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REPORT



The Insider

JOSH WOLFE, EDITOR

For this month's issue, we have the privilege of speaking with pioneers in the fields of environmental waste removal, research and scientific art.

We lead with Antoine Frérot of Veolia Environnement and William "Bill" Gallo of Kurion (*Full disclosure: my venture firm Lux Capital is an equity investor in Kurion*). On February 3, the French multinational company Veolia announced that it would be acquiring the nuclear waste innovator Kurion. We learn from Antoine and Bill about some of the drivers

New Partnership Takes Aim At Nuclear Waste

Antoine Frérot is the chairman and CEO of **Veolia Environnement** [VIE.PA]. He is a graduate of the École Polytechnique, an engineer of the Corps des Ponts et Chaussées, and holds a doctorate from the École Nationale des Ponts et Chaussées. Frérot started his career as an engineering researcher at the Central Research Office for French Overseas Departments and Territories. In 1983, he joined the Center for Study and Research of the École Nationale des Ponts and Chaussées as project manager and served as assistant director from 1984 to 1988. From 1988 to 1990, he was in charge of financial operations at Crédit National. In 1990, Frérot joined Compagnie Générale des Eaux as an official representative and, in 1995, became CEO of CGEA Transport. In 2000, he was appointed CEO of Connex, the transport division of Vivendi Environnement, and member of the Vivendi Environnement board. In January 2003, Frérot was appointed CEO of Veolia Eau, the water division of Veolia Environnement, and senior executive vice president of Veolia Environnement. In November 2009, he became CEO, and in December 2010, chairman and CEO of Veolia Environnement.

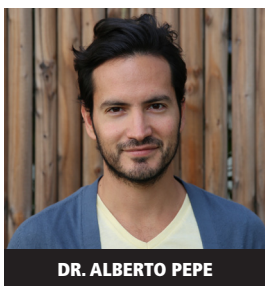


ANTOINE FRÉROT AND WILLIAM GALLO

William Gallo is CEO of Kurion (*Full disclosure: my venture fund Lux Capital is an equity investor in Kurion*).

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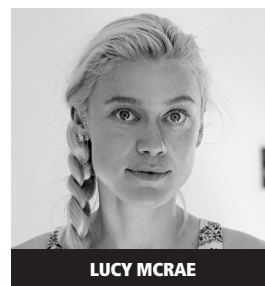


DR. ALBERTO PEPE

Alberto Pepe, Ph.D., is the co-founder of Authorea (*Full disclosure: my venture firm Lux Capital is an equity investor*). He recently finished a postdoctorate in astrophysics at Harvard University. During his postdoctorate, Alberto was also a fellow of the Berkman Center for Internet and Society and the Institute

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Body Architect Builds Bridges Between Art And Science



LUCY MCRAE

Lucy McRae is a science fiction artist, director and world proclaimed body architect probing the frontiers of the body, health and human adaptability. Lucy's artistic study of technology began during her formative years at **Philips** [PHG] Design, where she led the technology company's far-

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tor). Gallo joined Kurion in March 2013 as chief operating officer and was appointed CEO in June of that year. He is a notable executive and global leader in the technology-oriented energy field. As an executive with Areva, the world leader in the nuclear industry, he served most recently as the CEO for Areva Solar, where within his first two years he has grown the company to a top-tier global solar power company. In his previous role at Areva, he was the CEO of Areva Federal Services working closing with the Department of Energy (DOE) at various weapons complex cleanup sites. Before joining Areva, Gallo served eight years

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for the acquisition and the magnitude of opportunity for nuclear power and waste removal around the world.

Next we speak with Dr. Alberto Pepe, co-founder of the collaborative research platform Authorea (*Full disclosure: my venture firm Lux Capital is an equity investor in Authorea*). Alberto's extensive experience collaborating on scientific papers inspired him to build a superior platform for academic writing. Alberto explains the existing inefficient systems in place for collaborative research and publishing, and shares how Authorea is revolutionizing how authors share and create scientific works.

Lastly we sit with Lucy McRae, a self-described "body architect," whose projects are blurring the lines between science fiction and fact. Lucy uses both synthetic and organic materials to explore and expand the limits of the human body. We marvel at how Lucy manipulates the body's natural structure using cutting-edge technology in unprecedented and unpredictable ways.

As always here's to thinking big about thinking small...and to the emerging inventors and investors who seek to profit from the unexpected and the unseen.



as senior vice president of Transnuclear, part of the Areva Group, where he helped establish the company as the industry leader in used fuel storage, and led the company into the commercial nuclear decontamination and decommissioning sector. Prior to Transnuclear, Gallo served on several DOE positions at Hanford, Washington for five years, including director of projects for the Westinghouse/Fluor K-Basin project. He earned a Bachelor's of Science degree from the University of California, Berkeley.

Antoine, tell us a bit about Veolia and what led you to first become interested in Kurion.

Antoine: The mission of Veolia is to provide environmental solutions and develop renewable forms of energy in order to preserve and replenish diminishing resources. This involves treating all types of pollution, especially the most difficult and destructive forms, such as radioactive waste. Nuclear waste is one of my main focuses because the difficulty of controlling emissions through radioactive treatment seems to offer the biggest opportunity to add value and develop new technologies.

What are some of Veolia's latest efforts in the field of nuclear waste management?

Antoine: Typically, what we are doing at Veolia is providing treatment services to other businesses for managing radioactive wet waste. When we first met Kurion, we immediately understood that the combination of our services with Kurion's technological developments would provide a significant advantage against our competitors. We have already successfully solved a number of radioactive waste management problems, but there is always progress to be made.

What other types of solutions does Veolia offer in waste treatment and resource renewal?

Antoine: We also have a number of water treatment technologies and other hazardous waste treatment solutions. Some of the most important work we do involves managing low-level waste activity. We're developing radiation technologies that we'll be able to bring to the nuclear field to aid with the large volumes of low-level pollu-

tion. We hope to use Kurion's technologies to help concentrate specifically on environmental contamination due to low-level radioactive waste. Low-level pollution on a wide scale is an important challenge for which we hope to achieve a global solution.

What is the current state of the nuclear waste removal market and what areas are you going to target first?

Antoine: Just for the U.S., the U.K., France and Japan, the nuclear waste removal market is approximately \$7 billion annually. We're not as focused on extremely high-level waste activity. We think that the market for low-level activity will grow progressively so that five years from now, we'll be generating about \$250 million in business in the turnover of radioactive waste plus between \$100 and \$150 million in the decontamination of waste treatment. This means that \$350 to \$400 million of business in 2020 is achievable, or between 5% and 10% of the market.

Bill, can you tell us a bit about Kurion and what your company has to offer?

Bill: Kurion has assembled a suite of proprietary technologies to access, separate and stabilize nuclear waste. We have arranged these technologies to be interrelated and linked into a comprehensive offering. The technologies are patented, protected and, most importantly, they have been demonstrated as feasible and able to be deployed commercially and internationally.

Are there any other companies that have developed solutions similar to Kurion's?

Bill: There's no other company that can offer the range of integrated technology we do. Kurion is unique and essentially alone when it comes to applied technology solutions for the nuclear restoration market. The only other company in the world to have such technological capabilities would be Areva but, to this point, they haven't demonstrated the flexibility or speed to market that we have. In any event, we certainly consider Areva more of a partner than a competitor in this field.

What led to the partnership between Kurion and Veolia?

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Bill: Kurion and Veolia first became aware of each other in the aftermath of Fukushima. Just as Kurion responded after the disaster, Veolia also joined in the waste removal and decontamination efforts. We then began working together as Veolia supported us on our detritiation projects for the Japanese. As we became more and more familiar, we decided last summer to enter into more serious dialogue about the possibility of Veolia acquiring Kurion. Since then we've been in ever more serious discussions leading up to the recent announcement.

Can you tell us a bit about some of the recent acquisitions that Kurion has made?

Bill: Kurion has made three acquisitions over the last four years. Going back to 2012, we acquired the vitrification technology company GeoMelt. In 2014 we acquired Vista Engineering Technologies, which brought us a robotics business and serves as our access business unit today. Most recently, in December 2015, we closed on an acquisition of Oxford Technologies Limited, a U.K.-based robotics company. Oxford will be very complementary to our existing business, but its European footprint will provide important European contracts and capabilities. All of these acquisitions have been self-funded and the company has been self-sustaining ever since it was started with a very small seed round in 2008.

Where do you see Veolia's position in the nuclear restoration market in the coming years?

Antoine: I see Veolia solidifying itself as the world leader in the field. Radioactive wet treatment will be the first immediately achievable area to do this. Secondly, we hope to expand this business to radioactive equipment decommissioning and re-release. By being able to bring our expertise in water treatment, hazardous waste treatment and nuclear waste treatment we'll have a significant advantage in the field.

What types of facilities or plants are you focusing on to achieve this goal?

Antoine: We'll most likely establish our position as a leader first with nuclear research centers. There are around 50 of these in the U.S., France and the U.K. that have some

level of waste requiring treatment and decommissioning. Next we'll focus on nuclear plants. For these facilities to increase the duration of their work they'll have to adapt to change some equipment and extract low-level radioactive waste in big volumes. In France, for example, authorities decided to expand research for 40 to 60 years, which will require a lot of work. The future is clear for us to offer solutions to test, treat and decontaminate waste and equipment.

Do you think Kurion's technology can be used in any other methods of waste management?

Antoine: Yes, we think so. Kurion's vitrification technique could be used for other types of waste in addition to nuclear. This could be a very interesting and relatively inexpensive technique for removing asbestos, for example. Kurion's detritiation technique is another efficient but not overly expensive tool that could be applied to a number of waste types. Another example is robotics, which can be used to extract some elements from complex and dangerous industrial plants as well as to dismantle complex equipment or platforms.

Is betting on Kurion also betting on a nuclear renaissance?

Bill: Certainly in the United States one of the barriers to nuclear growth is the inability to solve the nuclear waste issue. There needs to be a comprehensive solution and progress on nuclear waste before Western countries progress significantly. France is the exception to this because it has adopted a closed fuel cycle strategy. It recycles its high-level waste and spent nuclear fuel and generates 85% of its electricity from nuclear power. In other countries, especially the U.S. and U.K., this hasn't been possible because of the waste issue.

Why hasn't there been much progress on the issue of nuclear waste?

Bill: There hasn't been a comprehensive suite of technologies that can be put into effect. We've grown our company very nicely through the implementation of these technologies and the advantage that we have now at Veolia is the ability to accelerate that growth through the synergy between our two companies.

Is it also true that even if the nuclear market doesn't take off, there will still be nuclear waste?

Bill: As we know, nuclear power can be an emotional question in some countries, such as the United States, but regardless of whether people support nuclear power or not, everybody agrees that the waste needs to be addressed. For Kurion, this is the market. Nuclear research centers, including the D.O.E. in the U.S. and the Nuclear Decommissioning Authority in the U.K., all have facilities that need to be cleaned up. These are an important part of our market as well.

Will this acquisition affect any of Kurion's operations in Fukushima?

Bill: It will only affect them by offering the potential to bring to bear some of Veolia's technologies. We began a project with Veolia last year that implemented our detritiation technology. Veolia's role was to pre-treat the water ahead of applying Kurion's detritiation technology. Veolia knows more about water technology than anybody else, so it's able to help us develop flow sheets and provide our technologies with a cleaner feed.

Will Kurion's headquarters remain in California?

Bill: Yes, Kurion's headquarters will remain in California. In addition to that, one of the things that we covered in both press conferences recently is that the existing nuclear businesses under Veolia will, in fact, be folded under Kurion, which will also report to me.

What is your vision for nuclear energy in the coming years?

Antoine: I have to say that the future of our role in the nuclear industry has no leash because I think it will be difficult for the world to stop nuclear energy. My feeling is that, especially with the issue of carbon emissions, nuclear energy will continue with a stronger issue about safety. The safety commissions of certain countries understand the inherent risk involved in building energy and are proof that good measures of safety can be developed. I think nuclear energy will continue to have a role and be in the energy mix in the world. **FT**

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for Quantitative Social Science. Alberto is the author of 30 publications in the fields of information science, data science, computational social science and astrophysics. He obtained his Ph.D. in information science from the University of California, Los Angeles with a dissertation on scientific collaboration networks that was awarded with the Best Dissertation Award by the American Society for Information Science and Technology (ASIS&T). Prior to starting his Ph.D., Alberto worked in the information technology department of CERN, in Geneva, Switzerland, where he worked on data repository software and also promoted open access among particle physicists. Alberto holds a M.Sc. in computer science and a B.Sc. in astrophysics, both from University College London, U.K. Alberto was born and raised in the wine-making town of Manduria, in Puglia, Southern Italy.

What led you to develop your collaborative tool Authorea?

After completing my Ph.D., I returned to astrophysics for a postdoctoral fellowship at Harvard. Throughout my career, I've written 30 research papers across very different fields and worked extensively on the topic of scientific collaboration. I understood how most collaboration networks are organized and what scientists use to write research papers. Having experienced the frustration at how long it takes for a research discovery to actually be written and published, I saw an opportunity in the need for a tool to facilitate scientific research writing.

What is the concept behind Authorea?

The idea behind Authorea was to create a system that would enable much faster and more seamless collaboration so that research results can be shared more quickly. If you share research faster, you are doing a service to society and technology. For example, the ability to publish medical research three months earlier could save a number of lives. In addition to accelerating collaboration, another component of Authorea involves improving the actual content of what is published.

How has academic publishing changed over time?

The academic publishing industry today functions with the exchange and publication of papers as **Adobe** [ADBE] PDF files. This file

format does not exploit the full functionality offered by the Internet in terms of collaboration, interactivity and dynamic content. Importantly, the current format doesn't take advantage of the real central element of research today, data.

How does this impede the use of data?

Until 20 or 30 years ago, most research data gathered could actually fit entirely in a paper, able to be summarized in a table. All of a researcher's data was thus shared with the world, including what was collected and how it was interpreted. Today, data has grown too large to fit within a paper, preventing researchers from reproducing others' results. The lack of transparency has made science more opaque and is eroding public trust in science, especially in areas that are at the center of attention such as climate change.

How does Authorea enhance the functionality of published research and data?

Scientific research should be open and transparent to the public. Every single data point collected should be shared to allow anyone to replicate the published work. Authorea uses Git, a version control software, and Github as part of a robust system to manage collaboration between up to hundreds or thousands of people working on research documents. Each document is more than a PDF, an aesthetic closed object. The content is contained in a dynamic, interactive Web page. Researchers can provide readers with various data visualizations and unique formats for reviewing published work.

For those who haven't participated in writing a scientific paper, can you describe what the traditional process entails?

The process often begins with researchers getting informally acquainted through mutual contacts or at an academic conference and coming up with an idea for a research project. The initial focus is solely on the research itself and generating data. Once there are findings that are worth publishing, the authors begin to develop a title and formulate the abstract. Each author takes a role in writing a section of the paper, passing the document back and forth until a good draft is compiled. After careful revision, the researchers submit the paper to a list of journals and await an editor's approval. The subsequent peer review determines whether the paper will be accepted and published.

How can Authorea improve the process of writing a scientific paper?

The collaborative process of sharing research in a scientific study and especially in writing a publication and seeking acceptance from a journal can be very painstaking. Authorea is making the collaborative writing phase much faster and easier by providing a framework that allows multiple people to work seamlessly together. Instead of intermittently passing a draft back and forth, all of the authors can work simultaneously in a streamlined process.

Does Authorea hope to facilitate the process of publishing research in journals or will it serve as a new platform for publication?

We're not yet a publishing platform per se, but our potential as a content repository will eventually allow us to become one. Rather than simply another academic journal, the publishing platform of the future will create a contributable story database, like Authorea is becoming. This will bring readers and authors much closer to each other, bypassing the role academic publishers have had for the last 200 years. A finished paper can be published immediately and reviewed closely by all scientific communities as well as the public.

What differentiates Authorea from other collaborative tools such as Google Docs?

The fundamental difference between Authorea and a tool such as **Google** [GOOG] Docs is that we are tailored for academic and scholarly writing. Not many scholars use Google Docs because it doesn't offer the same plug-ins and add-ons that they use in **Microsoft** [MSFT] Word to generate citations, references, tables, mathematical notation, and other features necessary for scholarly content. In addition, Google Docs does not perform the typesetting necessary to be in compliance with the formatting and stylistic requirements that most journals have.

Does Authorea take care of all of these technical features?

Authorea makes it very easy to generate all of scholarly features that scientific writers need. With one click, you can format your paper according to the style required by a particular journal. For students, our tool automatically generates all of the formats for citations and references required by the APA and MLA. We also differ in our data treatment approach and

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are built to support very dynamic data tables.

Can you discuss some of the specific collaborative features that you provide?

Our important focus on collaborative support differentiates Authorea from other tools for shared document creation. For example, Google Docs blocks users when more than 50 people are working on the same document simultaneously. We have collaborations at Authorea with hundreds of authors and it could not possibly be a successful tool for academic collaborations if we blocked the number of users at 50. I can think of an example of 300 authors working on a collaborative project. We're built on a very robust version control platform that allows for such scale.

How did Authorea progress after you first came up with the idea?

From the very beginning, our belief and main focus was on the idea of launching a live version of our product. We really didn't have an official launch date and, essentially, we've been live ever since we had a functional version of our tool. We've grown steadily as we've invited new people and, right now, we are at a point where Authorea is a very useful platform. We have close to 80,000 users and have seen 4,000 articles authored on Authorea that went on to be published in scholarly journals, some of which have involved extremely important, high-end research.

What is the current state of Authorea and what direction is it taking?

We're definitely focused on improving the platform and adding new features to the product. We constantly receive requests for a number of different features. Right now we're working specifically on improving the user interface to make the platform more intuitive and user-friendly. We think that scientists and scholars deserve a good-looking platform for collaboration. Some of the content that these researchers are writing on Authorea is among the most important in human history. We think that this type of content deserves a great place.

What has the reaction been in the scientific community?

There has been a big movement against traditional academic publishing, especially among Ph.D. students, post-docs and early-stage pro-

"If you share research faster, you are doing a service to society and technology. The ability to publish medical research three months earlier could save a number of lives."

fessors. Younger researchers, who focus largely on data-driven work and are familiar with modern tools, are pushing for openness and transparency in science to increase its reproducibility. The response in these communities to Authorea's efforts to make scientific research more modern and Web-based has been fantastic.

Have you faced any resistance in academia to the changes Authorea is fostering?

We have clearly become a leader in forward-thinking communities, but it hasn't been easy convincing older scholars, professors and researchers to shift away from their traditional practices of writing papers. It's hard to convince them to move to a new, unfamiliar tool, but I hope that eventually, with the development of increasingly useful features, we'll gain the support of the field as a whole.

Are there any features currently in development that particularly excite you?

We're in the process of developing a tool that will have the ability to display changes that have been made to a document in a very granular way. We already offer a version of this, but the presentation isn't great. What we're working on will be a much more intuitive and seamless feature for tracking changes made by numerous co-authors. Microsoft Word's 'track changes' is a great tool, but it can be very tedious and clunky to use. If we can solve that problem, I think we also have a chance to expand beyond academics, for example into the legal market.

What does success look like for Authorea? What obstacles do you need to overcome to get there?

Success is to be the reference platform; the place where any scientist or reader can log into

Authorea to find a place where new research on any topic is written, shared and discussed by the general public and researchers alike. Taking it a step further, our idea of success is to also become the reference platform for students to write papers, take class notes or work on problem sets, as well as the enterprise solution for a number of corporations even outside of research and academia.

What kinds of advantages can Authorea bring to a corporate environment?

I think Authorea can benefit any place that has a need for a collaborative platform that allows users to write documents internally and externally with a robust version control tool. We've already received interest from a number of companies outside of scientific research. Right now they use Microsoft Word on top of SharePoint to collaborate on documents, which is a terrible solution but their only option for use with an enterprise license. We have an opportunity to target that market and become a great player in the corporate space.

Is there currently a plan for Authorea to offer a publishing component in the future?

We're going to introduce the publishing component very soon; a process that will be extremely simple. Essentially, the feature will enable authors to generate a special published link and citation for their research documents. Upon request, a sort of a stamp of approval will be provided for a published document, which will then become part of the scholarly record. Gradually, we are going to introduce more and more features specifically for publishing.

How do you plan on convincing universities or other places that have established processes to make a switch to your product?

The way that this happens most of the time is through word of mouth as people involved in research talk to others in their fields. We have what I think is a viral component embedded within the platform, which is the fact that people use Authorea to write in collaborations. Naturally, they will invite others to collaborate with them, a process the tool makes very easy. I don't think that our strategy will be to target researchers and convince them to switch over. I think change will happen organically as the actual benefits of using Authorea become apparent to all. **FT**

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future research lab. Responding to complex future scenarios around health, she uses storytelling as a medium to catalyze innovation, inventing visually iconic experiences that reach the masses through her extensive network in cinema, music, fashion and pop culture.

Can you tell us a bit about your background?

Growing up, I trained in French classical ballet for 14 years and was a 100-meter hurdler, so my childhood was very much about pushing the limits of the body. I went on to study interior design and work in architecture. My first artistic study of technology was at Philips Consumer Electronics in Eindhoven, Netherlands. There, I led the far-future probes research team in wearable technologies, which tried to look ahead 20 years and understand how technology would affect the business of consumer electronics. After working at Philips, I moved on to film and started directing music videos and short science fiction films. Today, I work with scientists to create installations that merge science with the imagination and, hopefully, impact the future of health and human adaptability, still using the lens of science fiction.

You call yourself a “body architect.” What inspired you to come up with that term and use it?

I created the idea back in 2006 as a platform for combining my architecture, graphic design and fashion background under one description. “Body architect” was a job title I fabricated as an unconventional label to get me through the door at Philips Design. Since then, it’s become a fairly established label and even a lecture series in universities. Today, I consider myself more of a science fiction artist, but I’ve always tried to bounce between labels. I feel like the areas I’m interested in require a hybrid outlook on technology and the body, and one definition isn’t suitable.

Talk about a specific project and its purpose to paint a picture in the mind of the readers about what one of your pieces looks like.

One example is the Future Day Spa, which

was originally designed to prepare the body for space travel. The project happened as a result of a bus ride where I had a random encounter with Alex MacDonal, a NASA economist who is also a TED Fellow. He turned around to me on this bus ride and said, “NASA is concerned with the complications of growing a fetus in zero gravity.” This inspired me to create the Future Day Spa, a personalized physiological experience where the body is consumed by a vacuum that replicates the feeling of being hugged or embraced. I have the participants lie down and apply a fetal Doppler that lets them listen to their heartbeat. I then apply a vacuum to the entire body, sealing it in this environment, and I synchronize the heartbeat with the breathing sensation of the vacuum around the body.

What reactions have this elicited from participants?

One participant preemptively disclosed that he chooses not to have any physical contact with any other human, but he enjoys the sensation of being embraced with the vacuum around his body. After giving him a long treatment of what essentially consists of the vacuum oxygenating the body, he got right up and hugged me, which was quite an amazing experience, because I don’t know how long it’d been since he had hugged somebody.

Do you think this particular experience could be replicated and used to treat certain social anxiety disorders?

After finishing that participant’s treatment, I immediately started looking into touch syndrome and why someone would deprive himself of human contact. I researched oxytocin release and its connection to autism. Today, I’m working with King’s College in London and exploring the possibility that the Future Day Spa could be developed into a product to treat social anxiety and autism. I feel like I’m on the brink of something having seen some of the experiences I have to date.

Are there any other projects you’ve developed that have been particularly exciting?

In another project, the Swallowable Parfum, I was looking into the future possibility of using a cosmetic pill to reprogram our biology away from disease and aging. I worked with a synthetic biologist to find a way to create a biologically enhanced fragrance that, when taken in pill form, causes you to perspire and emit your own genetically enhanced fragrance. Essentially, I was hoping for a way to use pheromone excretion and smell as a way to communicate one’s desires and genetic information.

What has the feedback been like for the Swallowable Parfum?

I released the idea as a short campaign on my Web site and two days later it was on CNN. It went viral and was viewed by two million people. I was flooded with emails, particularly from Middle Eastern pharmaceutical companies who were ready to distribute my product as soon as I sent it to them. Of course, I had to make it clear that the idea for the pill was an artistic provocation. I’m really interested in exploring the niche I’ve found between pharmaceutical products and luxury.

Are there any particular ideas that you hope for people to take away from your work, or does it vary from project to project?

With the Future Day Spa, I am interested in using physical contact with people to treat them using storytelling and help them ponder the future of their health through the lens of science fiction. I don’t hope to try to make a specific point or cause an audience to react in a certain way. I plan to use an instinctive creative process rooted in evidence-based research. The outcome could be a product, film, installation, symposium or workshop—anything that purely provokes and makes people question what happens when we merge theater with biotechnology, and entertainment with science and human adaptability, for example.

What is your creative process when you first start thinking about a new project or building something new?

Each project has a unique creative process, but what I think is consistent through-

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out is that I use my own body as a testing ground. For a film I'm working on right now for the London Science Museum called *The Institute of Isolation*, I will be interviewing leading scientists in endocrinology and tissue engineering. These conversations will provide narration over visuals in which my body is being used to quantify different sensory scenarios. Similarly, for the Future Day Spa, the creative process involved vacuuming myself using different materials, environments and scenarios.

Is this film the only project that you are currently working on, or are you working on a number of different things simultaneously?

I try to focus on one project at a time, but of course that's not always possible. The other project I'm doing at the moment is an exhibition called *Close Up* that will take place in March in Los Angeles and is curated by the architecture school SCI-Arc. I'm working with three students to develop a biological anamorphic process in which we animate DNA strands that are reflected back into a mirrored surface. At the moment, I am working on a few different projects, but I do tend to focus on one at a time.

Do you feel your work evolving, and is it evolving in a way that has surprised you?

Yes, my work is absolutely evolving. Across my most recent projects, I can feel a natural gravitation toward collaboration with people from different disciplines and backgrounds, with an important focus on science as a regular part of my process. Interestingly, more and more of my projects have resulted in outcomes that could be used to treat autism, an area where I'm developing a serious interest in and hope to eventually create a product for through a creative project.

Much of your work is focused on the human body and the integration of technology to augment that body. How do you deal with the debate and controversy that tends to arise around some of these ideas?

"My work is absolutely evolving. I can feel a natural gravitation toward collaboration with people from different disciplines and backgrounds, with an important focus on science as a regular part of my process."

I have always been generally optimistic about this type of debate. I'm particularly fascinated by the ethical questions surrounding the use of technology to postpone or prevent death. I was recently at a lecture on the history of embalming technology, which has enabled us to maintain the body's figure long after death. I'm interested in the potential for technology to embalm the body as a live human being, deliberately postponing death. I tend to be the person asking more questions, and I prefer to contextualize my perspective through film or installation, as compared to making an ethical statement as a voice.

In all of your research, has any future technology ever struck you as particularly terrifying or exciting in its potential to alter our perception of reality or what it means to be human?

I have to say that I have quite a high tolerance for being terrified by imaginative ideas for technology. I have a wild imagination in general and much of my inspiration comes from the extremes and fringes of culture. I had a conversation with a neuroscientist a few years ago about his research on a wireless device that could be implanted under the skull to control bodily function and how it could affect the future of the body. It led me to thinking that the distance between science fiction and reality is shrinking, and there are a number of people ready to hit "play" on

some of these new realities.

What led to your decision to become a TED Fellow, and what have been the implications of doing that?

I was actually invited by TED to apply in 2011 and initially thought it was spam when I received the email. I, of course, applied and was overwhelmed with their reaction when they told me they wanted me as a TED Fellow. I think that the exposure and opportunities from being a part of that network have been incremental. I'm now starting to feel the effects, having received the opportunity to work closely with scientists and being uniquely positioned in an emerging science and technology landscape as someone without a degree in those areas.

What advice would you give to someone who is inspired by your work and wants to pursue a similar path?

I'm still very much progressing in this type of work, but from the experiences I've had, I've found it very important to cultivate your curiosity and investigate topics or subject areas that you are interested in. I have also found that being very diverse and developing the role of a hybrid can be very helpful when working in collaboration to be able to achieving your end goal. Without sounding too cheesy, it's important to be instinctive and dive into what you're interested in, as opposed to listening to what's going on in the periphery.

Do you have any literature, film or other recommendations that have particularly inspired you?

Without a doubt, I'd recommend *Evolving Ourselves* by Juan Enriquez, a sensational read. Another is *Codex Seraphinianus* by Luigi Serafini, which is a stunning illustrated encyclopedia from the 1970s of an imaginary world that nobody can read. *Upstream Color* is a film for which Shane Carruth served as a kind of Swiss Army knife. He wrote, directed, scored, edited and starred in the film. He also served as second camera and his family catered for it. Another film I'd recommend is *THX 1138*, George Lucas' first film from when he was a student. **FT**

The Emerging Tech Portfolio

Company[symbol]	Coverage Initiated	Current Price	52-week range	Mkt Cap (\$mil)
INTELLECTUAL PROPERTY INCUMBENTS Leading researchers in the physical sciences, with big potential for spin-offs and revolutionary breakthroughs				
GE [GE]	8/07	\$29.08	\$19.37-\$31.49	\$298,870.00
HP Inc. [HPQ]	3/02	10.52	8.91-14.82	19,370.00
IBM [IBM]	3/02	132.45	116.90-176.30	132,010.00
ELECTRONICS Companies that have corralled the key intellectual property that will be the foundation for next generation electronics				
Nanosys [private]	3/02	n/a	n/a	n/a
ENERGY Companies that are developing high-efficiency, low-cost alternative energy technologies				
First Solar [FSLR]	8/07	63.54	40.25-72.12	6,460.00
ENABLING TECHNOLOGIES Tools and instrumentation that enable critical science and technology discoveries				
Veeco [VECO]	3/02	19.38	16.54-33.22	809.50
FEI Company [FEIC]	1/03	74.92	64.93-87.51	3,130.00
INVESTMENT VEHICLES Funds that have investments in promising emerging technology companies				
Harris & Harris Group [TINY]	5/02	1.72	1.72-3.85	55.30
PowerShares WilderHill Clean Energy [PBW]	8/07	3.81	3.51-6.00	94.47

Stock prices as of February 18, 2016

Word on the Street

GE: General Electric shares finished up 2.1% as the conglomerate prepared to move its headquarters to Boston. GE is attempting to position itself at the center of the industrial Internet tech sector, a strategy underpinning the company's launch of Current, its new energy division. Jeff Immelt, chairman and CEO of GE stated, "Current combines GE's products and services in energy efficiency, solar, storage and onsite power with our digital and analytical capabilities to provide customers—hospitals, universities, retail stores and cities—with more profitable energy solutions." Meanwhile, GE reported that quarterly oil & gas revenue dropped 16% over the prior year due to low prices in the market.

HPQ: HP Inc. shares gained 4.1% as the company introduced a number of new products at the Consumer Electronics Show (CES) such as the EliteBook Folio, a thin business-class notebook and Sprout Pro, a suite of tools focused on schools and professionals. HP Inc. and **HP Enterprise** [HPE] will be reporting separate earnings for the first time since their November 1 split later this month.

IBM: Big Blue shares rose almost 2% as the company continued to aggressively expand its cloud and mobile business divisions. IBM announced an acquisition of Truven Health Analytics, a health care analytics firm

in a \$2.6B deal that is expected to close later this year. The tech company also announced a partnership with **Under Armour** [UA] to incorporate Watson technology with Under Armour's health and fitness apps. To complement this strategy, IBM announced additional acquisitions of three online advertising agencies, Resource/Ammirati, Aperto, and exc. io, for undisclosed sums.

FSLR: First Solar stock gained 3.6% as the solar leader prepared to announce earnings on February 23. First Solar has exceeded expectations in five of the last eight quarters, fostering a sense of optimism amongst investors.

VECO: Veeco Instruments gained more than 13% on the month and announced a collaboration with the Belgium-based nanoelectronics research center IMEC.

FEIC: FEI Company shares added almost 8% during the month.

TINY: Harris & Harris Group lost 3.3% on the month.

PBW: The PowerShares WilderHill Clean Energy portfolio slipped less than 1%.

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