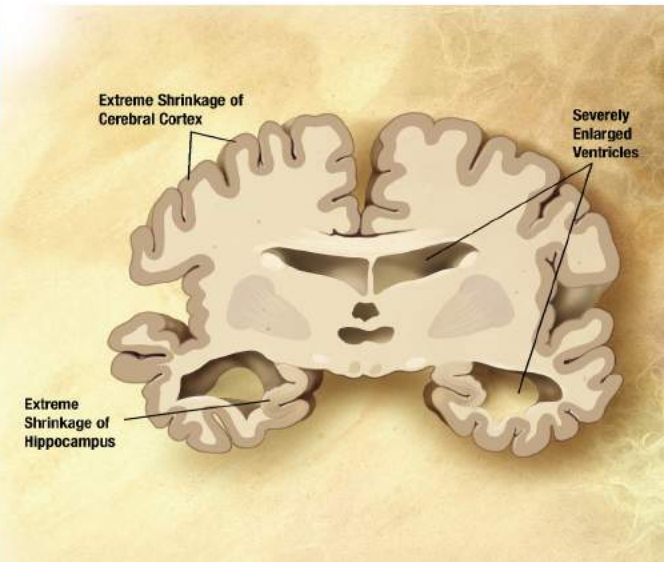
works.[1] If a solution is found, researchers will then restart FDA trials—testing the drug on animals and later on humans if animal results are promising—to determine the viability and potential of the drug. A successful drug can then be finalized and produced by pharmaceutical companies for public use.

While Calico's research might not result in some elixir that instantly heals old age and disease, its breakthroughs still have significance because of their implications. Considering that diseases such as ALS, Parkinson's, and Alzheimer's cause death by disabling or killing neurons, research with P7C3 and its family of compounds could allow scientists and doctors to prescribe drugs or treatment programs that block or reduce levels of harmful substances in the brain.[4] Even if this goal is not reached, the company's other projects studying the biochemical impact of stress could lead to a better understanding of the cell itself. Studying the intricate maze of cell signaling and molecular pathways could lead to key insights about the nature of certain medical conditions or offer solutions for avoiding disease.

For now, Calico will rely on the financial clout of its sponsor, Google, to drive its progress. The abundance of financial resources gives Calico an edge over any other similar startups, essentially ensuring that the company has no realistic competitors. Calico is utilizing the backing of Google to fund this promising research. While its research may not provide us with the way to immortality, it is definitely the right step to learning more about aging and potentially helping millions of patients.







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