DINA LITOVSKY

Climb Aboard, Ye Who Seek the Truth!

What do you get when you stick some of the conspiracy world's biggest celebrities and their die-hard fans on a cruise ship in the middle of the Pacific Ocean for a week? Some fascinating insight into our strange times. And one near fistfight.

// BY BRONWEN DICKEY AUG 17, 2016

It was a bit after seven, and I should have been downstairs on Plaza Deck, dressed in formal attire and enjoying dinner with the conspiracy theorists. There were about a hundred of them, and they were nearing the end of their week—the last week in January—aboard the *Ruby Princess*. Many of them were older people, and each of them had paid $3,000 (not including airfare and beverages on board) to participate in the first-ever Conspira-Sea Cruise, a weeklong celebration of "alternative science" hosted by a tour company called Divine Travels. For the past five days, they had

debated UFOs, GMOs, government mind-control programs, vaccines, chemtrails, crop circles, and the Illuminati's plan for world domination, all while soaking up the mystical energies of three Mexican tourist towns known mainly for wet T-shirt contests and Señor Frog's.

But I was not on Plaza Deck. I was locked in my stateroom on Baja Deck, picking at a room-service cheeseburger. Earlier that afternoon, a pair of Conspira-Sea presenters had chased me—*chased* me—from a conference room. This wasn't our first confrontation, and now I feared they were tracking me around the ship, waiting to spring out from blind corners and empty doorways.

Understand that I don't consider myself the paranoid type. Although when I had come across the Conspira-Sea Cruise on a science blog a few months earlier, I'd known I wanted to go, but not because I fear dark forces are out to get me. I used to love *The X-Files,* and the prospect of discussing Roswell and JFK over piña coladas sounded like fun. So did getting to know some devoted conspiracy wonks. Wondering whether the world is actually as it seems is a uniquely American sport, and there's plenty of evidence that's worth wondering about—this is the country of Watergate and the Tuskegee experiments and the NSA tapping your phone.

But the *Ruby Princess* was no place for casual wonderers. The *Ruby Princess* was for people who scraped together three grand to be reassured that their fears and suspicions and theories aren't the lonely fever dreams of basement-dwelling outcasts, that those fears and suspicions are valid, and that others share them. It would be like a weeklong, in-person internet chat room.

A predinner prayer in the ship's Michelangelo Dining Room.
DINA LITOVSKY

Not that that's necessarily a good thing. Chat rooms can be terrifying (virtual) places, rabbit holes of self-reinforcing misinformation. Dip your toe into Reddit or Disqus and you will be bombarded with proof that Bigfoot lives in the mountains of the Pacific Northwest and that our government is run by giant lizards posing as politicians. Charlatans with slick websites can now manipulate data, doctor images, and fabricate documents, collecting thousands of followers. But it's not fair to dismiss all conspiracy theorists as web-dependent crackpots, and there's a difference between caution and paranoia—between reasonable skepticism and a wholesale rejection of scientific method. I didn't know what I'd find on this cruise. One of the great blessings of the internet is that it helps us find people who are like us, or who seem to be like us. For example, there are casual Phillies fans, and then there are the kind of Phillies fans who spend endless hours on Phillies fan websites e-conversing with the equally obsessed. Likewise there are people who kind of wonder, fleetingly, whether Lee Harvey Oswald acted alone before their thoughts return to work and family and whether to take the freeway or the local roads. And then there are people who fly far from home, at great expense, to spend a week on the Conspira-Sea Cruise.

Somewhere in the middle was me, deadbolted in my room. Paranoid.

"DEATH IS NOT REAL," HE SAID. "THAT'S THE BIGGEST BUNCH OF CRAP ON EARTH."

On a brighter, happier afternoon five days earlier, I boarded the *Ruby Princess* in San Pedro, California. Flanked by the port's grimy regiment of industrial smokestacks, the ship gleamed majestic white and soared almost two hundred feet into the air. She could accommodate more than three thousand passengers, occupying them with four swimming pools, twelve dining rooms and restaurants, an outdoor movie screen, two nightclubs, a full-service spa, and enough rococo baubles to satisfy Liberace. The ship's central atrium and its giant spiral staircase glittered like a pageant crown. Every corridor stretched into eternity, with identical stairwells crosshatching all nineteen decks.

"I'm so glad you made it!" said Adele McIntosh, the tour company's travel agent, when I finally located the Conspira-Sea check-in desk. She gave me a tight hug, then handed me my name tag and an orientation packet. When I wrote "Popular Mechanics" on my sign-in form, a woman to Adele's right shuffled some papers and nodded approvingly.

"Wonderful to have you with us," the woman said. "We're only now beginning to understand the quantum realm."

One of the maze-like hallways on the *Ruby Princess.*

DINA LITOVSKY

The week's seminars appeared to be split into two broad categories. There were those with a magical or highly new age component: "Astral Possession, Psychic Vampirism, and Exorcism," "Gaia-Sophia, Timelines and Global Alchemy," "How to Control the World with Mind Machines." And then there were those that detailed concrete, terrestrial dangers: "Are GMOs and Roundup Causing Disease in Millions?"

"Vaccinations: Do You Really Know What's Coming Through That Needle?" A subset of the second group concerned itself with the U.S. legal and banking systems. Unfortunately, the nightly UFO watches had to be canceled because the man who was to lead them had recently suffered a stroke.

Inside my orientation tote bag was a shiny blue bracelet I was supposed to wear at all times. "Makes it easier to find members of the group," Adele said. But that wasn't necessary. Most of the cruisers—the vacationers, not our group—were generally outfitted in bright colors and loud prints. As the days passed, a lot of them began wearing novelty captain's hats from the gift shop. The conspiracy group, on the other hand, was mostly serious-looking senior citizens in "Infowars" T-shirts. Some of them wore casts, others walked with canes. Two relied on motorized scooters. None looked like he or she could afford to spend money frivolously. One eighty-year-old man's toes poked through the tops of his worn leather loafers.

I headed to the windowless conference room that had been temporarily renamed the Liberty Lab.

"Welcome everyone," said Dr. Susan Shumsky, the founder of Divine Travels and (claim to fame) one-time personal staff member of Beatles' guru Maharishi Mahesh Yogi. (Her doctorate in divinity is from the Teaching of Intuitional Metaphysics in San Diego.) "I'd like to begin with a prayer." Nearly everything the woman wore was either bright pink or sparkled. "Breathe in divine light!" she said. We closed our eyes and inhaled. Across the hall, in Gatsby's Casino, slot machines clanged to a piped-in soundtrack of Taylor Swift and Rihanna.

Then sixteen presenters introduced themselves and gave brief synopses of their seminars. Laura Eisenhower—great-granddaughter of Dwight!—said she had been invited in 2006 to join a secret American colony on Mars and that aliens, including some prominent U.S. politicians, are already living on earth in disguise. Dannion Brinkley, a *New York Times* best-selling author, announced that he had risen from the dead three times, the first after a lightning strike that sent him on a twenty-eight-

minute sojourn through the afterlife. "Death is not real," he said. "That's the biggest bunch of crap on earth." Winston Shrout spoke of "commercial redemption," a philosophy that promises each American citizen access to giant piles of secret money.

"Generally I do speak from a little bit of a higher level," Shrout drawled in a thick Kentucky accent. "Because to understand commercial redemption, you have to go into the fifth, and even sixth, dimensions."

The attendees scribbled in their notebooks and eagerly circled items on the schedule. There were pitches for wishing machines, astrological charts, and dowsing rods, followed by screeds against Big Pharma and Monsanto. Sean David Morton, whom AM radio host Art Bell called America's Prophet, vowed to help us get out of debt while sticking it to the American court system. (He did not mention that in 2010 he was sued by the Securities and Exchange Commission for telling a group of investors that he could psychically predict the stock market or that he tried to escape fraud charges by declaring himself the ambassador of a nonexistent country called the Republic of New Lemuria.)

Sean David Morton is called "America's Prophet." Psychically predicts the stock market. Recently arrested on charges to defraud the IRS. Has amazing taste in neckties.

DINA LITOVSKY

The biggest name on the program was Andrew Wakefield, the discredited former British gastroenterologist who wrote a highly controversial (and since retracted) 1998 paper that claimed to find an association between the measles-mumps-rubella (MMR) vaccine and autism in twelve children. The U.K.'s General Medical Council stripped Wakefield of his license in 2010, by which time he was living in the U.S. where he had assumed rock-star status among the growing American anti-vaccine movement.

Wakefield was superficially charming, if a bit weary. "The story of my life is basically how to take a perfectly good career and flush it down the toilet," he said.

Later that night, in the Michelangelo Dining Room, Dannion Brinkley was sitting under an airbrushed painting of Poseidon. He is six-foot-four, and the flowing scarf under his sport coat gave him the appearance of an aging linebacker who had just returned from an ashram. Several fans were gathered around him. He motioned me over warmly and I sat down.

"What is your motive for being here," he asked, "and what is your *intention?*"

Puzzled, I looked to the young man on my left, who said he was an orthodontist from Calgary named Leo. He leaned over and whispered in my ear, "Dannion can immediately tell if people are on the right frequency, like tuning a radio. He's trying to figure out what frequency you're on."

"I'm a reporter for Popular Mechanics," I told Dannion, "and I'm here to learn about the conspiracy community."

He beamed and started telling me about his lightning strike. "Whether or not you believe me doesn't matter," Dannion said. "Because ultimately I'm going to win the argument. You are not going to die, and some of us can get up from the dead."

Before he could elaborate, a pair of presenters, Leonard "Len" Horowitz and his girlfriend, Sherri Kane, breezed into the room and sat down at our table. Online, they call themselves "The Horokane." Len bore a strong resemblance to the Count from *Sesame Street,* if you had frozen the Count in 1974 and dressed him in Hawaiian shirts. A former dentist from New Jersey with a degree in public health from Harvard, he is most well-known for writing a 1996 book that theorized the AIDS and Ebola viruses are genocidal weapons engineered by the U.S. government to depopulate the planet through vaccination programs. On the cruise, however, he would be lecturing on the key to lifelong health and world peace: the "miracle frequency" of 528 hertz.

According to Len, everything in the universe emits vibrations, and all the positive, life-affirming forces (including the green/yellow light in rainbows) "resonate" at a frequency of 528 hertz. Therefore, all music should be tuned in 528 hertz, rather than the 440 hertz of standard tuning, which he asserted was an evil plot imposed by the Rockefeller Foundation to militarize the world's populace. Len believes that standard tuning aggravates the pineal gland, making all of us emotionally distressed, sicker, and more destructive. He called this "musical cult control."

"You," he said to me, and then paused. "Are … a … digital, bio-holo-*graph*-ic, precipitation, crystallization … mi-*rac*-ulous manifestation! Of divine frequency vibrations, forming harmonically in hydrospace."

"Okay," I said.

"That's the frequency that monks used to chant in while making brandy," Dannion added.

Len's face lit up. "When was that?"

"In the 1340s," Dannion said.

"And how do you know that?" Len asked.

Dannion dabbed at the corners of his mouth with his napkin and said, "Because when you die, you know these things. I saw it when I crossed over."

Sherri introduced herself as an investigative reporter who "defected from Fox News." A pretty blond much younger than Len, she seemed to be the great love of his life. "If it weren't for her," Len said, "I might not have known that my ex-wife was working with the CIA to undermine me." (Reached by email, Len's ex-wife denied these allegations.)

"How do you know *I'm* not working for the CIA?" I joked.

Sherri waved the question off, laughing. "Because trust me, it would be obvious. If you were a plant, I would *know*."

Cruisegoers paid around $3,000 for the weeklong trip. Not including umbrella drinks.
DINA LITOVSKY

When the ship lurched away from the dock and the ice cubes in our water glasses chimed under the drone of the propellers, Dannion requested that we all join hands to pray. Len lowered his voice and leaned across the table.

"The real question," he said, "is whether, after you've learned the truth about all this stuff, your editors at Popular Mechanics will even let you write it."

The next morning, shortly before Wakefield's lecture "Whistleblowing in the Public Interest," a tall, lean man wearing a shiny blue bracelet stood near the elevators. His name was Larry Cook. A soft-spoken fifty-one-year-old anti-vaccination activist from Los Angeles, he said he had joined the trip specifically to meet Wakefield, whom he regarded as something of a personal hero.

"The media has tried to destroy Andy," Larry said as he walked toward the back of a dining room where about fifteen other people were clustered. "But it's all lies and character assassination. We don't *need* drugs and vaccines. If we adopt a healthier lifestyle, we can regain our health without using them. Think about it: If vaccines actually worked, then why do these diseases still exist at all?"

The seminar began. For an hour, Wakefield paced in front of a projection screen, which ballooned his shadow to giant proportions. Slides of children born without arms and others screaming in pain flashed behind him.

"Your bodies are owned by Big Pharma," he said. "It's turning into a science-fiction movie." The audience gasped and shook their heads in disbelief. "This will be the end

of the United States of America." During the Q&A portion, Wakefield added, "This is a deliberate eugenics program, a deliberate population-control program."

I looked around the room. People were sitting and listening attentively. For the first two days, I was heartened by how open and friendly most of the group was, even if they sometimes said surprising things. They told me about their lives and how they were drawn to the conspiracy community.

"Ever since I was little, I've just known that something was off," a fit, stylish forty-seven-year-old office manager named Cary told me. "That we aren't being told everything. My family doesn't believe me, but they are totally brainwashed."

I asked her why she thought the government was poisoning its own citizens with vaccines and GMOs.

"Because they want to f--king kill us!" she said.

Not everyone was as cynical. Missy and Ron Hill were a married couple from Florida. Missy had a tousled thatch of short blond hair and wore a black leather jacket. Ron wore sandals and floppy fishing hats. The two had met in church roughly fifteen years ago. When Ron, a truck driver for a cryogenics company, was assigned longer runs, Missy went to truck-driving school so that they could see the country together. It was out on the open road that the couple began listening to the late-night AM radio show *Coast to Coast AM,* hosted by Art Bell, who is best known for broadcasting interviews with UFO researchers from a remote station in the middle of the Nevada desert.

"There was so much stuff I had never realized was going on," Ron said. "After that, we were kind of hooked, I guess." The couple's interest in "star gates" and global energy fields inspired them to travel to places like Ireland, France, and Spain. Unlike some of the other cruisers, they explored the world rather than hiding from it.

As the week went on, word spread among the participants that I was writing for a magazine that often covered the world of science. First, Susan Shumsky informed me and Dina Litovsky, the photographer on the story, that Wakefield had requested we not attend the preliminary screening of his documentary, *Injecting Lies,* which alleges that the Centers for Disease Control and Prevention has ironclad evidence that vaccines are linked to autism but has chosen to hide this alarming connection from the public. (Months later, the film—its title changed to *Vaxxed: From Cover-Up to Catastrophe*—would cause a heated national debate when it was accepted, then rejected, by the Tribeca Film Festival. In reviews, *Variety* called it a "scientifically dubious hodgepodge of free-floating paranoia" while *The Guardian* said it was "probably headed straight to the junkheap with all the other conspiracy films." Only when contacted by Popular Mechanics' research department five months later did Wakefield—through his publicist—offer to send me a link to the film.) Then we were asked by Jeffrey Smith, an anti-GMO activist whose previous career involved "yogic flying," to leave two other panels. After that, attendees began ducking out of photos and complaining about Dina's flash.

On Tuesday morning, we sat down in the front row of a presentation we had not yet been barred from: Len Horowitz's lecture on 528 hertz. While Len fussed with the projector, Sherri set out boxes of nutritional supplements and crystal pyramids for sale. Their flagship product, OxySilver, retailed for $49.40. It contained one listed ingredient: purified water, though its nutritional table also included 5 micrograms of colloidal silver.

Despite widespread seasickness, most of the week's presentations in the Liberty Lab were full.
DINA LITOVSKY

"I took some OxySilver, and I'm already feeling better!" a woman in a scooter who'd suffered a recent bout of cancer announced to the room.

Dressed in a black velour jacket and white shirt with a butterfly collar, Len walked over to me. "I just want you to know that if you degrade and disparage me and libel me in your article," he said, "I will devote everything I have to exposing Popular Mechanics and the people behind it."

"I'm not here to degrade anyone, Len," I said. I was somewhat in shock, because our conversation at dinner the first night had been so pleasant. "And certainly not to libel them. What is going on?"

"I am living a *nightmare!*" he sputtered, his voice rising like water starting to boil. "Every day of my life is like a roller coaster in *The Twilight Zone.* But I do this because I will not stand by and *watch this genocide!*" His eyes began to fill with tears. "I think that people should be able to choose how they are going to die, and not be *wiped out by the government!*"

The initial thrill of a tropical vacation soon curdled into tension and distrust.

Maybe it was the claustrophobia of all those small, windowless rooms. Or the seasickness that seemed to claim more Conspira-Sea participants by the day. I saw fewer of them relaxing by the pool or playing Texas Hold'em. At breakfast one morning, a woman whose father had survived the Holocaust told me that she broke down in tears when another cruiser claimed it never happened.

WE WERE BOBBING ON THE WATERS OF PURE INSANITY.

(One bright spot: During a day trip to the Las Labradas petroglyphs—carvings etched into large boulders on a beach near Mazatlán—Larry Cook calmly mentioned that the reason few people were now talking to me was that I was "pro-vaccine." We had a civil conversation about the issue—me conceding I was swayed by scientific consensus and the mountain of rigorously controlled peer-reviewed studies that have proved vaccines to be safe and effective, Larry remaining skeptical. Neither of us

changed our minds, but we didn't get into a heated shouting match or assault each other's motives. In the two-dimensional world of the internet, it is easy for people on the opposite sides of a controversy to become ciphers to be vanquished rather than human beings with legitimate questions and concerns. It's much harder to dismiss someone right in front of you, a person whose story you know.)

That night the ocean whipped itself into twelve-foot swells. Even more people grew seasick. Still, there were enough to pack the Liberty Lab for the Horokane's screening of their documentary about the Paris terrorist attack on the Bataclan concert hall in November 2015, which they maintained was part of one large false-flag operation. It turned out to be a plotless pastiche of Hollywood movie trailers (*Wag the Dog, Our Brand Is Crisis*), interview segments with survivors of the Bataclan theater attack downloaded from YouTube, and clips of Sherri and Len talking in front of a green screen that had been digitally rendered to look like a news desk. Drawings of Satan and banners denouncing the militant media scrolled behind Sherri's head, as did several advertisements for Len's supplement company, Healthy World Organization.

The film's central thesis went like this: Hollywood superagent Ari Emanuel (who represents Eagles of Death Metal, the band that was playing at the Bataclan when it was attacked) was in cahoots with the Lagardère Group, a French media conglomerate that had purchased the Bataclan in September 2015. Because Qatar Holding has a stake in Lagardère, and because the government of Qatar has been criticized for tacitly allowing terrorist groups to do their banking in the United Arab Emirates, and because—and this is where they totally lost me—Ari Emanuel is the brother of Rahm Emanuel, the mayor of Chicago, the Horokane believed that Lagardère must have orchestrated the attack with the help of Ari Emanuel.

A sign that was held up to presenters to keep them on schedule.
DINA LITOVSKY

When the film ended, Sherri grabbed the microphone. Her face had turned into a grim, ugly mask, the corners of her mouth pulled downward as if by strings.

"I don't want anybody to leave the room right now," she said. "I have a question." She pointed at Dina, our photographer, who was circling the room taking pictures.

"Come up here," Sherri said. "I want you to tell everybody who you work for."

"I'm with Popular Mechanics," Dina said. "Everybody knows that."

As though she were talking to a small child, Sherri continued, "And can you tell everybody what Popular Mechanics has to do with a *conspiracy cruise?*"

Someone in the audience interrupted, "You know she's the photographer, not the reporter?"

"Let me ask the questions, okay!" Sherri snapped, turning back to Dina. "And can you tell everyone why Popular Mechanics would be interested in people like us?"

Dina just smiled. "What, you don't think you are interesting?"

"You're taking photos so that you can label us conspiracy theorists!"

Dannion Brinkley groaned. "Let's keep it in 528, y'all," he said.

A woman named Abbie, who taught free yoga classes every morning, also stepped in. "That's enough, guys," she said.

"And who are *you?*" Sherri said.

"She's a plant!" someone yelled from the audience.

Eyes rolled. Heads shook. People filtered out.

Someone muttered, "She's the yoga teacher."

When we arrived at the Liberty Lab the next afternoon, Len accosted Dina in the doorway. His eyes were the size of dinner plates.

"I want you to see something!" he shouted as he tried to force a packet of papers into her hands, then mine. They were articles from Popular Mechanics debunking bad science. Apparently Len and Sherri had been up all night Googling the magazine and printing out documents in the ship's computer center. There was also a Wikipedia entry that linked the magazine's parent company, Hearst, to the Lagardère Group.

I tried to laugh it off and go around him, but Len wouldn't let me pass.

"Look at this!" he shouted, his face contorting with rage. "Look at this! *This is why you're here!* You're here in *bad faith!*"

Larry Cook, who had also been milling around in the hallway, stepped in front of Len to keep him from lunging at me.

"Get your hands off me!" Len shouted at him. "Get your f--king hands off me!"

Attendee Larry Cook (left) defends the Popular Mechanics team from presenters Len Horowitz and Sherri Kane.
DINA LITOVSKY

Armed with a camera, Sherri darted out from behind Len and chased me around the hallway, demanding that I explain myself. As I tried to block my face from the camera, I got trapped against the wall between Len and Larry, who seemed seconds away from a full-on brawl.

"If you don't stop this, I'm calling security," Larry said. Len then challenged Larry to a fistfight in the ship's gym.

That's when I ducked out of the corridor, fled Fiesta Deck, and dead-bolted myself in my cabin for the rest of the night. We had sailed far from the Mexican coast, over reason's horizon. We were now bobbing around on the waters of pure insanity.

The hallway showdown turned the rest of the trip into a blur. Wakefield chummily invited me and Dina to his third presentation, which we declined, only to learn from others who attended that he had planned to ambush us by reading aloud from Popular Mechanics. Dannion Brinkley "read my energies" by giving me a long hug. "You were flowing beautifully just then," he said. "But you're putting love out there to someone who isn't giving it back. You're giving this person too much power. You need someone who can appreciate you … like me!" Winston Shrout, in his farewell lecture, reasserted his position as the third-dimensional delegate to the Galactic Roundtable, noting that many of his clients were "fairies and elves." I learned from Laura Eisenhower that Hillary Clinton may have a supernatural agenda for world domination. "She's not even human," Eisenhower said. "You don't want to know what she is."

I also witnessed something called the Baked Alaska Parade. It was the final night of the cruise. I was eating dinner with Dina in the Da Vinci Dining Room, taking long pulls on overpriced beer. The lights dimmed. The waitstaff, holding LED-lit trays of meringue cakes over their heads, formed a conga line and began snaking around the tables to the song "Hot Hot Hot." Someone with a microphone shouted, "Ladies and gentleman, get those napkins up!" And they did. Everybody in the dining room except Dina and I twirled their napkins in the air while singing along. *Olé, o-lé, olé, o-lé*. It was kind of silly, but I think the point was to make people feel they were a part of something bigger.

"WHETHER OR NOT YOU BELIEVE ME DOESN'T MATTER. BECAUSE ULTIMATELY I'M GOING TO WIN THE ARGUMENT. YOU ARE NOT GOING TO DIE, AND SOME OF US CAN GET UP FROM THE DEAD."

The conspiracy community does the same thing. Its emotional power is much stronger than facts. It offers a worldview in which chaos, randomness, happenstance—the messy, frightening qualities of life that science depends upon and our minds find so hard to accept—simply do not exist. For some, a sinister reason for life's disappointments is more satisfying than no reason at all.

When we finally disembarked, after Dina and I had driven away, a team of special agents with the Internal Revenue Service arrived at the port and arrested Sean David Morton and his wife, Melissa, on fifty-six counts of fraud, including filing a false tax return that sought a refund of $2,809,921. If convicted, the two face more than six hundred years in prison. (Both have pleaded not guilty.) A couple months later, Winston Shrout was indicted for allegedly printing more than $1 *trillion* in fake financial documents. (He has also pleaded not guilty.) Len and Sherri returned to their home in Hawaii and wrote a long, angry blog post charging me with war crimes and claiming I was part of a top-secret cell of "Pharma Trolls." They also charged Larry, who tried to protect me, as being a double agent for Big Pharma.

Even then, I had a hard time feeling angry at Len.

"I had a brilliant mother who scrubbed the streets at Nazi gunpoint in Vienna," he revealed during one of his last panels, which I attended only after Adele's assurance that she would call security if the Horokane caused any more scenes. "By miracle my mother made it onto one of the last ships out of Europe. By a miracle I am sitting here today. My mother used to say, 'Lenny, you have no idea. Corporate fascism and neo-Nazism could arise at any time and anywhere, in any country.' And I said, 'Mom, I understand your pathology. You're neurotic. Had I been through what you went through, I certainly would feel the same way. You see Nazis everywhere. But I'm sorry, I can't go along with that agenda. I would recommend some good therapy.' "

Then Len's mother received the 1976 swine flu vaccine. After that, she developed Guillain-Barré syndrome, a disease that attacks the peripheral nervous system. She also developed uterine cancer. When she died, Len became convinced that the

vaccine—which *was* linked to a small uptick in Guillain-Barré, according to the CDC—was responsible for her illness and subsequent death.

Len Horowitz saw something troubling in the world. When bad things happen without cause, some people turn to religion for comfort. Some look for a scientific reason. Some conclude that bad things happen and there's nothing we can do. Not Len. Len wanted a direct explanation. There had to be one. You just had to know where to look.

**This article origionally appeared in the September 2016 issue of* Popular Mechanics.

MORE FROM

FEATURES

The Real Story Behind the Myth of Area 51
Pop Mech Pro

An Oral History Of the Challenger
Pop Mech Pro

Science Will One Day Cure Blindness

Pop Mech Pro

The Blood of the Crab

Pop Mech Pro

What About Bob Vila?

Can the Air Force Learn To Love Startup Culture?

FEATURES | CULTURE | WHAT A $115 MILLION CRUISE SHIP UPGRADE LOOKS LIKE

THE WILD CONSPIRACY THAT THE TITANIC NEVER SANK | 3 REASONS TO DOUBT THE TWA FLIGHT 800 CONSPIRACY THEORY

DEBUNKING THE 9/11 MYTHS: THE WORLD TRADE CENTER | DEBUNKING THE 9/11 MYTHS: SPECIAL REPORT - SOURCES

DEBUNKING THE 9/11 MYTHS: SPECIAL REPORT

Information and Management Systems Society (HIMSS) 16 in Las Vegas, March 1-3.

About Hearst Health

The Hearst Health network includes FDB (First Databank), Zynx Health, MCG and Homecare Homebase, Hearst Health International, Hearst Health Ventures and the Hearst Health Innovation Lab. The mission of the Hearst Health network is to help guide the most important care moments by delivering vital information into the hands of everyone who touches a person's health journey. Each year in the U.S., care guidance from the Hearst Health network reaches 84 percent of discharged patients, 174 million insured individuals, 41 million home health visits, and 4 billion prescriptions. www.hearsthealth.com

About Lightbeam Health Solutions

Lightbeam Health Solutions delivers a revolutionary model for managing patient populations and associated risk. Lightbeam's vision is to bring health data into the light through the use of analytics, and to provide the insight and capabilities healthcare clients need to ensure patients receive the right care at the right time. Lightbeam's platform facilitates end-to-end population health management for ACOs, payers, large provider groups, health systems and other healthcare organizations aspiring to provide superior care at a lower cost. For more information, visit www.lightbeamhealth.com.

Image Available: http://www.marketwire.com/library/MwGo/2016/2/24/11G084299/Images/Hearst_Health-8489a37ad001a8b38ca89a1d238ac4ec.jpg

Exhibit 2

MARCH 30, 2021

HEARSTLINK

Daily News & Industry Briefing

Today's Top Stories: Vaccine Efficacy | Women in Journalism | Tokyo Olympics

Study: Moderna & Pfizer COVID-19 Vaccines 90% Effective in Real-World Conditions

A new study from the U.S. Centers for Disease Control and Prevention found that both the Moderna and Pfizer-BioNTech COVID-19 vaccines are highly effective in preventing coronavirus infections in real-world conditions. According to the CDC study, both vaccines were 90% effective at preventing infections two weeks after the second dose was administered. In addition, the vaccines were 80% effective at preventing infections after the first dose.

Exhibit 3

ACUITAS THERAPEUTICS

For Immediate Release **November 3, 2020**

CureVac's Positive Preliminary Results for a COVID-19 Vaccine Showcases Important Canadian Connection

Vancouver, B.C. – German biotech firm CureVac has just announced positive preliminary results (https://bit.ly/34TK6Qn) from clinical studies on its COVID-19 vaccine, and it comes with a strong Canadian connection. Vancouver-based Acuitas Therapeutics is providing CureVac with a key element so that this urgently needed vaccine can be effective. Acuitas specializes in the development of delivery systems for nucleic acid therapeutics based on lipid nanoparticles (LNP), which enable messenger RNA (mRNA) vaccines.

To help develop their COVID-19 vaccine, which uses mRNA technology, CureVac turned to its long-standing Canadian partner, Acuitas Therapeutics. Acuitas provides LNP – tiny "delivery vehicles" – that protect the mRNA vaccine after it is injected. In simple terms, Acuitas' proprietary technology protects the vaccine after administration and delivers it into our cells, exactly where it needs to be. The Acuitas LNP delivery system is a key component of mRNA vaccines, and the company is playing a crucial role in the global race for a vaccine that will fight COVID-19.

About Acuitas Therapeutics

Founded in 2009, Vancouver-based Acuitas Therapeutics (www.acuitastx.com) is a private biotechnology company that specializes in the development of delivery systems for nucleic acid therapeutics based on lipid nanoparticles. The company partners with pharmaceutical companies, biotechnology organizations and academic institutes to advance nucleic acid therapeutics to the clinical trial phase and to the marketplace. The team works with partners to develop new therapies to address unmet clinical needs based on its internationally recognized capabilities in delivery technology. Acuitas Therapeutics has multiple agreements in place for their proprietary lipid nanotechnology to be used in the development of several COVID-19 vaccines – with BioNTech (https://bit.ly/389FTdA) and now CureVac (https://bit.ly/34TK6Qn) publishing data from their clinical studies. An additional collaborator has also initiated clinical studies.

-END-

Exhibit 4

EDITORS' PICK | Jul 29, 2020, 07:51am EDT | 96,577 views

Moderna's Mysterious Coronavirus Vaccine Delivery System

Nathan Vardi Forbes Staff
Hedge Funds & Private Equity
Following the money trail

Moderna Therapeutics headquarters in Cambridge, Massachusetts, on May 18, 2020. BOSTON GLOBE VIA GETTY IMAGES

On Monday, Vice President Mike Pence helped launch the big late-stage trial of Moderna Therapeutics' Covid-19 vaccine. "It is remarkable to

edge messenger RNA technology that could result in a viable vaccine. There is widespread hope Moderna's vaccine will play an important role in combating the pandemic. To aid the effort, Moderna has secured $955 million of commitments from the federal government's Biomedical Advanced Research and Development Authority (BARDA).

Wall Street also has high expectations for the vaccine, and Moderna's stock has quadrupled this year to a market valuation of $30 billion, allowing Moderna to raise $1.3 billion in a May stock offering. Moderna insiders have sold some $250 million of shares as the stock has soared.

With the stakes incredibly high, the mystery around a key technological component of Moderna's coronavirus vaccine has only become deeper. Last week, the U.S. Patent Trial and Appeal Board rejected Moderna's challenge to a patent owned by Arbutus Biopharma ABUS -1.1% related to the lipid nanoparticle (LNP) technology that is crucial to Moderna's mRNA medicines.

For a decade, Moderna has been working to develop mRNA technology that could turn the body's cells into drug factories. In order for the approach to work, Moderna needs to safely deliver the mRNA to the body's cells without the payload breaking down in the bloodstream. As a result, any mRNA vaccine or therapeutic consists of two components, the actual sequence mRNA and the delivery mechanism. Moderna has clearly engineered the first component, but there remain questions about the second. No mRNA vaccine or medicine has ever been approved by U.S. or European regulators.

His Workers Into Algorithms
How Troubled Trader Bill Hwang Quietly Amassed $10 Billion

Even though Moderna took the trouble to try to invalidate the patent owned by Arbutus, a small Canadian biotechnology company, Moderna said after it lost its patent challenge that its LNP technology had advanced well beyond the technology described in the Arbutus patent. Moderna claimed the LNP used to make mRNA-1273, its Covid-19 vaccine candidate, is not covered by the Arbutus patent. "Moderna is not aware of any significant intellectual property impediments for any products we intend to commercialize, including mRNA-1273," the company said.

In June, researchers from the NIH and Moderna made a manuscript preprint of preclinical data for mRNA-1273 available on bioRxiv, an open-access preprint repository. The preprint described Moderna's coronavirus vaccine candidate as using delivery technology that appears to be covered in the Arbutus patent that was upheld last week. The preprint of the study that tested the vaccine in mice described the mRNA for mRNA-1273 as being encapsulated into LNP "at molar ratio of 50:10:38.5:1.5 (ionizable lipid:DSPC:cholesterol:PEG-lipid)."

The first claim of the upheld Arbutus patent describes "a cationic lipid comprising from 50 mol % to 65 mol % of the total lipid present in the particle;" a non-cationic lipid comprising a mixture of phospholipid and cholesterol, where the "phospholipid comprises from 4 mol % to 10 mol %" and the cholesterol comprises "30 mol % to 40 mol %;" and a conjugated lipid "comprising from 0.5 mol % to 2 mol %."

In a statement to *Forbes*, Ray Jordan, Moderna's chief corporate affairs officer, said the June preprint describes data generated using a preclinical research formulation of a SARS-CoV-2 vaccine that is not the

same as the vaccine itself.

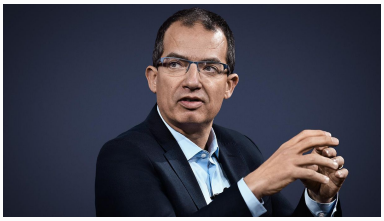
"While the authors of the preprint used the term 'mRNA-1273' for convenience of the reader, the preprint does not describe the cGMP process by which we make our messenger RNA and LNP or the final drug product composition in our commercial candidate (mRNA-1273)," Jordan wrote in a statement.

When asked if Moderna would provide the molar ratios at which mRNA-1273 encapsulates its LNP, Jordan said, "Nope, we are not disclosing our proprietary ratios at this time."

MORE FROM FORBES

Fueled By $500 Million In Federal Cash, Moderna Races To Make A Billion Doses Of An Unproven Cure

By **Leah Rosenbaum**



In a different preclinical study testing Moderna's vaccine in non-human primates that was published in *The New England Journal of Medicine* on Monday, the authors wrote mRNA-1273 is encapsulated in LNP as described in a 2019 paper, which said the mRNA was encapsulated at the same molar ratios as in the mouse study.

The description of the phase 1 study of Moderna's coronavirus vaccine registered with the federal government shows the LNP for mRNA-1273 is composed of an ionizable (cationic) lipid; cholesterol; DSPC (phospholipid) and PEG2000-DMG (conjugated anti-aggregation lipid). The percentages of the four components in the formulation of mRNA-1273 were not disclosed in the clinical trial registration or the July publication of an interim analysis of the Phase 1 study of mRNA-1273 in *The New England Journal of Medicine*. The appendix of

the interim analysis redacts information associated with LNP.

For years, Stephane Bancel, the billionaire CEO of Moderna, has said the company had moved beyond the delivery technology owned by Arbutus. "We knew it was not very good," he told Forbes in 2016. "It was just okay." He said Moderna was producing its own nanoparticle lipids, N1GEL, for example, and licensing another from Merck MRK +1.1%. He added that Moderna only used the Arbutus technology initially and had stopped using it for new drugs back in 2016.

When Moderna was first getting off the ground, Bancel turned to a tiny company called Acuitas to get access to a delivery technology for his mRNA vision. Acuitas was headquartered in the Vancouver, British Columbia, home of Thomas Madden, who founded it in 2009. Madden had been involved in a lawsuit with Tekmira Pharmaceuticals, which had merged with a company Madden had worked for and eliminated his position. Through the litigation, Madden secured a license for the LNP technology he had helped develop. Bancel decided to get a license for the LNP technology from Acuitas and not Tekmira, which later changed its name to Arbutus.

In 2016, Arbutus terminated Acuitas' license to the LNP technology, causing Acuitas to sue Arbutus in British Columbia court. Arbutus countersued, claiming Acuitas had no right to sublicense the LNP technology to Moderna. A B.C. judge issued a temporary 2017 injunction stopping Acuitas from further sublicensing the LNP technology.

A year later, in 2018, Arbutus reached a settlement with Madden that terminated Acuitas' license and stipulated Moderna could only use the technology in four vaccines that targeted viruses that had already been identified.

The Arbutus patents have since been taken over by Genevant Sciences, a subsidiary of Roivant Sciences, which is Arbutus' biggest shareholder and run by Vivek Ramaswamy. Arbutus retains a stake in Genevant and a right to a portion of the economics of the patents. Genevant declined to comment.

In the years since the Acuitas settlement, other vaccine candidates developed by Moderna have been described in publications with LNP technology comprised of the four components listed in the Arbutus patent with formulated percentages that seem to run through the patent. For example, publication of a study of an HIV vaccine listed on Moderna's website in July describes mRNA as being encapsulated by LNP "at molar ratio of 50:10:38.5:1.5 (ionizable lipid:DSPC:cholesterol:PEG-lipid)."

Moderna has challenged three of the Arbutus patents at the adjudicative body within the U.S. Patent and Trademark Office. One of its challenges was successful, another partially successful, and the challenge against the third patent was lost last week. There are three other relevant Arbutus patents that Moderna has not tried to challenge.

Whatever happens on the intellectual property front, it is highly unlikely that a patent issue will get in the way of the development or distribution of a Covid-19 vaccine. But shareholders of Moderna's hot stock were broadly warned in a May securities filing that the company had instituted *inter-partes* review proceedings against issued U.S. patents related to mRNA delivery and the unsuccessful invalidation of those patents might lead to the kind of litigation that could result in substantial damages.

Taxpayers also might have an interest in knowing the ownership of the delivery technologies used by an mRNA vaccine backed by nearly $1

billion of federal government funds. When asked about the delivery technologies, a spokesperson for the Department of Health and Human Services, which houses BARDA, said that intellectual property is assessed for any company submitting a proposal to BARDA, as part of the proposal evaluation process.

Full coverage and live updates on the Coronavirus

Send me a secure tip.

Nathan Vardi

Follow

I am a senior editor at Forbes who likes digging into Wall Street, hedge funds and private equity firms, looking for both the good and the bad. I also focus on the...

Read More

nature COMMUNICATIONS

ARTICLE

https://doi.org/10.1038/s41467 019 14114 0 OP N

Non-equilibrium signal integration in hydrogels

Peter A. Korevaar[1,2]*, C. Nadir Kaplan[1,3,4]*, Alison Grinthal[1], Reanne M. Rust[5] & Joanna Aizenberg[1,3,5,6]*

Materials that perform complex chemical signal processing are ubiquitous in living systems. Their synthetic analogs would transform developments in biomedicine, catalysis, and many other areas. By drawing inspiration from biological signaling dynamics, we show how simple hydrogels have a previously untapped capacity for non-equilibrium chemical signal processing and integration. Using a common polyacrylic acid hydrogel, with divalent cations and acid as representative stimuli, we demonstrate the emergence of non-monotonic osmosis-driven spikes and waves of expansion/contraction, as well as traveling color waves. These distinct responses emerge from different combinations of rates and sequences of arriving stimuli. A non-equilibrium continuum theory we developed quantitatively captures the non-monotonic osmosis-driven deformation waves and determines the onset of their emergence in terms of the input parameters. These results suggest that simple hydrogels, already built into numerous systems, have a much larger sensing space than currently employed.

Exhibit 6

[1] John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA 02138, USA. [2] Institute for Molecules and Materials, Radboud University, Heyendaalseweg 135, 6525 AJ Nijmegen, The Netherlands. [3] Kavli Institute for Bionano Science and Technology, Harvard University, Cambridge, MA 02138, USA. [4] Department of Physics, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, USA. [5] Wyss Institute for Biologically Inspired Engineering, Harvard University, Cambridge, MA 02138, USA. [6] Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA 02138, USA. email: p.korevaar@science.ru.nl; nadirkaplan@vt.edu; jaiz@seas.harvard.edu

ydrogels play a central role in a wide range of applications[1–11], from drug delivery[12] to microsensors[13] to smart optical[14] and homeostatic[15] materials. Much of the recent interest has focused on enabling hydrogels to deform rapidly in-phase with speci c inputs from the environment, such as pH[13,14], temperature[16,17] or chemical concentration[18,19]. In living systems, however, chemical signal transduction—from self-organizing amoebas navigating in elds of chemoattractant waves[20], to heartbeats adapting to ionic bursts and spikes[21], to membranes[22] and genetic material recon guring with changing metabolic states[23]—often involves coupling multiple chemical stimuli arriving at separate times and rates. This non-equilibrium integration is driven by materials that convert each incoming stimulus into a long-lived active chemical or mechanical response, often outlasting the duration of the stimulus and thereby enabling it to be coupled to a later one. We considered that even simple hydrogels intrinsically possess these same mechanistic elements. In this way, hydrogels may potentially act as complex chemical signal integrators and in turn exhibit a wide range of previously unexplored transient phenomena and sensing behaviors.

In current strategies, there is a tight, in-phase feedback between the hydrogel deformations, diffusion, and reversible chemical reactions, such as protonation/deprotonation[7,13,14], oxidation/reduction[24], or complexation/dissociation[10,18]. This means that as soon as the stimulus—e.g. protons, divalent ions or reagents—has been removed from the environment, the gel returns to its original state. Then, the gel s response to a subsequent stimulus is a new, separate, independent event. However, we hypothesized that introducing species that complex to the gel with variable, rather than uniformly fast, association/dissociation rates would enable common hydrogels to act as couplers of different stimuli separated across time and space. In particular, a slow dissociation rate should alter the traditional picture: By remaining complexed to the gel, a chemical stimulus would create a kinetically stable state with a characteristic lifetime. In such a case, the gel s deformation would be transiently maintained upon removal of the stimulus from the environment. A second chemical species introduced later could then compete for binding sites, and trigger decomplexation of the rst chemical species. As a result, the complexation, diffusion, and gel deformation rates associated with the rst stimulus become interlinked with those of the second. In this paper, we show how coupling the dynamics of otherwise separate stimuli in time and space creates speci c responses arising from the transient superposition of chemical species entering and exiting the gel.

We explore this concept with a widely used hydrogel, polyacrylic acid (PAA). Our system consists of a thin layer of hydrogel containing an array of embedded microplates, which enable real-time visualization of the gel s deformations at the microscale. The hybrid hydrogel-microplate con guration[25] has previously enabled a class of adaptive materials that catch and release biomolecules[26], switch chemical reactions on and off[27], or control wettability[28], homeostasis[15] and flow[29]. Under neutral or basic conditions, the carboxyl groups (COOH) of the PAA gel exist in a deprotonated form (COO), the gel is swelled, and the embedded microplates stand upright. Consistent with the traditional use of PAA gel as a direct pH sensor, exposure to acid protonates the COO groups, inducing nearly immediate contraction of the gel and the associated tilting of the microplates (Fig. 1a, yellow). Adding a base rapidly deprotonates the gel and restores the original state. To test our hypothesis, we apply as a rst stimulus divalent copper ions (Cu^{2}), which interacts with COO and contracts the gel. Cu^{2} and COO form a kinetically stable chelate complex, which has been reported to maintain localized gel deformation and blue color over months in the absence of external Cu^{2} (Fig. 1b, blue).[30] Our results demonstrate how this blue color, characteristic for COO -Cu^{2} -COO complexation, provides a complementary readout mechanism for the complex kinetic interplay between two stimuli. When acid (H) is delivered as a second stimulus to a system previously exposed to Cu^{2} , H competes for COO groups (Fig. 1b, gray box) and displaces Cu^{2} , releasing it into the fluid phase of the gel and then into the initially copper-free supernatant. Cu^{2} decomplexation will be dependent on the timescale of acid delivery $_{H}$. Varying $_{H}$ with respect to the timescales of Cu^{2} diffusion and hydrogel deformation leads to the emergence of a variety of competing non-equilibrium dynamics (Fig. 1, expanded gray box).

Through experiments, scaling laws and a non-equilibrium continuum theory that captures the time-dependent coupling of the two stimuli, we demonstrate how two different, previously unseen responses emerge. (i) Acid-induced Cu^{2} decomplexation inside the gel triggers transient water influx, driven by the osmosis caused by the Cu^{2} ions released into the fluid phase of the gel (dependent on the timescale of acid delivery $_{H}$). At the same time, acid itself contracts the gel (with the mechanical relaxation time $_{\perp}$). Counterintuitively, even though both Cu^{2} and H contract the gel upon complexation, the competition between Cu^{2} -induced osmosis and acid-induced contraction produces traveling osmotic swelling waves when $_{H} < _{\perp}$ (Fig. 1c). (ii) If copper is complexed locally in the hydrogel, acid releases Cu^{2} in region A to diffuse and recomplex to new COO groups in previously unoccupied neighboring regions B (Fig. 1d). At the same time, acid also competes with Cu^{2} and displaces it from these new sites. As a result, traveling color waves appear ahead of a slow-moving acid front when it progresses more slowly than Cu^{2} diffusion.

Results

Delivering the Cu^{2} stimulus to the hydrogel microplate system. Our hydrogel system comprises an array of surface-attached, slightly pretilted epoxy microplates embedded in a PAA hydrogel (Fig. 2a). The plates are 18 μm tall. The hydrogel has a height of H 10 μm measured from the confocal microscopy z-stack imaging (Supplementary Fig. 1). After deprotonating the PAA hydrogel by rinsing with a base, the hydrogel is swollen and the microplates are oriented nearly upright, 9° with the surface normal (see Methods for details). Upon addition of an aqueous copper(II)sulfate solution (0.8 M $CuSO_4$), the hydrogel turns blue, indicating the formation of COO -Cu^{2} -COO complexes in the hydrogel (Fig. 2b, c). Concurrently, the hydrogel contracts, and the embedded microplates tilt toward the substrate. This is evidenced by a progressive conversion from a rectangular to a square projection of the microplates in plain-view optical microscopy images. We note that the presence of the microplates and the blue color of the gel provide simple visual reporters on, respectively, (i) the deformation state of the gel, which is quanti ed by the microplate tilt angle, and (ii) Cu^{2} complexation, which is quanti ed by the red channel (r-) value in optical microscopy images (see Methods and Supplementary Fig. 1). Both the microplate tilting and the blue color are maintained after Cu^{2} is removed from the external solution, even after repeated rinsing with water, indicating a kinetically stable state that stores the Cu^{2} stimulus upon complexation. The vertical diffusion of Cu^{2} into the gel layer happens at a timescale $_{Cu2}$ H^2/D_{Cu2} 10 s, with a diffusion constant of D_{Cu2} 10 ^{11} m^2 s ^{1}. Thus, we expect the local contraction and coloring responses upon Cu^{2} delivery to occur over a time $_{Cu2}$.

The Cu^{2} delivery can be localized and made directional by using a thin copper electrode wire (diameter approx. 100 μm) mounted directly on top of the substrate, covered with a thin

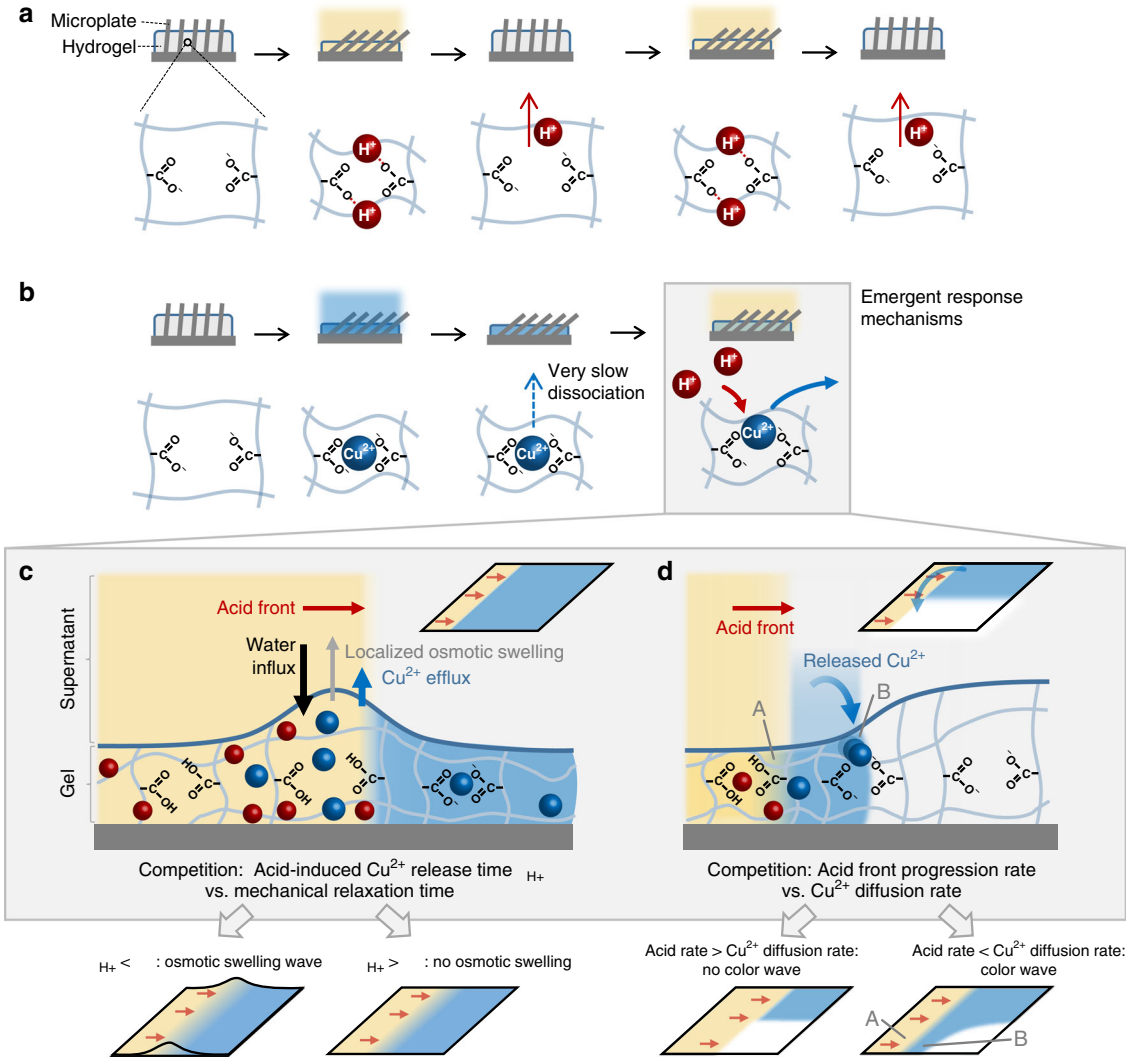


Fig. 1 Non equilibrium coupling of stimuli across time. a Traditionally, a responsive polyacrylic acid (PAA) hydrogel contracts and swells directly in-phase with the presence or absence of an acid stimulus (yellow). Here, hydrogel contraction tilts an array of embedded microplates (gray). **b** In contrast to this rapid reversibility, divalent cations (Cu^2 , blue) contract the PAA gel by forming a kinetically stable complex with two carboxylate (COO) groups, remaining in the gel after removal of Cu^2 from the environment. A subsequent acid stimulus then competes for COO groups and triggers dissociation of the Cu^2 on a timescale determined by its delivery rate ($_H$). The ensuing dynamics of diffusion, complexation, and mechanical deformations in the presence of the entering and exiting stimuli can lead to scenarios depicted in c-d: **c** Competition between transient water in ux, induced by released Cu^2 , and the mechanical relaxation time of the gel ($_\perp$) creates traveling osmotic swelling waves reporting the speed of an oncoming acid front when $_H < _\perp$; **d** Competition between the diffusion and transient recomplexation of released Cu^2 (top, curved blue arrow) and its re-release by oncoming acid creates rate-sensitive traveling color waves when the acid progression rate is smaller than the Cu^2 diffusion rate (bottom right, narrow blue band).

layer of a sodium perchlorate electrolyte solution ($NaClO_4$, 0.05 M, see Scheme in Fig. 2d, Methods and Supplementary Fig. 2). When a voltage of approx. 1 V (current 0.1 mA) is applied, the microplates near the positive electrode begin to tilt as the corresponding region of the hydrogel contracts and turns blue. The region expands outward in time with a gradient of tilt angles and color intensity, consistent with Cu^2 ions diffusing from the electrode through the electrolyte and binding to the hydrogel (Fig. 2e and Supplementary Movie 1). The slight initial pretilting of the microplates in one orientation results in a uniform tilting direction upon Cu^2 -complexation. As we noticed a variability in the degree of gel contraction depending on the direction of electrochemical Cu^2 delivery, all experiments were performed such that the pretilted plates were oriented towards the Cu^2 source, as schematically represented in Fig. 2d. Both the tilted state and blue color are maintained after Cu^2 is removed from the external solution by rinsing the substrate with water. Only a slow release of Cu^2 occurs at the edge of the Cu^2 -contracted region (Fig. 2f).

Osmotic pulses and waves selective to rapid Cu^2 release. The kinetically stable complexation creates a unique condition where Cu^2 is present inside the gel and absent from the external environment. Hence, rapid dissociation of Cu^2 upon protonation of the carboxylates must yield a transient osmotic pressure within the gel (Fig. 3a): If the release rate of Cu^2 is fast enough to induce water influx, this triggers an osmotic imbalance across the gel supernatant solution interface. Satisfying this condition requires the relaxation time of the hydrogel deformation $_\perp$ to be smaller than the diffusion timescale of Cu^2 ($_{Cu2}$), *i e* $_\perp <$ $_{Cu2}$ ($\equiv \epsilon L$ $U^{(0)}$, where $\epsilon \sim$ h H is the ratio of the change in gel lm thickness h over its equilibrium thickness H, L is the horizontal length scale, and $U^{(0)}$ is the inlet speed of the acid).

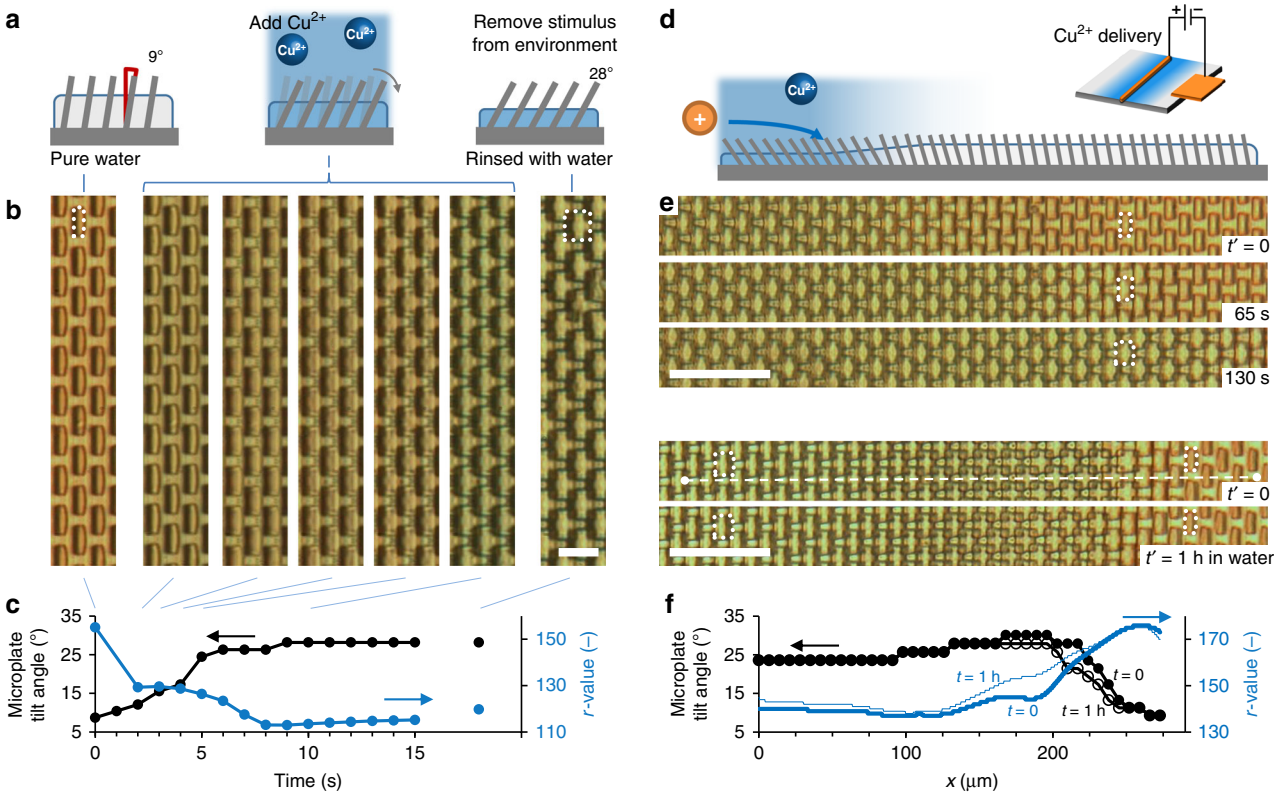


Fig. 2 Delivery and storage of a Cu^2 stimulus. a Scheme of the Cu^2 complexation, hydrogel contraction, and microplate tilting upon exposure to Cu^2, and the maintenance of this response upon the formation of kinetically stable complexes after the stimulus is removed from the external environment. **b** Optical microscopy images showing that the addition of copper(II) sulfate (see Methods) leads to progressive microplate tilting, concurrent with a progressive colorless-to-blue transition of the hydrogel, indicative of COO -Cu^2 -COO complexation. The white dotted outlines indicate the change of the cross-sectional view of a single plate from rectangular (in the upright state) to nearly square (in the tilted state). Scale bar: 15 m. **c** Data corresponding to microscopy images of the microplate tilt angle (black, reported as the angle between microplate and normal to the substrate, see Methods), and Cu^2 complexation (blue, reported as value, i.e. red-channel value of the optical micrographs). The tilt angles and blue color are maintained after rinsing the substrate with water (right image in b). **d** Scheme showing Cu^2 ions electrochemically delivered from a positively charged copper electrode wire. **e** Upon applying a voltage of approx. 1 V across a copper wire (diameter approx. 100 m), Cu^2 ions are released from the electrode (from the left side of the images), diffuse from left to right, and undergo complexation by the COO groups in the hydrogel, inducing blue color and microplate tilting. Scale bar: 50 m. **f** After electrochemical delivery, localized storage of Cu^2 remains intact, with only a slow release of Cu^2 at the boundary of the contracted region. The value and the microplate tilt angle vs. position *x*, shown in the graph, were acquired along the horizontal white dashed line shown in e. Scale bar: 50 m.

Then, a suf ciently low acid-induced Cu^2 release timescale $_H$, such that $_H < _\perp$, is expected to produce an unusual transient gel swelling that would be selective only to fast onset-rates of the acid stimulus.

As an initial test of this scaling prediction, a concentrated acid solution (1 M HCl) was added to a hydrogel-microplate substrate containing complexed Cu^2. Directly after this delivery of a 'fast arriving acid stimulus, a rapid dissociation of Cu^2 was observed, as indicated by the loss of blue color within $_H$ 2 s (Fig. 3b, d and Supplementary Movie 2). Concurrent with this color transition, the initially tilted microplates briefly stood upright at the onset of the acid stimulus, con rming that the system reports the fast acid flow with a transient swelling of the hydrogel when $_H < _\perp$, and then tilted back toward the substrate over $_{Cu2}$ 10 s. Corroborating that this unique transient swelling is indeed driven by an osmotic imbalance induced by Cu^2 dissociation, we show that the inclusion of $CuSO_4$ (0.8 M) in the HCl solution—to reduce its hypotonic character—suppresses the swelling pulse (Supplementary Fig. 3).

To assess the selectivity of the swelling response for fast Cu^2 release, the same amount of acid was added slowly via a series of progressively concentrated HCl solutions, from 0.01 to 1 M. As shown in Fig. 3c, e, Cu^2 dissociates from the hydrogel during the addition step of 0.05 M HCl, over $_H$ 20 s. Since in this case the generation of free Cu^2 inside the gel is slower than its diffusion out of the gel (i.e. $_H > _{Cu2}$ 10 s), the accumulation of free Cu^2 in the gel is insuf cient to drive the osmotic swelling. As a result, the gel is observed to remain in its contracted state with the microstructures titled to the substrate, and simply changes color as protonation induces the release of Cu^2. We note that when calcium (Ca^2) is used as an alternative complexing agent to contract the PAA hydrogel, Ca^2 release upon rapid addition of acid induces a transient swelling response as well (Supplementary Fig. 4), suggesting a general applicability of our approach.

The transient osmotic pressure due to rapid Cu^2 dissociation can also take the form of traveling swelling waves that are sensitive to the progression rate and direction of an acid front spreading across the substrate. As schematically shown in Fig. 4a, an acid stimulus with a controllable progression rate can be initiated by delivering a drop of acid under one edge of a glass cover (Methods and Supplementary Fig. 5). Cu^2 decomplexation at the acid front is indicated by a blue-to-colorless transition that progresses from left to right (Fig. 4b, c), and occurs over a length scale of L 100 µm, consistent with free diffusion within the stimulus front (D 10 ^{9} m^2 s ^{1}) over $_{Cu2}$ 10 s and $_\perp$ 10 s (see Supplementary Information). To meet the

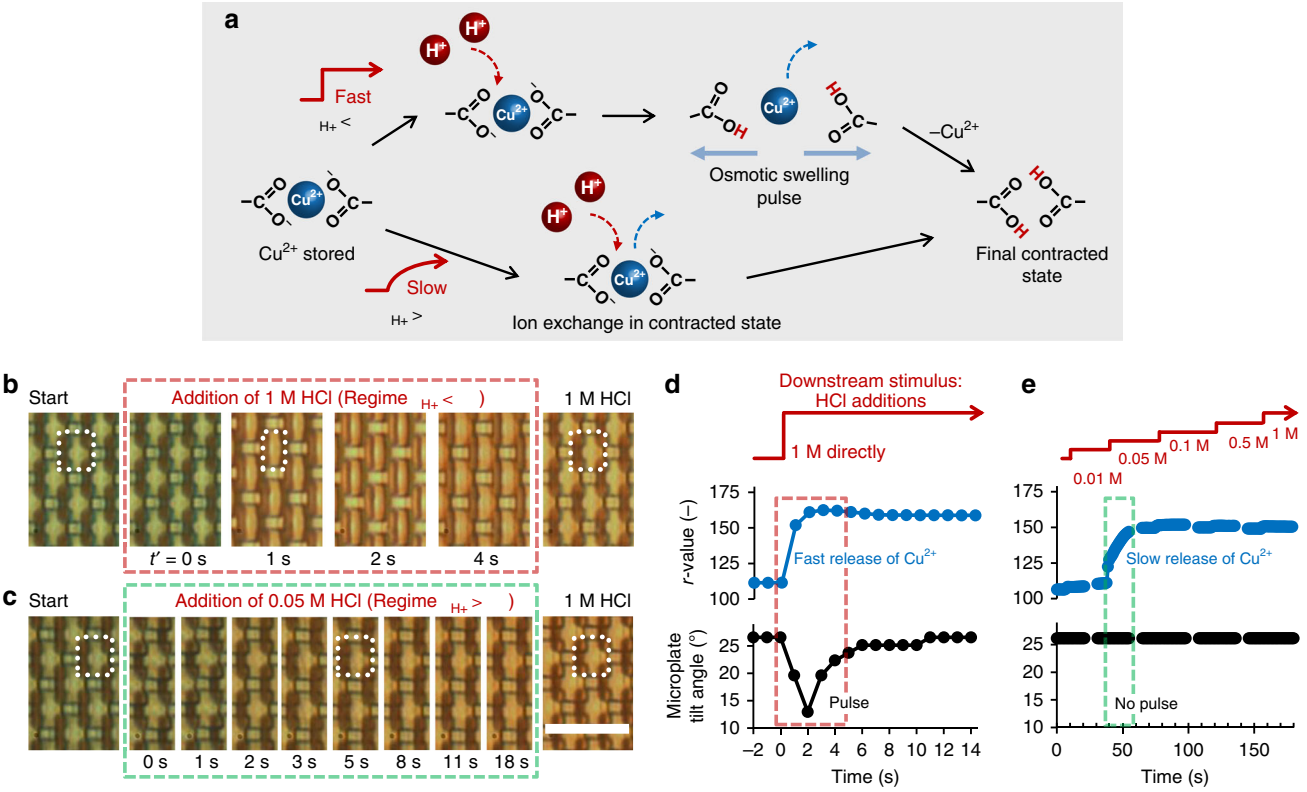


Fig. 3 Cu^{2} ions generate a transient osmotic swelling pulse upon rapid release by an acid stimulus. a Schematic presentation of the mechanism, showing how acid delivered after Cu^{2} has been removed from the external environment of the hydrogel protonates carboxylate groups and thereby releases the complexed Cu^{2} . Fast release would generate an osmotic swelling pulse (top) before acid contracts the hydrogel again, while slow addition of acid should lead to a slow Cu^{2} release without transient swelling (bottom). **b** Experimental demonstration of the fast Cu^{2} release (regime $_{H}$ < $_{\perp}$), triggered by direct addition of concentrated 1 M HCl, which results in rapid disappearance of the blue color and transient reorientation of the microplates to an upright position. The dotted outlines indicate the change of the cross-sectional view of a single plate from nearly square (in the tilted state) to rectangular (in the upright state), and back to nearly square. **c** Stepwise addition of acid leads to a slow release of Cu^{2} , such that the gel remains contracted without transient swelling (regime $_{H}$ > $_{\perp}$). Scale bar: 25 m. **d**, **e** Time-dependent microplate tilt angle and value (acid stimulus added at t = 0) for fast (**d**) and stepwise, slow (**e**) addition.

condition of $_{H}$ < $_{\perp}$ 10 s—the requirement for observing a transient swelling response as discussed above, where $_{H}$ L/v_{C}—the acid progression speed must be $v_{C} > 10$ µm s ^{1}. Consistent with this prediction, a wave of weakly up-and-down moving microplates is experimentally observed to travel at the front of an acid stimulus moving with a minimum rate of v_{C} = 8.6 µm s ^{1} (Fig. 4c and Supplementary Movie 3). A slower progression yields no swelling pulse at the stimulus front (Supplementary Fig. 6), as exempli ed by the results in Fig. 4b acquired at $v_{C} = 0.76$ µm s ^{1}. In contrast, fast progression ($v_{C} \geq$ 95 µm s ^{1}) yields a high-amplitude traveling pulse (Fig. 4d). The pressure that is required to establish a swelling wave spreading over L 100 µm within $_{H}$ 10 s determines the poroelastic diffusion constant of water inside the hydrogel, given by D_{water} $k_{f}p/\mu_{f}$ 10 ^{10} m^{2} s ^{1}, where k_{f} 10 ^{19} 10 ^{18} m^{2} is the hydraulic permeability of the hydrogel and $\mu_{f} = 10$ ^{3} Pa s is the dynamic viscosity of water. The required pressure p equals 1 10 MPa; a pressure that can be generated upon osmosis as the concentration of Cu^{2} ions is estimated to be 2.9 M (Supplementary Fig. 7 and Supplementary Information), implying a maximum osmotic pressure of ~7 MPa (p_{osm} [Cu^{2}]·k$_{B}T$). We note that the orientation of the microplates with respect to the acid stimulus progression does not have a major effect on the swelling response of the hydrogel.

To further assess the timescales and forces involved in the unique transient swelling responses and traveling waves that arise upon coupling of successive Cu^{2} and acid stimuli, we developed a continuum theory that gives the time-dependent height pro le of a thin hydrogel sheet, based on time- and position-dependent descriptions of (i) Cu^{2} and acid present in the supernatant fluid, in the hydrogel interior fluid, and complexed to PAA; (ii) the osmotic and contractile forces exerted on the gel due to free and complexed Cu^{2} and acid in the gel, and (iii) the mechanical deformation of the gel (see Supplementary Discussion). Simulations based on parameter values, which match experimentally assessed time- and pressure-scales, quantitatively reproduce the experimental vertical deformation waves of the hydrogel, as derived from the experimentally observed microplate tilting waves (Fig. 4e, Supplementary Figs. 8 and 9, and Supplementary Movies 4–6). The transient osmotic vertical flow for thin lm domains is given by Supplementary Eq. 14 and holds at the leading order O(δ^{0}, ϵ^{0}), where δ is the aspect ratio of the thin lm; both ϵ and δ are very small. The mobility coef cient in Supplementary Eq. 14 scales with δ ^{2} and is not a free parameter. This osmotic flow term quantitatively reproduces the osmosis-induced traveling waves (Fig. 4, Supplementary Movies 4–6). Thereby, our theory shows that, rst, species released within the hydrogel induce transient osmosis; second, this enables unique signaling routines that selectively report input stimuli occurring at fast rates; and, third, swelling pulses are displayed at timescales that cannot be established by solely breaking crosslinks in the hydrogel.

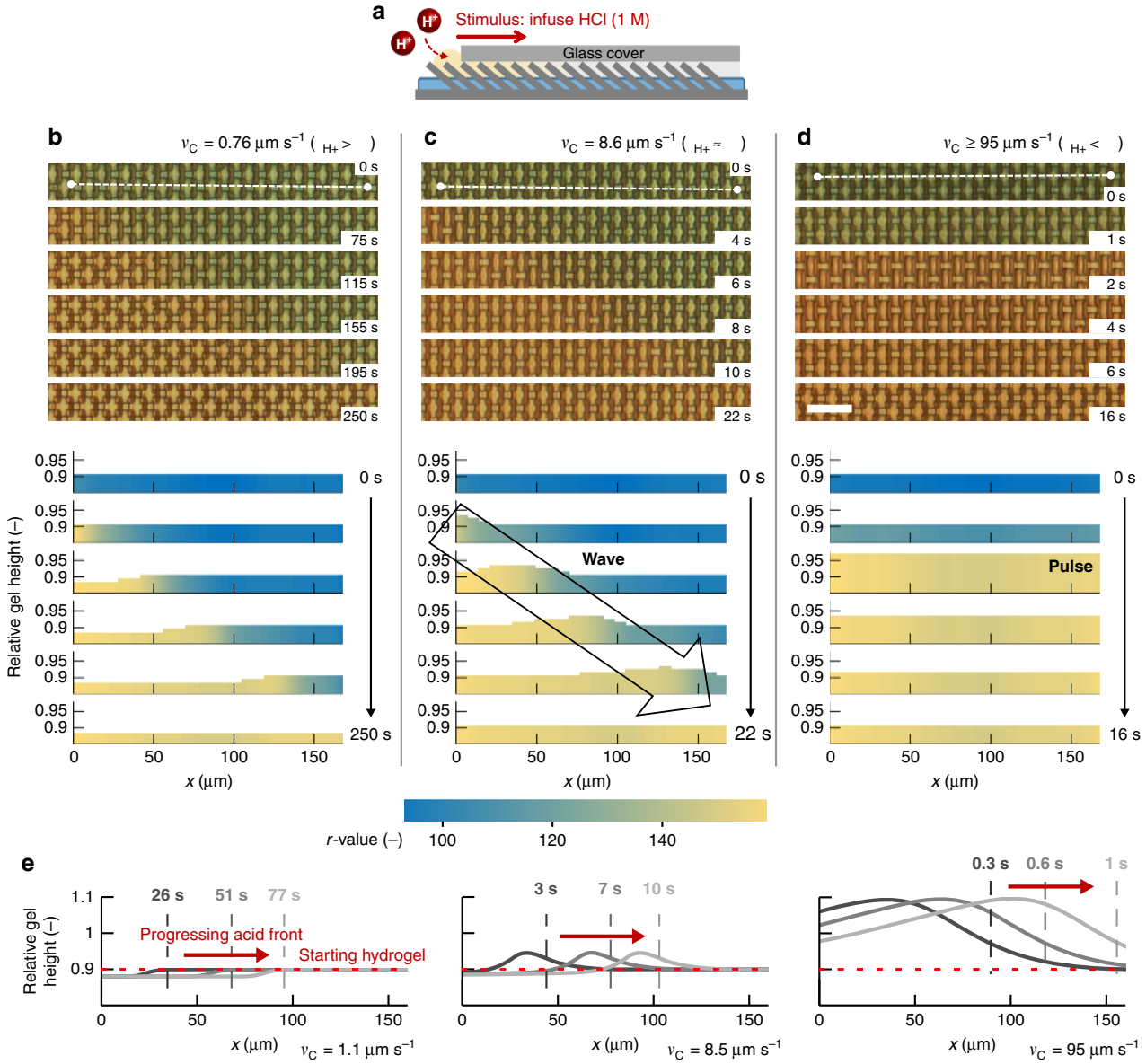


Fig. 4 Traveling swelling waves that are sensitive to the acid progression rate. a Schematic of the experimental design: HCl (1 M) is added from the left side of a Cu^{2} -contracted substrate covered with a thin water film and a glass cover (see Methods). **b d** (Top) Micrographs showing the progression of the acid stimulus at various rates, indicated by a blue-to-colorless transition. (Bottom) The height of the diagrams represents the evolution of the relative hydrogel height in time and space derived from the microplate tilt angle as described in Methods (Supplementary Fig. 1), along the white dashed line for the six micrographs from top to bottom; and the color of the diagrams represents the Cu^{2} release as characterized by the blue-to-colorless transition: **b** No swelling pulse is observed for the acid stimulus that travels from left to right over 190 m in 250 s ($v_C = 0.76$ m s ^{1}); **c**, **d** Faster progression of the acid within 22 s ($v_C = 8.6$ m s ^{1}) and within 2 s ($v_C \geq 95$ m s ^{1}) generates swelling/contraction waves that travel at the acid front. Scale bar: 25 m. **e** The results of our continuum theory show that traveling swelling/contraction waves are only obtained at $v_C \geq 8.5$ m s ^{1} for this set of experimental parameters, in excellent agreement with the experimental data. The red dashed lines indicate the starting height of the Cu^{2} -storing hydrogel; the vertical lines indicate the position of the progressing HCl front at three different times; the curves show the corresponding relative hydrogel height along the horizontal position *x*. The grayscale corresponds to three different times given in the legend of each plot.

Traveling color waves reporting slow acid fronts. Copper ions released by acid from the hydrogel into an otherwise Cu^{2} -free medium not only enable short-term osmotic pressure in the gel, but also give rise to localized patterns of recomplexation as the released Cu^{2} ions diffuse with the moving acid front. While swelling waves require a rapidly moving acid front to trigger a rapid release of Cu^{2} inside the gel, recomplexation of Cu^{2} should in contrast require the acid front to be moving slowly enough for the diffusing Cu^{2} ions to be able to compete with the oncoming protons for new binding sites. Assuming a graded acid concentration at the front, Cu^{2} comigrating with the front will potentially have a time window to recomplex to the gel in the presence of a low acid concentration, before saturating acid overtakes the recomplexed Cu^{2} and releases it again. Consistent with this possibility, flowing a solution containing 1 M HCl and 0.8 M $CuSO_4$ with a slow progression rate along a substrate with a deprotonated PAA hydrogel yields a transient band of Cu^{2} complexation at the solution front ($v_C = 3$ µm s ^{1}, Supplementary Fig. 10). For a system that is exposed rst to Cu^{2} and subsequently to progressing acid, initial release of Cu^{2} by acid at

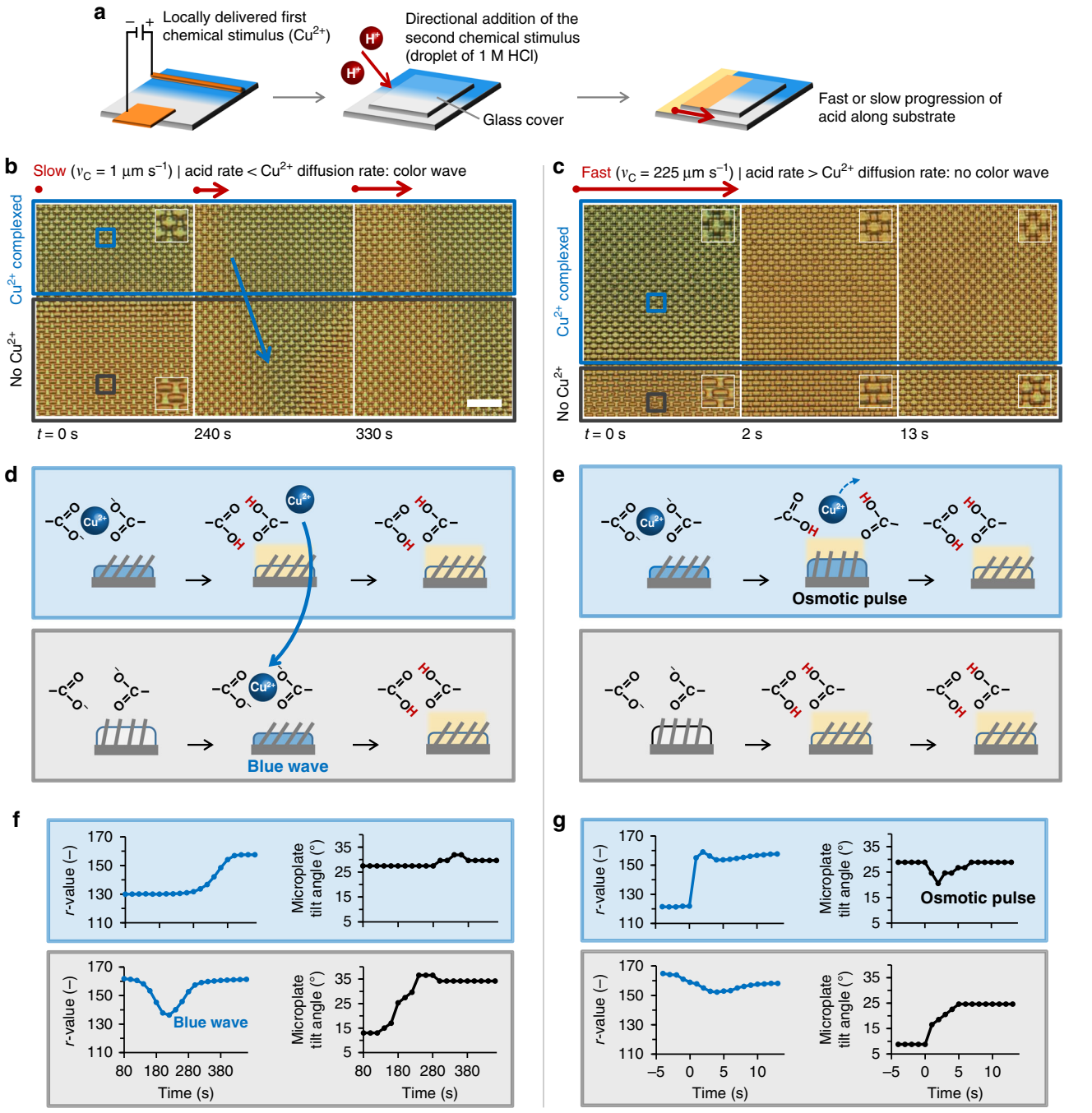


Fig. 5 Traveling color waves selectively reporting slowly progressing acid stimuli. a Schematic presentation showing the mechanism for the appearance of the travelling color waves: Cu^2 is initially delivered electrochemically to one side of the substrate (blue region in diagram). A glass cover is then applied and the acid is added from the left and allowed to progress along the substrate. **b** Experimental demonstration of the slow acid progression: Cu^2 is complexed in the region of the substrate where it was applied; slow progression of the acid (acid rate < Cu^2 diffusion) allows Cu^2 , released at the acid front in the Cu^2 -complexing region (blue box), to migrate to the adjacent Cu^2 -free region (blue arrow), generating a transient blue wave just ahead of the stimulus front (gray box). Scale bar: 50 m. **c** Fast progression of the acid from left to right (acid rate > Cu^2 diffusion) induces a swelling/contraction wave in the Cu^2 -complexing region (blue box) and a direct contraction of the hydrogel with no color wave in the region with no Cu^2 (gray box). **d**, **e** Schematic representation of the subsequent stages for both regions in (**b**) and (**c**), respectively. **f**, **g** Time-dependent value and microplate tilt angle, acquired at the blue and gray squares in (**b**) and (**c**), respectively.

a region A, followed by diffusion of Cu^2 through the supernatant solution and recomplexation to the gel at a region B, can result in a transient band of Cu^2 complexation. This must only happen when acid migration from A to B is slower than the diffusion of Cu^2 and its subsequent recomplexation at B: $L_x/v_C > L_x^2/D^{(a)}$ $_{Cu2}$, where $L_x \sim L$ 100 μm is the distance between A and B, and $D^{(a)}$ is the diffusivity in the supernatant solution.

To test this idea, we electrochemically delivered Cu^2 across one half of a gel/microplate system, so that Cu^2 is stored on one side while the other remains copper-free (blue and white sides in Fig. 5a, respectively). Acid is then flowed such that the front progresses over both halves in parallel (Fig. 5a, yellow). This con guration potentially allows some of the released Cu^2 at the front to diffuse to and recomplex on the copper-free side, subject

to the acid-dependent competition and time window. Our experimental results at different progression speeds indeed indicate the ability of this mechanism to produce a distinctive slow-rate-sensitive response: a slow acid progression speed (v_C = 1 μm s ^{1}) generates a wave of blue color that travels with the acid front through the initially copper-free side (Fig. 5b, d, f and Supplementary Movie 7), featuring the regime where the acid progression is slower than the Cu^{2} diffusion. This response was further observed with an intermediate rate of $v_C = 3$ μm s ^{1} (Supplementary Fig. 11), and also with a hydrogel without embedded microplates (Supplementary Fig. 12). The inequality $L_x/v_C > L_x^2/D^{(a)}$ $_{Cu2}$ only holds when $v_C < 5$ μm s ^{1}, assuming $D^{(a)} = 10^{9}$ m^2 s ^{1} and $_{Cu2}$ = 10 s. Indeed, at fast progression rates ($v_C = 225$ μm s ^{1}, Fig. 5c, e, g), no blue color was observed on the copper-free side (acid progression rate > Cu^{2} diffusion rate). Instead, a wave of osmotic pressure was generated on the copper-storing side, with the associated transient upright movement of the microplates, as discussed above.

Discussion

Our results provide a potentially transformative approach to chemical signal processing and, more generally, suggest that simple hydrogels have a much larger sensing space than is currently made use of. By integrating the complexation-transport-deformation dynamics induced in the gel by two chemical stimuli that occur separately in time and space, we show that a common hydrogel—traditionally used for direct stimulus tracking through nearly in-phase response to an applied stimulus—can produce previously unseen complexity. This is demonstrated by time-sensitive, nonmonotonic osmotic effects accompanied by spikes and waves of gel expansion and contraction, as well as traveling color waves of patterned migration and recomplexation. Our non-equilibrium continuum theory captures how the diverse responses depend on the coupling of diffusion, flow, complexation, and hydrogel deformation as successive chemical stimuli enter and exit the gel. The theory allows the parameter windows to be predicted for a range of phenomena based on the relative timescales involved in signal coupling. Combined with an extensive experimental and scaling analysis, the model provides insight into the competing processes underlying the response mechanisms and emergent behaviors. As exemplary cases, our theory reveals how traveling osmotic swelling waves can emerge in response to the rapid onset of a stimulus that would normally —on its own—contract the gel, if the timescale of acid propagation is smaller than the mechanical relaxation time of the hydrogel. The theory further implies that, when two H signals approach from opposite directions, the accompanying swelling fronts would annihilate each other upon collision. This is because no available bidendate complexation sites would be left ahead of each front to be decomplexed and create osmotic imbalance. Further scaling laws elucidate how a slowly moving acid gradient can induce sequences of migration and recomplexation highly sensitive to the interdependent dynamics of the released and oncoming stimuli.

In conclusion, the framework presented here shows how a hydrogel can be used without specialized modi cations to perform complex chemical sensing tasks not previously achieved with electronics-free systems. The exemplary responses we demonstrate likely represent only a small sample of the dynamic phenomena that may emerge. Based on simple, reversible chemistry and trivial hydrogel composition and geometry, our scaling analyses and the theoretical model elucidate distinct outputs able to discriminate among many possible combinations and permutations of rates, times, sequences, and con gurations of multiple arriving stimuli. These concepts are potentially applicable to a wide range of hydrogels, stimuli and non-equilibrium molecular systems beyond the ions, acid, and PAA gel used in this study.[31–39] The non-equilibrium concepts and theory can be further applied to readout mechanisms beyond the microplates used in this study, such as via microparticles dispersed within the gel or via focussing and defocussing of light beams by the gel. Additionally, the concept of rate-selective recomplexation waves—exempli ed by the blue color waves in our system—can be expanded by selecting alternative pairs of complexing agents (such as Ca^{2} and H), potentially in combination with fluorescent or other indicators. In particular, the non-equilibrium mechanisms revealed in this study may enable micron-scale synthetic soft actuators, analogous to the way Ca^{2} -based biochemical reaction-transport pathways power the motion of some single-celled organisms, such as *D discoideum*[40] and the *Vorticella* ciliates[41]. Beyond reporting the gel s dynamics, microstructures embedded in the gel can themselves introduce feedback to the complexation-transport-deformation coupling[42], potentially opening another realm of non-equilibrium sensing. Further developing these capacities may bring about new possibilities for integrating complex chemical sensing and transduction, using simple soft materials, into areas such as soft robotics, catalytic materials, and agricultural and biomedical diagnostics.

Methods

Chemicals and materials. Polydimethylsiloxane (PDMS, Dow-Sylgard 184) was purchased from Dow Corning Corporation (Midland, MI, USA). Epoxy resin OG178 was purchased from Epoxy Technology (Billerica, MA, USA). Glycidyl methacrylate, acrylic acid, sodium acrylate, 2,2 -azobis(2-methylpropionamidine) dihydrochloride, *N-N* -methylenebisacrylamide, 1-butanol, ethylene glycol, copper (II)sulfate, sodium perchlorate, ethylenediaminetetraacetic acid, potassium hydroxide and hydrochloric acid were purchased from Sigma Aldrich. Irgacure 819 was purchased from BASF Corporation, Lumiprobe BDP FL NHS ester from Lumiprobe Corporation (Hallandale Beach, FL, USA), calcium chloride from J.T. Baker and copper(II)chloride from Fluorochem. All compounds and materials were used as received.

Fabrication of hydrogel embedded microplate substrates. To prepare the epoxy microplate substrates, rst a PDMS negative mold was obtained by curing a 10:1 wt./wt. mixture of base resin and hardener onto a silicon master with the microplates positioned in a staggered array, with a height of 18 μm, a width of 10 μm, a thickness of 2 μm and a spacing of 5 μm in both *x* and *y* directions. The silicon master was fabricated via the Bosch process and functionalized with (tridecafluoro-1,1,2,2-tetrahydrooctyl)trichlorosilane in a desiccator under vacuum at room temperature for at least 24 h, in order to facilitate demolding of the PDMS. The PDMS prepolymer mixture was mixed for 1 min, degassed under vacuum at room temperature, poured over the silicon master in a petri dish, put under vacuum at room temperature to remove bubbles, and then cured at 70 °C. After 2 h, the PDMS molds were cooled and peeled off from the silicon mold. To prepare an epoxy microplate substrate, 35 μL of a 9:1 (wt./wt.) prepolymer mixture of the OG178 epoxy resin and glycidyl methacrylate was added to the PDMS mold and covered with a glass slide (16 × 16 mm^2, pretreated in O_2-plasma for 2 min). UV curing was performed under a UV lamp (100 W, Blak-Ray with a 365 nm band-pass lter, approx. 10 mW cm ^{2} at 365 nm) for 30 min. The microplate substrate was then obtained by carefully removing the glass slide from the PDMS mold.

In order to embed the microplate structures in the hydrogel, 3 μL of a hydrogel precursor solution was added to the substrate. The hydrogel precursor solution was prepared by combining 400 μL of acrylic acid with 20 mg *N-N* -methylenebisacrylamide crosslinker in 1 mL of a 1:1 v/v mixture of ethylene glycol and 1-butanol. To introduce the Irgacure 819 photoinitiator, 10 μL of a 25 mg mL ^{1} solution in 1-butanol was added to 90 μL of the aforementioned solution to obtain the hydrogel precursor solution. After applying the hydrogel precursor solution to the microplate substrate, it was immediately covered with a thin glass cover slide (cleaned with isopropanol) and the hydrogel was subsequently cured for 5 min under UV, similarly to the epoxy curing. After curing, the hydrogel-microplate substrate was immersed in deionized water to allow the glass cover slide to detach and to exchange the ethylene glycol/1-butanol mixture in the hydrogel for water.

To assess the embedding of the microplates in the hydrogel, the hydrogel was dyed by combining a solution of Lumiprobe BDP FL NHS ester (2.5 mg mL ^{1}) in a 1:1 v/v 1-butanol/ethylene glycol mixture with an equal volume of a double concentrated hydrogel precursor solution (see above). Next, the obtained solution was applied to the microstructures and cured as described above. The dyed hydrogel-microplate substrates were then analyzed by confocal microscopy (λ_{ex} = 488 nm).

To prepare a hydrogel substrate with no microplates embedded, rst an epoxy substrate was prepared by photo curing a Norland 68 epoxy resin sandwiched between a flat PDMS support layer and a glass cover (prepared as described above, total exposure time under UV 10 min). Subsequently, 40 µL of a hydrogel precursor (113 mg mL ^{1} sodium acrylate, 11 mg mL ^{1} *N-N* -methylenebisacrylamide and 7.5 mg mL ^{1} 2,2 -azobis(2-methylpropionamidine) dihydrochloride photoinitiator in water) was applied, and covered with a glass slide of 18 × 18 mm^2. Subsequently, the hydrogel was cured under UV (366 nm, 4 min) and the substrate was immersed in water to detach the glass cover. Then, the substrate was vertically immersed for 2 min in an aqueous $CuCl_2$ (0.8 M) solution, such that one half of the hydrogel was complexed to Cu^2 as evidenced by the appearance of blue color. The results in Supplementary Fig. 12 were acquired in analogy to the methodology applied for Fig. 5; the images were acquired on a Leica DM 2500 microscope equipped with a Leica DFC 7000T camera.

Assessing complexation of Cu^2 and tilting of microplates. All optical microscopy images were acquired with an Olympus IX71 dark eld inverted microscope equipped with a QImaging Retiga 2000R camera unless stated otherwise. All colored images were acquired with similar white balance settings and light intensity. Confocal microscopy was performed using a ZEISS LSM 700 microscope. SEM images were acquired on a JEOL JSM 639OLV scanning electron microscope, and the sample was sputter-coated with Au/Pd for imaging.

To quantify the tilting of the microplates, the microplate tilt angle was determined from the microplates projection in optical microscopy images. The projection of the microplates was measured in the images and, based on the ratio of this projection to the distance between n rows of microplates in the same image, which equals (n 1) × 7 µm, converted to the real dimensions p in µm. Based on the height of the microplates $h = 18$ µm and the thickness $t = 2$ µm, the microplate tilt angle α was determined as $\alpha = 90$ acos((p t)/h) (see Supplementary Fig. 1c). It is assumed that the plates do not curve upon actuation but maintain their straight form and only hinge at the connection to the substrate (see Supplementary Fig. 1b). The relative gel height was derived via $\cos(\alpha)/\cos(\alpha_{\text{gel completely swelled}})$.

The color pro les were acquired using ImageJ 1.50b software. To avoid the pro les being disturbed by the contours of the microplates, the images were blurred (Gaussian blur; Sigma radius 50) prior to acquiring the r value (red channel RGB value).

Absorption spectra were acquired on a Beckman Coulter DU 720 UV/Vis spectrometer, in a polymethyl methacrylate (PMMA) cuvette (optical path length 1 cm) at room temperature, and the background was acquired on a PMMA cuvette with water.

Complexation of Cu^2 in the hydrogel. Prior to the contraction of the hydrogel via Cu^2 complexation, the hydrogel-microplate substrate was sequentially rinsed with hydrochloric acid (HCl 1 M, 4× the same solution of 2 mL), water (5×), potassium hydroxide (KOH in a concentration of 0.1 M, 4× the same solution of 2 mL, repeated with a fresh solution of 2 mL), and water (5×). Thereafter, excess water was removed from the substrate with a tissue. For Fig. 2b, a thin layer of 50 µL water was applied to the substrate, and subsequently 10 µL $CuSO_4$ 0.8 M was added. To assess the storage of Cu^2 upon complexation to the hydrogel, the substrate was rinsed with water (4×).

Electrochemical delivery of Cu^2 . Cu^2 ions were delivered to the hydrogel-microplate substrate by mounting a copper wire (diameter approx. 100 µm) as a positive electrode and a copper mesh (hole and wire diameter approx. 100 µm) as a negative electrode on top of the substrate with scotch tape, with a distance between the ( ) and (–) electrodes of approx. 3 mm, as schematically represented in Fig. 2d. The scotch tape was applied such that it did not allow a short-circuit between the electrodes. One hundred microliters sodium perchlorate ($NaClO_4$) in water (0.05 M) was added as an electrolyte solution, forming a thin electrolyte layer that ensured contact with both the ( ) and (–) electrodes. The electrodes were connected via crocodile clips to a Keithley 2450 Sourcemeter power supply, and the current was set at 0.1 mA, resulting in a voltage of approx. 1 V.

Swelling and contraction pulses. To prepare the hydrogel for Cu^2 complexation, the hydrogel was rinsed with hydrochloric acid (HCl 1 M, 4× the same solution of 2 mL), water (5×), potassium hydroxide (KOH 0.1 M, 4× the same solution of 2 mL, repeated with a fresh solution of 2 mL), and water (5×). Subsequently, excess water was removed from the substrate with a tissue, 50 µL of a 0.8 M $CuSO_4$ solution was added, excess Cu^2 was removed by rinsing the substrate with water and excess water was removed with a tissue. To obtain the swelling/contraction pulse (Fig. 3b), 1 mL 1 M HCl was added. The stepwise addition of HCl solutions with increasing concentrations (Fig. 3c) was performed by adding volumes of 1 mL, with removal of excess HCl solution from the substrate prior to each subsequent addition.

Controlled progression of acid stimulus. Cu^2 was rst complexed to the hydrogel as described above (swelling and contraction pulses). The substrate was then dried with a tissue, 4 µL water was applied, and the substrate was covered with a 10 × 16 mm^2 glass cover of 1 mm thickness. To initiate the HCl stimulus, a droplet of 30 µL 1 M HCl was added at the edge of the glass cover as schematically shown in Fig. 4a. The color transition progression speed v_C in µm s ^{1} was determined via the time it took the blue-to-colorless front to progress from left to right over the eld of view (190 µm). Small-magni cation optical microscopy images in Supplementary Fig. 5 reveal a fast progression of the HCl front over the rst few millimeters, whereas further away from the edge of the glass cover the progression of the HCl front slows down, enabling variation of v_C for different experiments shown in Fig. 4 and Supplementary Fig. 6. Alternatively, a larger amount of water under the glass cover can be used to slow down the progression.

Spatial patterning of pulses and traveling waves. To obtain a localized Cu^2 complexation (Fig. 5), Cu^2 was electrochemically delivered via the same procedure as described above (electrochemical delivery of Cu^2). Here, the experiments started with a substrate that was rinsed with hydrochloric acid (HCl 1 M, 4× the same solution of 2 mL), water (5×), potassium hydroxide (KOH 0.05 M, 4× the same solution of 2 mL, repeated with a fresh solution of 2 mL), and water (5×). Subsequently, the electrodes were removed, and the substrate was rinsed with water, dried with a tissue, and covered with 4 µL water and a glass cover (10 × 16 mm^2, 1 mm thick). Similarly to the procedure described above (Controlled progression of acid stimulus), a droplet of 30 µL 1 M HCl was added at the edge of the glass cover to initiate the Cu^2 release, as schematically shown in Fig. 5a.

Determining the concentration of Cu^2 complexed to gel. The concentration of Cu^2 complexed to the COO groups in the hydrogel was determined upon extraction of Cu^2 from the hydrogel with an ethylenediethylaminetetraacetate (EDTA) solution, as shown in Supplementary Fig. 7. By comparing the optical density of the extract solutions to a calibration line (based on absorption spectra of aqueous EDTA solutions (0.27 M, 1 M KOH) with different $CuSO_4$ concentrations), the total amount of Cu^2 ions was determined. For the hydrogel-microplate substrate, we obtained a total Cu^2 -amount of 0.0038 mmol. Based on the ratio between the area of the blue region in Supplementary Fig. 7b and the printed squares of the paper background (0.634 × 0.634 cm^2), the hydrogel area in the sample is estimated to be 1.30 cm^2. Based on the estimated thickness of the contracted hydrogel of 10 µm (Supplementary Fig. 1), the volume of the hydrogel is 0.00130 cm^3. Therefore, the Cu^2 concentration inside the contracted hydrogel is estimated to be 0.0038 mmol/0.00130 cm^3 = 2.9 M (Supplementary Fig. 7). The concentration of carboxylic acid groups in the hydrogel is estimated from the precursor solution, which was prepared from a solution of 0.4 mL acrylic acid 0.5 mL ethylene glycol 0.5 mL 1-butanol, and was subsequently mixed in a 9:1 ratio with the initiator solution, resulting in an acrylic acid concentration of 3.74 M. After the application of the hydrogel precursor, we assume that the solution wets the plates, with a height of 18 µm, as well as the glass cover applied on top of it. Densi cation of this precursor solution with a thickness of 18 µm to a hydrogel with a nal thickness of 10 µm (see Supplementary Fig. 1) results in a nal carboxylic acid concentration of 6.7 M. This indicates that after exposing to a concentrated $CuSO_4$ solution, the Cu^2 to COO complexation in the hydrogel approaches a 1:2 ratio (Cu^2 /COO $_{\max} = 43$).

Data availability

The data that support the ndings of this study are available within the article (and its Supplementary Information les) and from the corresponding authors on reasonable request.

Code availability

The computer code that was developed to perform the simulations with our model is freely available at Github: https://github.com/nadirkaplan/hydrogels_naturecomm.

Received: 7 October 2019; Accepted: 12 December 2019;
Published online: 20 January 2020

References

1. Zhang, Y. S. & Khademhosseini, A. Advances in engineering hydrogels. *Science* **356**, 500 (2017).
2. Ulijn, R. V. et al. Bioresponsive hydrogels. *Mater Today* **10**, 40–48 (2007).
3. Ionov, L. Hydrogel-based actuators: possibilities and limitations. *Mater Today* **17**, 494–503 (2014).
4. Schroeder, T. B. H. et al. An electric-eel-inspired soft power source from stacked hydrogels. *Nature* **552**, 214–218 (2017).
5. Yuk, H. et al. Hydraulic hydrogel actuators and robots optically and sonically camouflaged in water. *Nat Commun* **8**, 14230 (2017).
6. Ma, C. et al. Bioinspired anisotropic hydrogel actuators with on–off switchable and color-tunable fluorescence behaviors. *Adv Funct Mater* **28**, 1704568 (2018).

7. Shim, T. S., Kim, S.-H., Heo, C.-J., Jeon, H. C. & Yang, S.-M. Controlled origami folding of hydrogel bilayers with sustained reversibility for robust microcarriers. *Angew Chem Int Ed* **51**, 1420–1423 (2012).
8. Kim, J., Hanna, J. A., Byun, M., Santangelo, C. D. & Hayward, R. C. Designing responsive buckled surfaces by halftone gel lithography. *Science* **335**, 1201–1205 (2012).
9. Gladman, A. S., Matsumoto, E. A., Nuzzo, R. G., Mahadevan, L. & Lewis, J. A. Biomimetic 4D printing. *Nat Mater* **15**, 413–418 (2016).
10. Ma, M., Guo, L., Anderson, D. G. & Langer, R. Bio-inspired polymer composite actuator and generator driven by water gradients. *Science* **339**, 186–189 (2013).
11. Morales, D., Palleau, E., Dickey, M. D. & Velev, O. D. Electro-actuated hydrogel walkers with dual responsive legs. *Soft Matter* **10**, 1337–1348 (2014).
12. Zhao, X. et al. Active scaffolds for on-demand drug and cell delivery. *Proc Natl Acad Sci USA* **108**, 67–72 (2011).
13. Zabow, G., Dodd, S. J. & Koretsky, A. P. Shape-changing magnetic assemblies as high-sensitivity NMR-readable nanoprobes. *Nature* **520**, 73–77 (2015).
14. Dong, L., Agarwal, A. K., Beebe, D. J. & Jiang, H. Adaptive liquid microlenses activated by stimuli-responsive hydrogels. *Nature* **442**, 551–554 (2006).
15. He, X. et al. Synthetic homeostatic materials with chemo-mechano-chemical self-regulation. *Nature* **487**, 214–218 (2012).
16. Kim, Y. S. et al. Thermoresponsive actuation enabled by permittivity switching in an electrostatically anisotropic hydrogel. *Nat Mater* **14**, 1002–1007 (2015).
17. Chin, S. M. et al. Covalent-supramolecular hybrid polymers as muscle-inspired anisotropic actuators. *Nat Commun* **9**, 2395 (2018).
18. Zhang, C., Cano, G. G. & Braun, P. V. Linear and fast hydrogel glucose sensor materials enabled by volume resetting agents. *Adv Mater* **26**, 5678–5683 (2014).
19. Qin, M. et al. Bioinspired hydrogel interferometer for adaptive coloration and chemical sensing. *Adv Mater* **30**, 1800468 (2018).
20. Skoge, M. et al. Cellular memory in eukaryotic chemotaxis. *Proc Natl Acad Sci USA* **111**, 14448–14453 (2014).
21. Nerbonne, J. M. & Kass, R. S. Molecular physiology of cardiac repolarization. *Physiol Rev* **85**, 1205–1253 (2005).
22. Péter, M. et al. Metabolic crosstalk between membrane and storage lipids facilitates heat stress management in Schizosaccharomyces pombe. *PLoS ONE* **12**, e0173739 (2017).
23. Bräutigam, K. et al. Dynamic plastid redox signals integrate gene expression and metabolism to induce distinct metabolic states in photosynthetic acclimation in Arabidopsis. *Plant Cell* **21**, 2715–2732 (2009).
24. Kim, Y. S., Tamate, R., Akimoto, A. M. & Yoshida, R. Recent developments in self-oscillating polymeric systems as smart materials: from polymers to bulk hydrogels. *Mater Horiz* **4**, 38–54 (2017).
25. Sidorenko, A., Krupenkin, T., Taylor, A., Fratzl, P. & Aizenberg, J. Reversible switching of hydrogel-actuated nanostructures into complex micropatterns. *Science* **315**, 487–490 (2007).
26. Shastri, A. et al. An aptamer-functionalized chemomechanically modulated biomolecule catch-and-release system. *Nat Chem* **7**, 447–454 (2015).
27. He, X., Friedlander, R. S., Zarzar, L. D. & Aizenberg, J. Chemo-mechanically regulated oscillation of an enzymatic reaction. *Chem Mater* **25**, 521–523 (2013).
28. Sidorenko, A., Krupenkin, T. & Aizenberg, J. Controlled switching of the wetting behavior of biomimetic surfaces with hydrogel-supported nanostructures. *J Mater Chem* **18**, 3841–3846 (2008).
29. Liu, Y. et al. Computational modeling of oscillating ns that "catch and release" targeted nanoparticles in bilayer flows. *Soft Matter* **12**, 1374–1384 (2016).
30. Palleau, E., Morales, D., Dickey, M. D. & Velev, O. D. Reversible patterning and actuation of hydrogels by electrically assisted ionoprinting. *Nat Commun* **4**, 2257 (2013).
31. Grzybowski, B. A. & Huck, W. T. S. The nanotechology of life-inspired systems. *Nat Nanotechnol* **11**, 585–592 (2016).
32. Dayal, P., Kuksenok, O. & Balazs, A. C. Recon gurable assemblies of active, autochemotactic gels. *Proc Natl Acad Sci USA* **110**, 431–436 (2013).
33. Cohen Stuart, M. A. et al. Emerging applications of stimuli-responsive polymer materials. *Nat Mater* **9**, 101–113 (2010).
34. Ashkenasy, G., Hermans, T. M., Otto, S. & Taylor, A. F. Systems chemistry. *Chem Soc Rev* **46**, 2543–2554 (2017).
35. Epstein, I. R. & Xu, B. Reaction-diffusion processes at the nano- and microscales. *Nat Nanotechnol* **11**, 312–319 (2016).
36. Dhanarajan, A. P., Misra, G. P. & Siegel, R. A. Autonomous chemomechanical oscillations in a hydrogel/enzyme system driven by glucose. *J Phys Chem A* **106**, 8835–8838 (2002).
37. Wrobel, M. M. et al. pH Wave-front propagation in the urea-urease reaction. *Biophys J* **103**, 610–615 (2012).
38. Cangialosi, A. et al. DNA sequence-directed shape change of photopatterned hydrogels via high-degree swelling. *Science* **357**, 1126–1130 (2017).
39. Heinen, L., Heuser, T., Steinschulte, A. & Walther, A. Antagonistic enzymes in a biocatalytic pH feedback system program autonomous DNA hydrogel life cycles. *Nano Lett* **17**, 4989–4995 (2017).
40. Fets, L., Kay, R. & Velazquez, F. Dictyostelium. *Curr Biol* **20**, R1008 (2010).
41. Mahadevan, L. & Matsudaira, P. Motility powered by supramolecular springs and ratchets. *Science* **288**, 95–99 (2000).
42. Hu, Y., Kim, P. & Aizenberg, J. Harnessing structural instability and material instability in the hydrogel-actuated integrated responsive structures (HAIRS). *Extrem Mech Lett* **13**, 84–90 (2017).

Acknowledgements

This material is based upon work supported by the Department of Energy under Award Number DE-SC0005247. P.A.K. thanks the Netherlands Organisation for Scienti c Research (NWO Rubicon, VENI) and the Ministry of Education, Culture and Science (Gravity program, 024.001.035) for nancial support. We thank M. Aizenberg, L. Mahadevan and T. Schroeder for stimulating discussions.

Author contributions

P.A.K., A.G. and J.A. conceived the research. P.A.K. and R.M.R. performed the experiments; C.N.K. developed the theoretical model; all authors analyzed the results; P.A.K., C.N.K., A.G. and J.A. wrote the manuscript.

Competing interests

The authors declare no competing interests.

Additional information

Supplementary information is available for this paper at https://doi.org/10.1038/s41467-019-14114-0.

Correspondence and requests for materials should be addressed to P.A.K., C.N.K. or J.A.

Peer review information *Nature Communications* thanks the anonymous reviewer(s) for their contribution to the peer review of this work.

Reprints and permission information is available at http://www.nature.com/reprints

Publisher s note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional af liations.

DEFENSE ADVANCED
RESEARCH PROJECTS AGENCY

Autonomous Diagnostics to Enable Prevention and Therapeutics (ADEPT)

Dr. Amy Jenkins

The Autonomous Diagnostics to Enable Prevention and Therapeutics (ADEPT) program supports individual troop readiness and total force health protection by developing technologies to rapidly identify and respond to threats posed by natural and engineered diseases and toxins. A subset of ADEPT technologies specifically support use by personnel with minimal medical training, delivering centralized laboratory capabilities even in the low-resource environments typical of many military operations. The program is part of a portfolio of DARPA-funded research aimed at providing options for preempting or mitigating constantly evolving infectious disease threats.

The ADEPT program's four thrusts cover simple-to-use, on-demand diagnostics for medical decision-making and accurate threat-tracking; novel methods for rapidly manufacturing new types of vaccines with increased potency; novel tools to engineer mammalian cells for targeted drug delivery and in vivo diagnostics; and novel methods to impart near-immediate immunity to an individual using antibodies.

ADEPT has pioneered use of nucleic-acid-based anti-infective technologies, valuable for their efficacy and adaptability. These tools—primarily coded genetic instructions to the body on how to produce its own protective antibodies against a specific threat—have the advantages of being easily manufactured at scale using largely synthetic processes, transported and stored without many of the cold-chain logistics required by traditional medical countermeasures, delivered with near-immediate efficacy, and safely expressed in the body for only a limited duration, causing no permanent alteration to the genome.

Defense Advanced Research Projects Agency Intelligent Healing for Complex Wounds

Intelligent Healing for Complex Wounds

A bioelectronic interface could speed the body's natural healing processes to deliver faster recovery from wounds with fewer complications

OUTREACH@DARPA.MIL
2/6/2019

Blast injuries, burns, and other wounds experienced by warfighters often catastrophically damage their bones, skin, and nerves, resulting in months to years of recovery for the most severe injuries and often returning imperfect results. This long and limited healing process means prolonged pain and hardship for the patient, and a drop in readiness for the military. However, DARPA believes that recent advances in biosensors, actuators, and artificial intelligence could be extended and integrated to dramatically improve tissue regeneration. To achieve this, the new Bioelectronics for Tissue Regeneration (BETR) program asks researchers to develop bioelectronics that closely track the progress of the wound and then stimulate healing processes in real time to optimize tissue repair and regeneration.

Exhibit 8

23

Paul Sheehan, the BETR program manager, described his vision for the technology as "not just personalized medicine, but dynamic, adaptive, and precise human therapies" that adjust to the wound state moment by moment to provide greater resilience to wounded warfighters.

"Wounds are living environments and the conditions change quickly as cells and tissues communicate and attempt to repair," Sheehan said. "An ideal treatment would sense, process, and respond to these changes in the wound state and intervene to correct and speed recovery. For example, we anticipate interventions that modulate immune response, recruit necessary cell types to the wound, or direct how stem cells differentiate to expedite healing."

The envisioned BETR technology would represent a sharp break from traditional wound treatments, and even from other emerging technologies to facilitate recovery, most of which are passive in nature.

Under current medical practice, physicians provide the conditions and time for the body to either heal itself when tissues have regenerative capacity or to accept and heal around direct transplants. Most people are familiar with interventions that include casts to stabilize broken bones or transplants of healthy ligaments or organs from donors to replace tissues that do not regenerate.

Passive approaches often result in slow healing, incomplete healing with scarring, or, in some unfortunate cases, no healing at all. Blast injuries in particular seem to scramble the healing processes; 23 percent of them will not fully close. Moreover, research shows that in nearly two thirds of military trauma cases — a rate far higher than with civilian trauma injuries — these patients suffer abnormal bone growth in their soft tissue due to a condition known as heterotopic ossification, a painful experience that can greatly limit future mobility.

Although recent experimental treatments offer some hope for expedited recovery, many of these new approaches remain static in nature. For instance, some "smart" bandages emit a continuous weak electric field or locally deliver drugs. Alternatively, hydrogel scaffolds laced with a drug can recruit stem cells, while decellularized tissue re-seeded with donor cells from the patient help avoid rejection by the host's immune system. These newer approaches may indeed encourage growth of otherwise non-regenerative tissue, but because they do not adapt to the changing state of a wound, their impact is limited.

"To understand the importance of adaptive treatments that respond to the wound state, consider the case of antibiotic ointments," Sheehan explained. "People use antibiotics to treat simple cuts, and they help if the wound is infected. However, completely wiping out the natural microbiota can impair healing. Thus, without feedback, antibiotics can become counterproductive."

Recent technologies have begun to close the loop between sensing and intervention, looking for signs of infection such as changes in pH level or temperature to trigger treatment. To date, however, these systems have been limited to monitoring changes induced by bacteria. For BETR, DARPA intends to use any available signal, be it optical, biochemical, bioelectronic, or mechanical, to directly monitor the body's physiological processes and then to stimulate them to bring them under control, thereby speeding healing or avoiding scarring or other forms of abnormal healing.

By the conclusion of the four-year BETR program, DARPA expects researchers to demonstrate a closed-loop, adaptive system that includes sensors to assess wound state and track the body's complex

responses to interventions; biological actuators that transmit appropriate biochemical and biophysical signals precisely over space and time to influence healing; and adaptive learning approaches to process data, build models, and determine interventions. To succeed, the BETR system must yield faster healing of recalcitrant wounds, superior scar-free healing, and/or the ability to redirect abnormally healing wounds toward a more salutary pathway.

DARPA anticipates that successful teams will include expertise in bioelectronics, artificial intelligence, biosensors, tissue engineering, and cellular regeneration. Further, DARPA encourages proposals that address healing following osseointegration surgery, which is often necessary to support the use of advanced prosthetics by wounded warfighters.

DARPA will host a Proposers Day on March 1, 2019 in Arlington, Virginia, to provide more information to researchers interested in submitting a proposal for funding. Additional information is available at https://go.usa.gov/xENCQ. A forthcoming Broad Agency Announcement, to be posted to the Federal Business Opportunities website, will include full details of the program.

TAGS

| Artificial Intelligence | Health | Injury | Med-Devices | Sensors |

SIMILARLY TAGGED CONTENT

New Generation of Intelligent Bio-Interfaces Could Overcome Aspects of Spinal Cord Injury
Bioelectronics for Tissue Regeneration
Biological Technologies
Detect It with Gene Editing Technologies (DIGET) Proposers Day
Gene Editors Could Find New Use as Rapid Detectors of Pathogenic Threats

IMAGES

BETR program

https://www.mckesson.com/About-McKesson/

The difference we make in one minute

McKesson is the central nervous system of health care. At any given moment, in any given minute, we simultaneously execute thousands of critical operations that improve the businesses of our customers and the lives of their patients.

This is the difference we make in one minute. This is the difference we make every minute.

Exhibit 9

ICD-10

MICROMD EMR VERSION 10.0

UPDATE GUIDE

Exhibit 10

HENRY SCHEIN®
MicroMD®

Clinical Quality Measures

43 Clinical Quality Measures have been updated for Stage 2 to include ICD-10 codes as well as ICD-9 codes. These updates are done behind the scenes in the reference database.

Form Encounters and the Administrative Form Builder

Users can create forms using the Form Encounter or the Administrative Form Builder to create forms containing ICD-10 codes. The codes will work with checkboxes, options buttons, pick lists and when inserting medical information or assessments with ICD view/print.

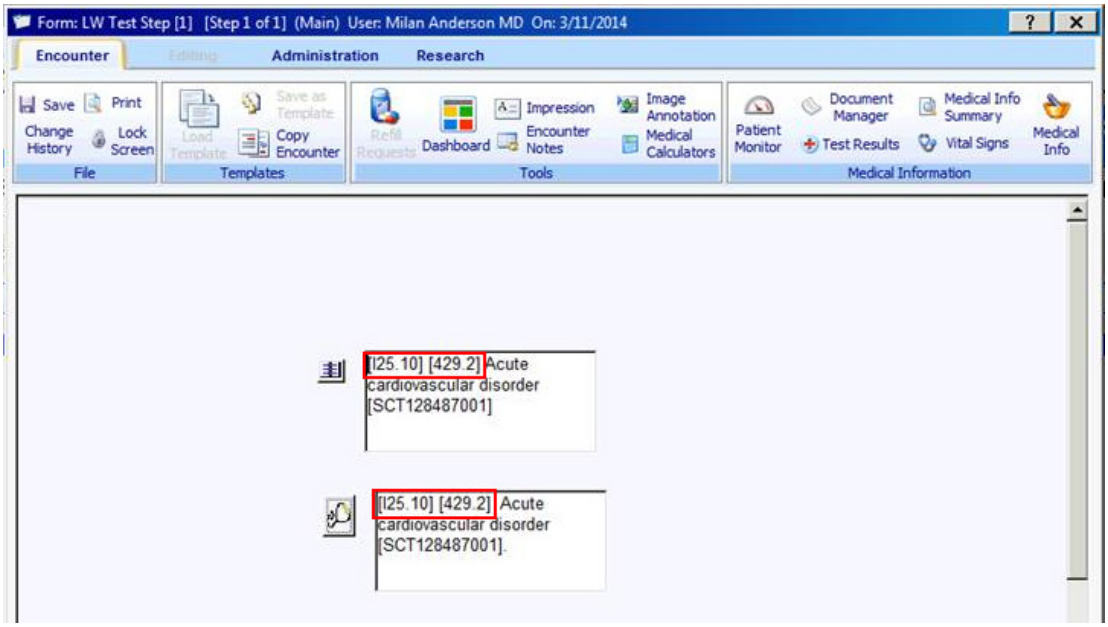


Figure 1.34 ICD-9 and ICD-10 codes in the Form Builder

Drug-to-ICD Warnings

MicroMD has incorporated First DataBank's Medical Lexicon Module, which integrates all existing ICD-10 codes into the EMR, and drug-to-ICD warnings are current with the new code set.

First Databank (FDB) Empowers Medical Decision-Making

First Databank is the leading provider of drug databases that are integrated into HIT systems. We create innovative solutions to meet clinical and other healthcare business decision support needs. And, we've launched a new database platform to help improve the identification, utilization, and tracking of medical devices.

- Unmatched experience in developing and integrating drug and medical device databases
- Reliable and consistent knowledge that creates customer confidence and trust
- High satisfaction ratings that prove we exceed customer need

Get the FDB MedKnowledge Brochure

Complete this form to download

First Name | Last Name | Email Address

Exhibit 11

DOWNLOAD BROCHURE

About FDB

First Databank (FDB) is the leading provider of drug and medical device knowledge that helps healthcare professionals make precise decisions. We empower our information system developer partners to deliver valuable, useful, and differentiated solutions used by millions of clinicians, business associates, and patients every day. For more than four decades, our medical knowledge has helped improve patient safety, operational efficiency, and healthcare outcomes. For a complete look at our solutions and services, please visit **www.fdbhealth.com** and follow us on **Twitter**, **LinkedIn**, and **YouTube**.

McKesson Fills Initial Government Orders for Moderna's COVID-19 Vaccine

December 20, 2020

IRVING, Texas, Dec. 20 – As part of Operation Warp Speed, the U.S. government's public-private partnership to deliver COVID-19 vaccines to Americans, and under the direction of the Centers for Disease Control and Prevention (CDC), **McKesson** began distributing Moderna's COVID-19 vaccines and the ancillary supply kits needed to administer them. After months of preparation, which included establishing dedicated distribution centers and assembling supply kits, the company is primed to support the nation during this significant healthcare challenge.

Brian Tyler, CEO, McKesson said, "We are honored to be a partner with the U.S. government and other private-sector companies such as Moderna to support in the distribution of COVID-19 vaccines and the ancillary supply kits. In March, our world seemed to change overnight. But with a renewed sense of commitment and intensified focus, we've come together across industries and forged public and private partnerships to help restore and protect the health and well-being of people around the world. With our exceptional group of employees managing the effort, we stand ready as a company to meet this historical moment."

Key facts include:

- McKesson, a global leader in healthcare supply chain management, is managing two different aspects of the distribution efforts in coordination with the U.S. government. The company is distributing all supply kits for COVID-19 vaccines, as well as the distribution of frozen or refrigerated COVID-19 vaccines. McKesson is not distributing the Pfizer ultra-frozen vaccine.
- McKesson has a long history of managing the pharmaceutical and medical supply chain in the U.S., as well as handling the distribution of vaccines. The company has been the centralized distributor for the CDC's Vaccines for Children program for 13 years, including during the H1N1 public health crisis.
- The U.S. government is making all decisions related to where, when and how many doses McKesson will distribute. The company filled the first order from the CDC on Sunday, December 20. Our shipping partners should deliver initial vaccine orders at administration sites nationwide on Monday, Dec. 21, 2020.
- Maintaining the cold chain is a priority for the company. Upon arrival at a McKesson vaccine distribution center, McKesson will verify that the vaccines were maintained at the proper temperature while in transit and will place the vaccines inside a large-scale, pharmaceutical-grade freezer designed to maintain proper temperatures.
- The freezers are equipped with sophisticated controls, monitoring systems and alarms intended to ensure the vaccines remain within the appropriate temperature ranges.
- After receiving CDC orders, from inside the freezers the vaccine doses will be packed into insulated coolers with specialized cold packs and a temperature monitor so the administration site can verify that the vaccine doses stayed within the required temperature range during transit.
- For the Moderna COVID-19 vaccine, the ancillary supply kit normally will be sent at the same time as the vaccines. The kits include alcohol prep pads, face shields, surgical masks, needles and syringes, a vaccine administration sheet, and a vaccine record and reminder card.
- The company has partnered with FedEx and UPS, who will deliver the vaccines and ancillary supply kits to administration sites throughout the country.

Through Operation Warp Speed, McKesson partners closely with the U.S. Department of Health and Human Services (HHS) and the CDC. For the ancillary supply kit production and distribution, McKesson has partnered with the Strategic National Stockpile, which is part of the Office of the Assistant Secretary for Preparedness and Response within HHS.

About McKesson Corporation

McKesson Corporation is a global leader in healthcare supply chain management solutions, retail pharmacy, community oncology and specialty care, and healthcare information solutions. McKesson partners with pharmaceutical manufacturers, providers, pharmacies, governments and other organizations in healthcare to help provide the right medicines, medical products and healthcare services to the right patients at the right time, safely and cost-effectively. United by our ICARE shared principles, our employees work every day to innovate and deliver opportunities that make our customers and partners more successful – all for the better health of patients. McKesson has been named a "**Most Admired Company**" in the healthcare wholesaler category by FORTUNE, a "**Best Place to Work**" by the Human Rights Campaign Foundation, and a top **military-friendly company** by Military Friendly. For more information, visit **www.mckesson.com**.

PR Contact

David Matthews
David.Matthews@McKesson.com
214-952-0833

Exhibit 12

How the U.S. government bolstered Moderna's COVID-19 vaccine candidate

By Brian Buntz | November 23, 2020

Until recently, the most rapidly developed vaccine was for mumps, which took four years. Now, Pfizer (NYSE:PFE) and Moderna (NSDQ:MRNA) appear to be on the cusp of commercializing COVID-19 vaccines under emergency use authorization.

[Image courtesy of Wikipedia]

It was only a year ago that physicians in China identified unusual pneumonia cases that would later be associated with the novel coronavirus.

As impressive as the rapid pace of COVID-19 vaccine development has been, researchers have drawn on foundational work that stretches back almost two decades, said Barry Bloom, a research professor at Harvard University, in the recent webinar titled the "Race for the COVID-19 Vaccine: Latest Updates."

And the Moderna vaccine candidate, in particular, has benefited from U.S. government support.

A marathon as well as a sprint

The race to develop COVID vaccines has roots stretching back to the terrorist attacks on September 11 and the anthrax attacks that followed in the subsequent weeks. The events led the National Academy of Sciences to convene a set of committees to examine the twin threats of terrorism and pandemics. The committees "concluded that we were enormously vulnerable and we had to do a lot of different things [to] protect the country," said Bloom, who co-chaired a bioterrorism panel for the National Academy of Sciences at the time.

In 2002, severe acute respiratory syndrome (SARS) first appeared in China and took hold internationally within months. Effective public health interventions prevented SARS from becoming a pandemic.

The pandemic plan stressed the importance of antiviral drugs and vaccines. “It is a wonderful plan,” Bloom noted. But before COVID-19 hit, the report had “disappeared in a drawer somewhere in Washington,” he added.

But the U.S. government’s focus on vaccines to combat pandemics likely played a role in spurring further research into novel vaccine platforms.

DARPA and BARDA make vaccine investments

Government agencies such as the Defense Advanced Research Projects Agency (DARPA) and the Biomedical Advanced Research and Development Authority (BARDA) would play a role in vaccine development. DARPA “invests in very long term science and technology [projects] that will pay off in 20 years,” Bloom said.

The National Institute of Allergy and Infectious Diseases (NIAID) developed a stabilized SARS-CoV-2 spike immunogen (S-2P) that Moderna would later use in its messenger RNA platform.

DARPA was instrumental in the development of RNA vaccines and provided $25 million in financial support to Moderna in 2013 to pursue messenger RNA–based antibody drugs and vaccines. DARPA announced it was committing up to $56 million in additional funding to Moderna this October.

BARDA has committed another roughly $955 million to Moderna.

In all, the U.S. government vaccine contract with Moderna is worth roughly $1.5 billion. BARDA has also invested in producers of other COVID-19 vaccines.

BARDA was also instrumental in resetting researchers’ expectations for vaccine development, Bloom said. The organization set a goal of developing a vaccine 60 days after determining a pathogen’s DNA sequence. Moderna had a vaccine candidate 66 days after scientists identified its genetic sequence. “And that is a reflection of tremendous foresight by these technical agencies,” Bloom said. By identifying promising research and identifying companies to advance it, the government agencies have played a role in engineering COVID-19 vaccines. But the platform approach could also help fight future pandemics, given its ability to allow researchers to tweak antigens and genes to target a new pathogen.

The U.S. government’s support of the vaccine platform led to investigations into its use to treat infections from Middle East Respiratory Syndrome (MERS), influenza, Zika and HIV. “We had a background on these

UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

NEW ENGLAND CARPENTERS HEALTH BENEFITS FUND, et al., Plaintiffs, v. FIRST DATABANK, INC. and McKESSON CORPORATION, Defendants.	)	CIVIL ACTION NO. 05-11148-PBS

MEMORANDUM AND ORDER APPROVING CLASS SETTLEMENT AND AWARDING ATTORNEY'S FEES AND EXPENSES

August 3, 2009

Saris, U.S.D.J.

After hearing on July 24, 2009, the Court allows the motion for final approval of the proposed nationwide class settlement of $350,000,000 as fair, reasonable, and adequate. See Fed. R. Civ. P. 23(e)(2).

As background, plaintiffs have asserted that defendants First DataBank, Inc. ("FDB"), a drug pricing publisher, and McKesson Corporation, a drug wholesaler, engaged in a racketeering enterprise to fraudulently increase the published "average wholesale price" ("AWP") of over four hundred branded drugs by five percent from late 2001 to 2005 in violation of 18 U.S.C. § 1962 and state law. The full factual background of the allegations are set forth in my Memorandum and Order, dated March

Exhibit 14

17, 2009 [Docket No. 720]. New England Carpenters Health Benefits Fund v. First Databank, Inc., 602 F. Supp. 2d 277 (D. Mass. 2009); see also New England Carpenters Health Benefits Fund v. First Databank, Inc., 244 F.R.D. 79 (D. Mass. 2007). Various objections were filed to the settlement. I find that the allocation among the cash, co-pay, and third-party classes is reasonable. I also find that notice to the classes was innovative, expansive and reasonable. I reject the objections to the allocation among the classes, the methodology for identification of class members, and notice for the reasons stated in court.

One remaining issue is the award of attorneys' fees and expenses. Class counsel seek an award of attorneys' fees and expenses in the amount of $84,000,000, which is 24 percent of the $350,000,000 settlement fund. The total lodestar accumulated by class counsel as of May 1, 2009 was in excess of $8,356,100. Plaintiffs report expenses accumulated in the amount of $4 million. If the lodestar of $8,356,100 (the attorneys' fees only) is divided into the requested fee award of $84 million, the multiplier is 10.05, which is at the highest end of multipliers imposed in comparable litigation. Objectors have challenged attorneys' fees and expenses as excessive and not supported by contemporaneous records.

In the First Circuit, "[t]he lodestar approach (reasonable hours spent times reasonable hourly rates, subject to a

multiplier or discount for special circumstances, plus reasonable disbursements) can be a check or validation of the appropriateness of the percentage of funds fee, but is not required." In re Compact Disc Minimum Advertised Price Antitrust Litig., 216 F.R.D. 197, 215-16 (D. Me. 2003); In re Thirteen Appeals Arising out of the San Juan Dupont Plaza Hotel Fire Litig, 56 F.3d 295, 307 (1st Cir. 1995); see also Manual for Complex Litigation (Fourth) § 14.122 (2004) ("the lodestar is . . . useful as a cross-check on the percentage method by estimating the number of hours spent on the litigation and the hourly rate, using affidavits and other information provided by the fee applicant. The total lodestar estimate is then divided into the proposed fee calculated under the percentage method. The resulting figure represents the lodestar multiplier to compare to multipliers in other cases.").

Several factors militate in favor of a significant multiplier. Plaintiffs point out that they successfully achieved a mega-amount of $350,000,000 plus future injunctive relief requiring First DataBank to roll back the prices of drugs subject to the conspiracy. There has been near-unanimous and "eye-popping" support for this settlement. (Aff. of Arthur R. Miller [Docket No. 794] ¶ 58.) Plaintiffs' counsel have been excellent in this complex, hard-fought litigation and innovative in its notice program and efforts to find class members. The expenses are included within the amount requested. Still, much of the

spade work in learning the arcane intricacies of drug pricing has been done in the related "Average Wholesale Price" litigation, which is separately compensated. See, e.g., In re Pharm. Indus. Average Wholesale Price Litig., 230 F.R.D. 61, 92 (D. Mass. 2005). The major new hurdle plaintiffs mounted here was the contentious battle over class certification, which was continued in the First Circuit. Balancing all the factors under the cross-check approach, I award the amount of $70,000,000, which represents a multiplier of about 8.3 times lodestar, and about 20 percent of the common fund. See Conley v. Sears, Roebuck & Co., 222 B.R. 181, 182 (D. Mass. 1998) (approving attorneys' fees that would constitute a lodestar multiplier of 8.9); In re Rite Aid Corp. Sec. Litig., 146 F. Supp. 2d 706, 736 n.44 (E.D. Pa. 2001) (concluding that, under the cross-check approach, a lodestar multiplier in the range of 4.5 to 8.5 was "unquestionably reasonable").

The Court allows compensation to the Named Consumer Representatives of $2,000 and the Third-Party Payor ("TPP") Plaintiffs for time spent on this case at $100 per hour. There were no objections to these amounts.

Finally, Skilstaf Inc., a TPP, has filed a motion for clarification of, or in the alternative, limited objection to the release by the class of the right to sue retailers separately. Specifically it objects to the release of "any other person" in Section 15 of the Settlement Agreement. McKesson argues that

this provision is important because it buys complete peace from having to contribute to judgments that might be entered against retailer pharmacies. This concern is hardly illusory. McKesson states that it has already received a demand letter for contribution in litigation filed in California by Skilstaf against retail pharmacies accused of being part of the price-rigging conspiracy. Mirabile dictu, class counsel (Hagens Berman) apparently is one of the law firms representing Skilstaf in that litigation. This was an issue which the parties did not flag to the Court during the preliminary approval proceedings or in the Notice, and the Court completely missed it. Confusingly, McKesson actually wrote Skilstaf an e-mail explaining that it did not intend the release to extend to claims against retail pharmacies. (Mot. for Clarification [Docket #779] Ex. B at 1.)

Because this is a proposed settlement, this Court would not have the authority to strike a material provision. At best it would be able to give a thumbs down to the entire agreement. To breach the impasse, McKesson has agreed to let Skilstaf opt out. While this approach raises some concerns that Skilstaf is being given special treatment, it is the pragmatic approach. No other TPP has objected to the provision, and indeed there has been no TPP objection to the settlement. Indeed, some TPPs filed a brief in support of the settlement. Moreover, any new suit against the pharmacies based on the allegations in this case is likely time barred. Accordingly, the Court declines to strike or clarify the

"any other person" language. Skilstaf has ten days from July 24, 2009 in which it may opt out of the settlement.

SO ORDERED.

S/PATTI B. SARIS
UNITED STATES DISTRICT JUDGE

Press Room

HEARST CORPORATION AND CORUS ENTERTAINMENT PARTNER TO LAUNCH COSMOPOLITAN TELEVISION IN CANADA

August 16, 2007

(New York, New York and Toronto, Canada) Leading media companies **Hearst Corporation** and Canada's **Corus Entertainment Inc.** have partnered on a strategic joint venture to bring **Cosmopolitan Television** to Canada. Inspired by *Cosmopolitan*, the world's best-selling young women's magazine, the 24-hour digital channel for women will launch in early 2008. Cosmopolitan TV Canada joins Cosmopolitan Television networks in Spain and throughout Latin America.

"Corus is delighted to have the opportunity to work with Hearst Corporation on this globally-recognized brand," said John Cassaday, president and CEO, Corus Entertainment. "With our past experience in creating successful niche-targeted television services and our expertise in marketing to women, Cosmopolitan TV is a perfect fit for Corus. We look forward to the opportunity to further extend this brand to television and to introduce this exciting new service to Canadian women."

"We successfully launched Cosmopolitan Television in Spain several years ago and have since rolled out Cosmopolitan TV in many other countries. We believe that the channel's unique brand of entertainment and information programming, customized for the particular country, resonates with young women everywhere," said Bruce Paisner, executive vice president, Hearst Entertainment and Syndication, a unit of Hearst Corporation. "Corus is the right partner to help us launch Cosmopolitan TV, which we're confident will be well-received by women across Canada."

Cosmopolitan Television is a national, English-language category 2 digital specialty service targeted to women ages 18-34. Aimed at a younger demographic than Corus' W Network, this service will air a mix of entertainment and lifestyle programming, ranging from comedy and drama series to relationship and self-help reality programming to blockbuster movies. Cosmopolitan Television was first launched in Spain in March 2000 and now exists in more than 20 countries, including Spain, Mexico, Argentina and now Canada. Hearst Magazines' *Cosmopolitan*, with 58 international editions, is published in 34 languages and distributed in more than 100 countries.

About Corus Entertainment Corus Entertainment Inc. is a Canadian-based media and entertainment company. Corus is a market leader in specialty television and radio with additional assets in pay television, advertising and digital audio services, television broadcasting, children's book publishing and children's animation. The company's multimedia entertainment brands include YTV, Treehouse, W Network, Movie Central, Nelvana, Kids Can Press and radio stations including CKNW, CKOI and Q107. Corus creates engaging branded entertainment experiences for its audiences across multiple platforms. A publicly traded company, Corus is listed on the Toronto (CJR.B) and New York (CJR) exchanges. Experience Corus on the web at www.corusent.com.

About Hearst Entertainment and Syndication Hearst Entertainment & Syndication, a unit of Hearst Corporation, is the operating group responsible for Hearst's interests in cable television networks, television production and distribution, newspaper syndication and merchandise licensing. Hearst owns substantial stakes in ESPN; A&E Television Networks, including the A&E, History and Biography channels; Lifetime; and international Cosmopolitan channels. Hearst also owns King Features Syndicate, a major newspaper syndication and merchandise licensing company. Hearst Entertainment, Inc. produces reality programming and administers distribution of Hearst's TV movie library.

About Hearst Corporation Hearst Corporation (www.hearst.com) is one of the nation's largest diversified communications companies. Its major interests span nearly 200 magazines around the world, including *Cosmopolitan* and *O, The Oprah Magazine*; 12 daily newspapers, including the *Houston Chronicle* and *San Francisco Chronicle*; 28 television stations through Hearst-Argyle Television (NYSE: HTV), which reach a combined 18% of U.S. viewers; ownership in leading cable networks, including Lifetime, A&E, The History Channel and ESPN; as well as business publishing, Internet businesses, television production, newspaper features distribution and real estate.

–30–

For further information, please contact:
Lindsay Smith Communications Corus Entertainment 416-530-2248
Jessica Kleiman VP, Public Relations Hearst Magazines 212-649-2545

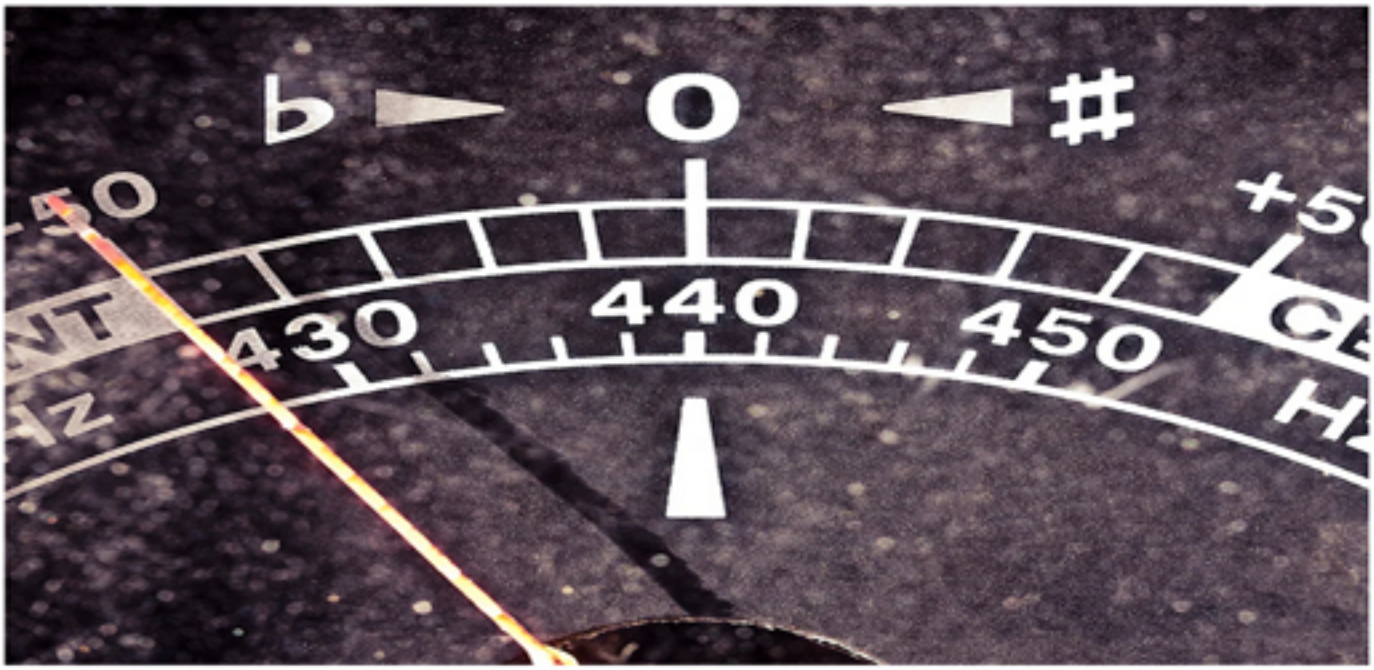
COSMO TV®

Exhibit 15

COMMENTARY

The great 440 Hz conspiracy, and why all of our music is wrong: Alan Cross

By **Alan Cross** · **Global News**
Posted May 13, 2018 10:00 am



A vintage plastic guitar tuner measures 440 Hz. **Getty Images**

-A A+

Gather 'round, kids. Those of you with tinfoil hats may wish to ensure that they're fitted snuggly. What I'm about to tell you will shake your faith in all the music you've heard in your life.

If you look down the right paths, it becomes clear that governments and various security apparatuses have used music to control us using music. All the music of the West that's based on the standard 12-tone scale is used for the management of crowds as well as thought control.

Exhibit 16

READ MORE: 'Big Brother Canada' Season 6 winner crowned

Let's begin with some music theory.
41

If musical performances were to sound the same the world over, some standardization was required. As early as 1885, the Music Commission of the Italian Government declared that all instruments and orchestras should use a tuning fork that vibrated at 440 Hz, which was different from the original standard of 435 Hz and the competing 432 Hz used in France.

In 1917, the American Federation of Musicians endorsed the Italians, followed by a further push for 440 Hz in the 1940s.

In 1953, a worldwide agreement was signed. Signatories declared that middle "A" on the piano be forevermore tuned to exactly 440 Hz. This frequency became the standard ISO-16 reference for tuning all musical instruments based on the chromatic scale, the one most often used for music in the West. All the other notes are tuned in standard mathematical ratios leading to and from 440 Hz.

This tone standard is now universally accepted, which is why a piano in Toronto sounds exactly the same as a piano in China.

Weirdly, no one can say for sure why this frequency was chosen in the first place. In fact, there those among us who vehemently disagree with this standard. In fact, they consider the 440 Hz middle “A” to be an abomination against nature.

READ MORE: Neon Dreams on their undefinable music and leaving the Hedley tour

Adherents to this theory claim that a more “natural” frequency for middle “A” is 438 Hz. Others believe that the correct middle “A” is 432 Hz (also known as Verdi’s A) because it has “a pure tone of math fundamental to nature” and is “mathematically consistent with the patterns of the universe, vibrating with Phi, the Golden Ratio. They point to how this pitch can be connected to everything from nautilus shells to the works of the ancients, including the construction of the Great Pyramid.

Furthermore, 432 Hz resonates with 8 Hz (the Schumann Resonance), the documented fundamental electromagnetic “beat” of Earth. It just *feels* better.

Research says that music tuned from this frequency is easier to listen to, brighter, clearer, and contains more inherent dynamic range. As a result, music with this tuning need not be played at higher volumes and thus reduces the risk of hearing damage.

The more radical among middle “A” haters insist that the true frequency should be 528 Hz because it’s a “digital bio-holographic precipitation crystallization [and] miraculous manifestation of diving frequency vibrations.” I have no idea what that means.

Here’s where the conspiracy comes in. There is allegedly something sinister and evil about 440 Hz. It is said that the Rockefeller Foundation had an interest in making sure the United States adopted the 440 Hz standard in 1935 as part of a “war on consciousness” leading to “musical cult control.”

Without going too far down this rat hole, this theory says that tuning all music to 440 Hz turns it into a military weapon.

I quote from one of the many online articles on the subject: “The monopolization of the music industry features this imposed frequency that is ‘herding’ populations into greater aggression, psychosocial agitation, and emotional distress predisposing people to physical illnesses and financial impositions profiting the agents, agencies, and companies engaged in the monopoly.”

READ MORE: Carrie Underwood goes into detail about facial injury in 1st TV interview since accident

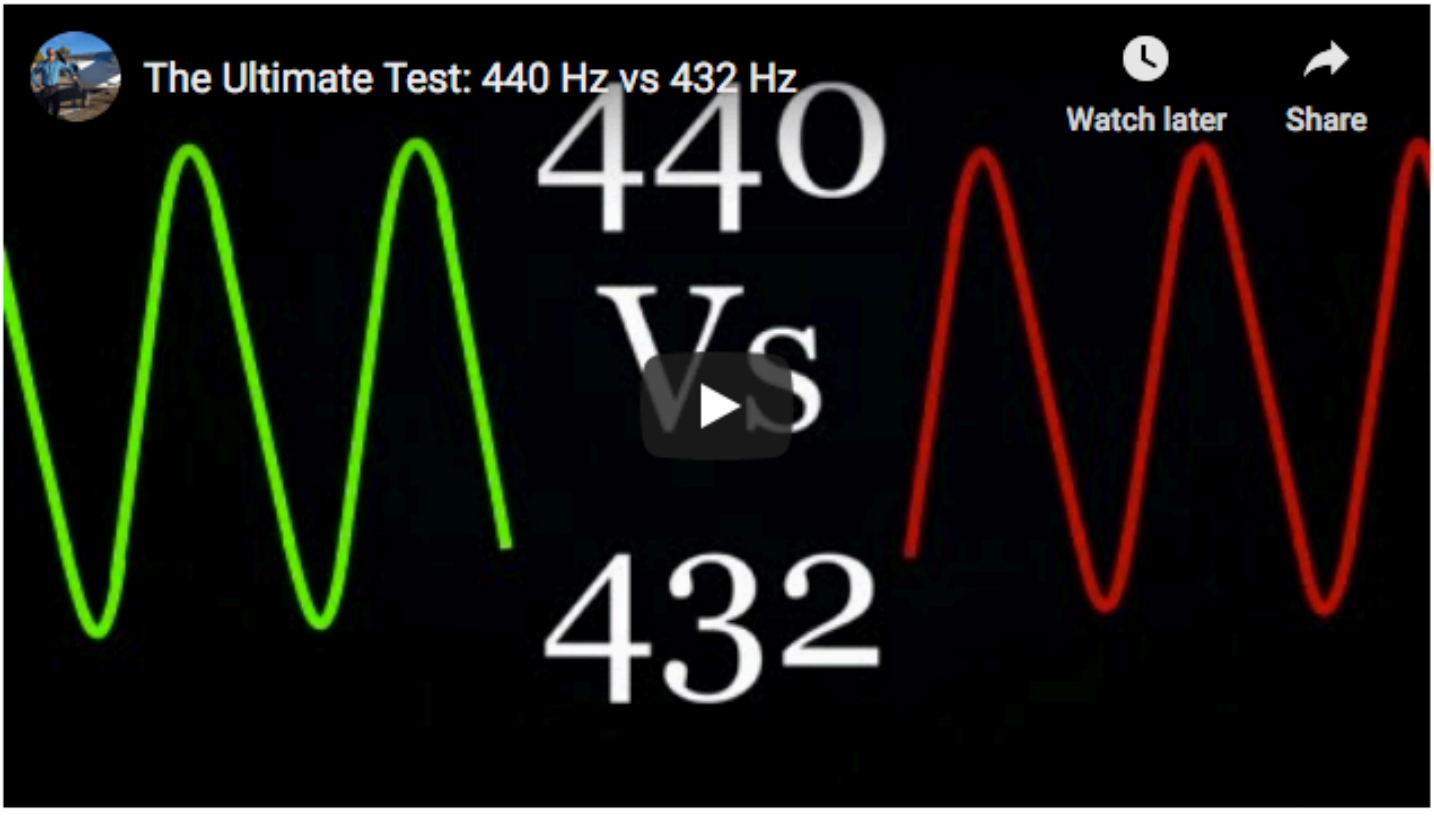
Whoa.[44]

Going a little deeper, we end up at the doorstep of the Nazis. It is said that propaganda minister Joseph Goebbels insisted that on 440 Hz tuning in Germany because he believed it made people think and feel in specific ways, making them "a prisoner of a certain consciousness." And if you're trying to mobilize the population for Der Fuhrer, that's exactly what you want, right?

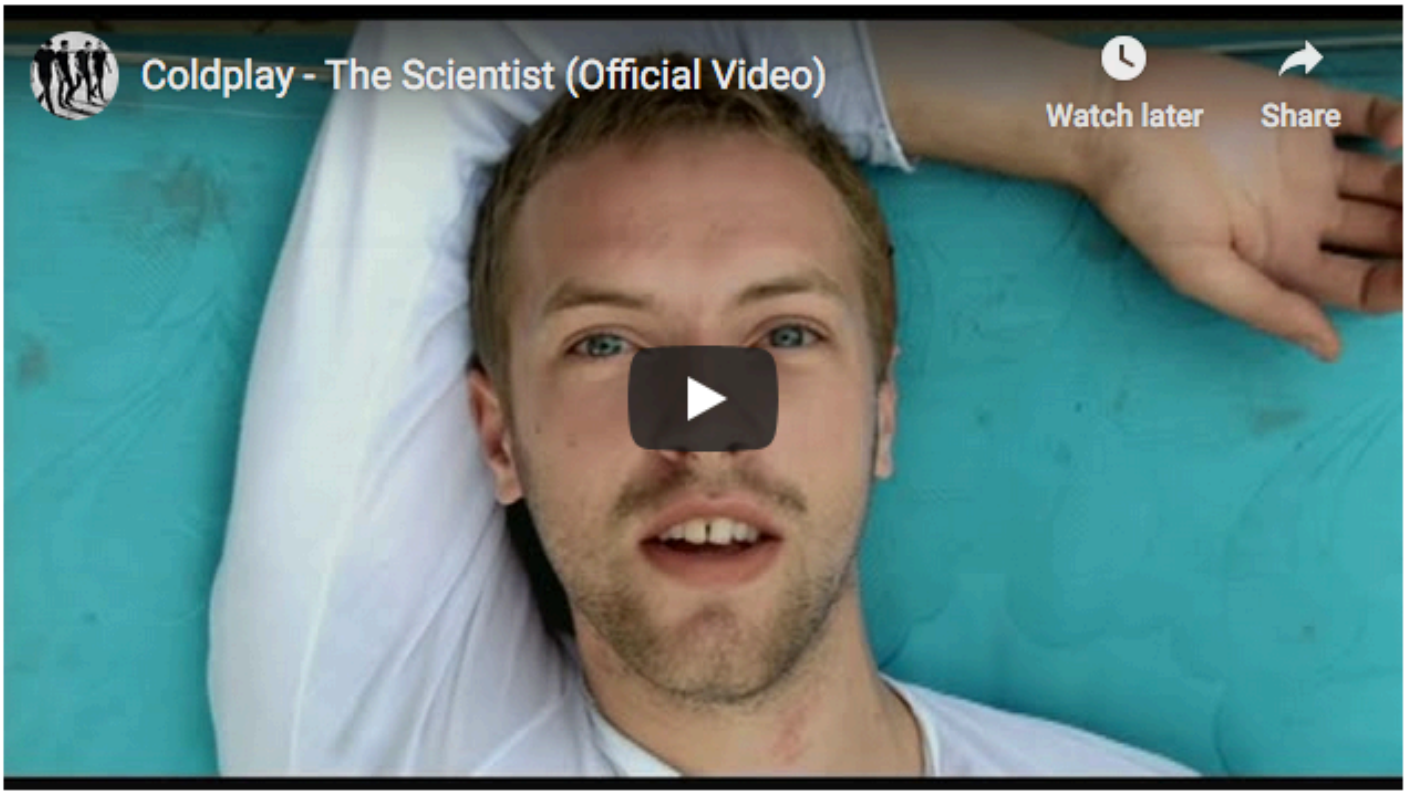
There's more from the Tinfoil Headphones crowd: "The powers that be are successfully lowering the vibrations of not only the young generation but the rest of us as well. These destructive frequencies entrain the thoughts towards disruption, disharmony, and disunity. Additionally, they also stimulate the controlling organ of the body — the brain — into disharmonious resonance, which ultimately creates disease and war."

There's something to think about the next time you pop in some earbuds. Does listening to music make you feel more warlike and diseased?

Let's test it out with this video.



Got that? Now try another experiment. Here are two versions of Coldplay's "The Scientist," starting with the standard version from their 2002 album, *A Rush of Blood to the Head*.



Any feelings of war or disease yet?

Now listen to this. It's a version of the same song that's been tuned down to the supposedly more natural frequency of 432 Hz. Can you feel a difference?

I've also been told that the different effects these frequencies have on our chakras. Songs tuned to 440 Hz work on the third eye chakra (the "thinking") while 432 Hz stimulates the heart chakra (the "feeling"). Therefore, 432 Hz music increases the spiritual development of the listener. It may even have healing properties.

There are numerous organizations advocating a universal switch to 432 Hz, but that would involve upsetting worldwide standards, not to mention the construction and re-tuning of millions of musical instruments. Nice idea, but it ain't gonna happen.

If that idea stressed you out, please meditate on this special 432 Hz music.

Alan Cross is a broadcaster with 102.1 the Edge and a commentator for Global News.

Subscribe to Alan's Ongoing History of New Music Podcast now on Apple Podcast or Google Play

JOURNALISTIC STANDARDS REPORT AN ERROR

Alan Cross | 432 Hz | 440 Hz | 440 Hz conspiracy | +4

COMMENTS

Welcome to 528records.com

i528Tunes NETPLAY
THE GREAT HOLLYWOOD ENDING

GETTING STARTED | GENRES | MEDIA | PRESS

LOGIN | REGISTRATION

SEARCH

Donations

PREMIUM RADIO SUBSCRIPTION

or GENERAL DONATIONS

Got Questions?

CLICK HERE for answers.

DOWNLOAD 528-TRANSPOSED tracks & albums

People's 528 Music Cooperative & Library

Use This Convenient Service to Transpose iTunes or MP3 Audio Files to 528Hz - The Frequency of Love - to Turn Listening into Powerful Miraculous Healing

NOW 100% FREE

TRANSPOSE

You are the Music

"You are a digital bioholographic precipitation, crystallization, miraculous manifestation, of Divine frequency vibrations, coming out of Water. Get it? You are the music, echoing universally, eternally, hydrosonically, with your heart at 528!"

- Dr. Leonard Horowitz

GETTING STARTED

THE WORLD'S FIRST MUSIC TRANSPOSITION SERVICE SPREADING "528/LOVE"

Introduction

Besides music being enjoyable, you can now make it more spiritually uplifting and physically healing.

I528Tunes.com exclusively transposes YOUR CDs, mp3, aac, and mp4 files into *DOWNLOADABLE* healing versions transposed into 528Hz frequency for more relaxing, comfortable, and confident listening.

The Mission of i528Tunes.com is to EVOLve and heal you and our planet musically.

528Hz is revolutionizing the music industry and restoring humanity's original spirituality (by playing and broadcasting a principle primordial frequency of creation "528/LOVE.") By listening, performing, and recording in the "Key of LOVE" (528Hz), you too can engage and advance this awesome transformation. And every time you do, it not only helps you, but like waves radiating out from a pebble thrown into a pond, your 528 musical energy reaches the farthest shores.

Developing a Deeper Understanding

CLICK HERE to learn why standard tuning (A=440Hz) is an unhealthy, spiritually-degrading, imposition.

CLICK HERE to learn why 528Hz, the "MI" or MIracle frequency" (of the original Solfeggio musical scale) is most preferred by nature and masterful musicians, especially for healing and Spiritual Renaissance.

Note: This site does not take orders for hardcopy CDs donated to the **528 Music Lovers Library.** Producing and shipping "special order" CDs made from your personal property, acquired through downloads from this site, is not a "Special Service" available by

Donate Now!

CLICK HERE FOR PREMIUM RADIO.

Or click the DONATE button below to make a general donation of any amount.

Donate

SSL Click to Verify...

Radio

- 528 Music Mix
- 528 Classic Rock
- 528 Ecstatic Dance
- 528 Disco
- 528 Oldies
- 528 Country Western
- 528 Christian Radio
- Monkeyman 528 Radio
- 528 Blues Radio
- 528TalkRadio.com
- 528 Radio Mobile
- 528 Meditation Music

Or use your favourite media player to load one of the stations playlists below for the server nearest you.

- US
- EU

Exhibit 17

Alan Cross

Toronto, ON
6° 6° 6°
Overcast
TRAFFIC Travel times & incidents

AUTHOR ARCHIVES: ALAN CROSS

ENTERTAINMENT 9 hours ago

The Ongoing History of New Music Podcast surpasses 10 million downloads

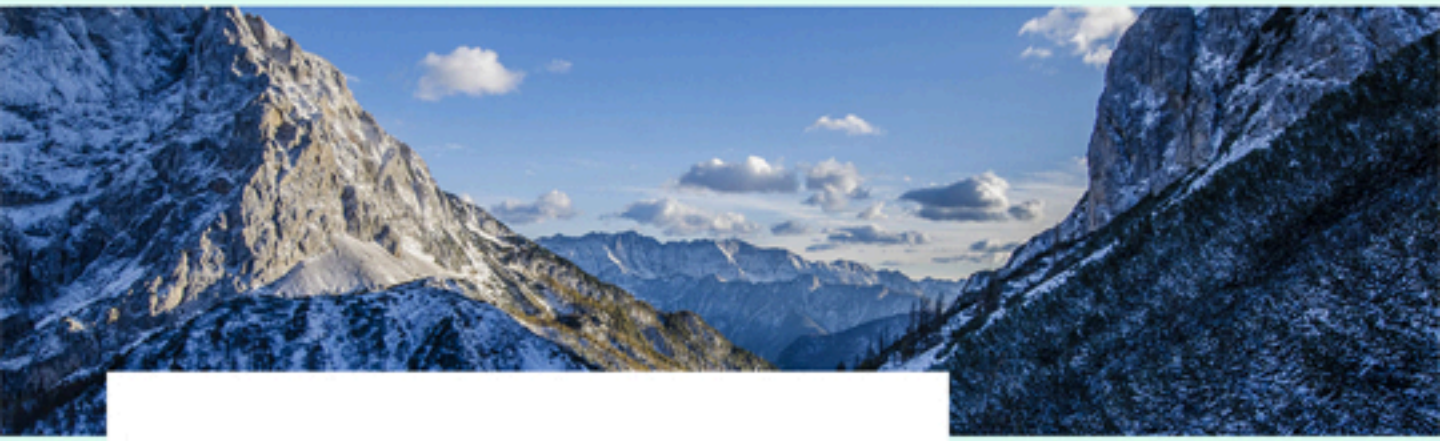
That's a lot of bandwidth. Continue reading →

TRENDING

Alberta enacts 2nd COVID-19 state of public health emergency. Here's what it means
46095 READ

Exhibit 18

Battleground Earth
by Wes Penre of WesPenre.com



Musical Cult Control: The Rockefeller Foundation's War on Consciousness Through the Impostion of A=440Hz Standard Tuning

by Leonard G. Horowitz, DMD, MA, MPH, DNM(hon.)
Published here: Friday, October 22, 2010 @ 5:43 AM

> ***Wes Penre's Comment**: This is much more important than perhaps people who are not musicians realize. It's about mind alteration, manipulation and keeping our vibrations distorted in a successful effort to disconnect us from the Multiverse and Cosmos in general.*
>
> *Everything is vibrating, and the more we can vibrate with the Higher Cosmos, the closer our connection with our Higher Selves and God, if you will. It's the key to ascension. All you need to do to prevent people from being able to "tune in" to the Higher Cosmos is to keep them trapped in either low vibrations or vibrations that don't align us with the Higher Cosmos. This was successfully done by the International Bankers around World War II, by introducing the Standard A=440Hz tuning!*

Exhibit 19

I am a former musician myself, and interestingly enough, a few months ago I took my whole pop/rock music collection of CDs and threw them away — easily 500 CDs. The more spiritual work I'm doing, the more torturous the music I hear on the radio and elsewhere. I couldn't stand it anymore. I didn't know it then, but years ago, when I was playing, I never tuned my guitars in a standard A. I randomly chose my own A which sounded better with my voice and where the chords rang more pleasantly. Now I know why...

Go out in the street and take a look around. What do you see? Teenagers, people walking their dogs, sitting around tables, having one thing in common — iPods or MP3 Players! Ingenious, isn't it? The Powers That Be are successfully lowering the vibrations of not only the young generation but the rest of us as well.

by Leonard G. Horowitz, DMD, MA, MPH, DNM(hon.)
Published here: Friday, October 22, 2010 @ 5:43 AM

Abstract

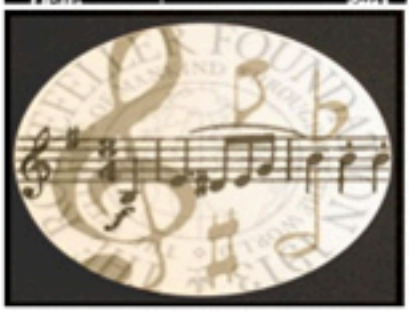
This article details events in musical history that are central to understanding and treating modern psychopathology, social aggression, political corruption, genetic dysfunction, and cross-cultural degeneration of traditional values risking life on earth. This history concerns A=440Hz "standard tuning," and the Rockefeller Foundation's military commercialization of music. The monopolization of the music industry features this imposed frequency that is "herding" populations into greater aggression, psychosocial agitation, and emotional distress predisposing people to physical illnesses and financial impositions profiting the agents, agencies, and companies engaged in the monopoly. Alternatively, the most natural, instinctively attractive, A=444Hz (C5=528Hz) frequency that is most vividly displayed botanically has been suppressed. That is, the "good vibrations" that the plant kingdom obviously broadcasts in its greenish-yellow display, remedial to emotional distress, social aggression, and more, has been musically censored. Thus, a musical revolution is needed to advance world health and peace, and has already begun with musicians retuning their instruments to perform optimally, impact audiences beneficially, and restore integrity to the performing arts and sciences. Music makers are thus urged to communicate and debate these facts, condemn the militarization of music that has been secretly administered, and retune instruments and voices to frequencies most sustaining and healing.

52

528 FREQUENCY MEDIA VACCINECIDE

Musical Cult Control

By **admin** · May 7, 2015 139393 1



"Bio-creation, and health restoration, may have more to do with frequencies of sound energy, or music, than has been previously thought."

MUSICAL CULT CONTROL: THE ROCKEFELLER FOUNDATION'S WAR ON CONSCIOUSNESS THROUGH THE IMPOSITION OF A=440HZ STANDARD TUNING

Exhibit 20

Wes Penre

0 0 Rate This

We are not here to combat dark forces, we are here for the awakening…The rest is just information. People wake up by approaching the phenomenon from different angles. Some by first reading 'conspiracy theories', while others go right onto the spiritual work.

Still, we all need to know at least the basics of what's going on behind the scenes – the work of the dark forces. Darkness is needed to bring forth the light – without darkness, there would be no awakening.

OCTOBER 23, 2010 AT 10:21 AM

REPLY

Exhibit 21

NEWS FROM BEHIND THE SCENES

by Wes Penre of Illuminati-News.com

stay updated via rss

The New Phoenix Program — The Traceless Killer

0

Posted: August 26, 2010 by **Wes Penre** in **Mind Control, Science and Technology, Wars and Rumors of War**
Tags: **cia, new phoenix program, killing opposition, silent killer, government, miltary, church of set, michael aquino**

Source: Google Videos
Published here: Thursday, August 26, 2010 @ 5:00 AM

The film about war crimes using microwave weapons to neutralize and kill political activists and whistleblowers. The author has interviewed 200 targets who have been turned into human guinea pigs to perfect electromagnetic weapons and the science of behavior modification.

Watch the video on Google video >>>

Obama Created by CIA: Report

0

Posted: August 26, 2010 by **Wes Penre** in **Politics, The Global Elite**
Tags: **obama created by cia, press tv**

Source: PressTV, August 26, 2010
Published here: Thursday, August 26, 2010 @ 4:42 AM

SEARCH BLOG
search this site
WES PENRE'S FORUM
View my Message Forum
Free Forums by Bravenet.com
SIGN MY GUESTBOOK
View my Guestbook
Free Guestbooks by Bravenet.com

August 2010

M	T	W	T	F	S	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

« Jul

ARCHIVES
- August 2010
- July 2010
- June 2010
- May 2010
- April 2010
- March 2010

Exhibit 22 . 53

BLOG ON "THE WES PENRE PAPERS"

by Wes Penre of Illuminati-News.com and WesPenre.com

stay updated via rss

SEARCH BLOG

search this sit

WES PENRE'S FORUM

View my Message Forum
Free Forums by Bravenet.com

SIGN MY GUESTBOOK

View my Guestbook
Free Guestbooks by Bravenet.com

CALENDAR

July 2015

M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

« Feb

Home Page

25

Welcome to the "Wes Penre Paper" blog!

Saturday, February 28, 2015 @ 8:35 PM

This blog is mainly based on the Wes Penre Papers, which can be found at http://wespenre.com/. The papers are separated into five "Levels of Learning," and the last paper of the "Fifth Level of Learning" was published on Thursday, February 26, 2015.

The great majority of the articles included here are in one way or another related to topics I am discussing in the papers. This has been the main reason for this blog, and now when the papers are all posted, this blog will no longer be updated.

Exhibit 23

I am now concentrating on new projects, and instead of writing papers I will

BLOG ON "THE WES PENRE PAPERS"

by Wes Penre of Illuminati-News.com and WesPenre.com

stay updated via rss

Home Page

2

47 Votes

Welcome to the "Wes Penre Paper" blog!

Saturday, February 28, 2015 @ 8:35 PM

Exhibit 24

This blog is mainly based on the Wes Penre Papers, which can be found at http://wespenre.com/. The papers are separated into five "Levels of Learning," and the last paper of the "Fifth Level of Learning" was published on Thursday, February 26, 2015.

The great majority of the articles included here are in one way or another related to topics

SEARCH BLOG

search this site

WES PENRE'S FORUM

View my Message Forum
Free Forums by Bravenet.com

SIGN MY GUESTBOOK

View my Guestbook
Free Guestbooks by Bravenet.com

CALENDAR

March 2015

M	T	W	T	F	S	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

« Feb

CATEGORIES

- 01 – First Level of Learning (8)
- 02 – Second Level of Learning (38)
- 03 – Third Level of Learning (21)
- 04 – Fourth Level of Learning

by Wes Penre of Illuminati-News.com and WesPenre.com

October 8-11, 2016–Native Americans Set Time for Changing the World through Consciousness

On October 7, 2016October 7, 2016 By Wes PenreIn Spiritual Soul-utions3 Comments

Exhibit 25

Source: http://us3.campaign-archive2.com/?u=0c577e1509d3b98bd708929ae&id=887db768ac&e=839ddfbfaa
Posted here: Friday, October 7, 2016 @ 4:10 AM

[**Note from the editor**: This is a good initiative. A unifying event such as this do make a difference. The 8-11 of October has been set by Native Americans as a time for changing our world through consciousness.]

---------- Forwarded message ----------
From: **Sherri Kane** <sherrikane@gmail.com>
Date: Thu, Oct 13, 2016 at 1:43 AM
Subject: Fwd: We may have Hester,,,
To: Leonard Horowitz <len15@mac.com>

Contract sent from Anonymous to us.

---------- Forwarded message ----------
From: **Black Angel** <anonblackangel@gmail.com>
Date: Sat, May 14, 2016 at 1:47 PM
Subject: Re: We may have Hester,,,
To: Sherri Kane <sherrikane@gmail.com>

Please sign, scan and send back 1 for you 1 for Len

--
#anonblackangel

We are Anonymous.
We are Legion.
We do not forgive.
We do not forget.
Expect us.

Exhibit 26

NONDISCLOSURE AGREEMENT ____/____/20____

This Nondisclosure Agreement ("Agreement") is entered into by and between **MET aka BLACK ANGEL, David Ryker, David Black, others list below** "Disclosing Party") and _____ ("Receiving Party ")

_____

_____

_____

_____

for the purpose of preventing the unauthorized disclosure of Confidential Personal Information as defined below. The parties agree to enter into a confidential relationship with respect to the disclosure of certain proprietary and confidential personal information ("Confidential Personal Information").

1. **Definition of Confidential Personal Information**. For purposes of this Agreement, "Confidential Personal Information" shall include all information that identifies an individual, including an individual's photograph, social security number, driver license number, name, address, telephone number, date of birth, e-mail address, records of any financial or credit institution, including any records of deposits, withdrawals, and balances of any checking and savings accounts and loans and their respective account numbers, and any personal identification number or password that would permit access to an individual's financial accounts, employment and pre-employment records, real and personal property tax statements and records, conviction records for violation of the law, and any other personally identifiable information lawfully accessible from publicly available information. If Confidential Personal Information is in written form, the Disclosing Party shall label or stamp the materials with the word "Confidential" or some similar warning If Confidential Personal Information is transmitted orally, the Disclosing Party shall indicate beforehand that such oral communication constitutes Confidential Personal Information and the Disclosing Party shall quickly put such communication in writing and stamp the materials with the word "Confidential"

2. **Exclusions from Confidential Information**. Receiving Party's obligations under this Agreement do not extend to information that is: (a) publicly known at the time of disclosure or subsequently becomes publicly known through no fault of the Receiving Party; (b) discovered or created by the Receiving Party before disclosure by Disclosing Party; (c) learned by the Receiving Party through legitimate means other than from the Disclosing Party or Disclosing Party's representatives; or (d) is disclosed by Receiving Party with Disclosing Party's prior written approval.

C S TS TS/SCI CCO ECI

Exhibit 27

3. **Obligations of Receiving Party**. Receiving Party shall hold and maintain the Confidential Personal Information in strictest confidence for the sole and exclusive benefit of the Disclosing Party. Receiving Party shall not, without prior written approval of Disclosing Party, use for Receiving Party's own benefit, publish, copy, or otherwise disclose to others, or permit the use by others for their benefit or to the detriment of Disclosing Party, any Confidential Personal Information. Receiving Party shall return to Disclosing Party any and all records, notes, and

other written, printed, or tangible materials in its possession pertaining to Confidential Personal Information immediately if Disclosing Party requests it in writing.

4. **Time Periods**. The nondisclosure provisions of this Agreement shall survive the termination of this Agreement and Receiving Party's duty to hold Confidential Personal Information in confidence shall remain in effect until the Confidential Personal Information becomes publicly known through no fault of the Receiving Party or until Disclosing Party sends Receiving Party written notice releasing Receiving Party from this Agreement, whichever occurs first.

5. **Relationships**. Nothing contained in this Agreement shall be deemed to constitute either party a partner of the other party for any purpose.

6. **Severability**. If a court finds any provision of this Agreement invalid or unenforceable, the remainder of this Agreement shall be interpreted so as best to effect the intent of the parties.

7. **Integration**. This Agreement expresses the complete understanding of the parties with respect to the subject matter and supersedes all prior proposals, agreements, representations and understandings. This Agreement may not be amended except in a writing signed by both parties.

8. **Waiver**. The failure to exercise any right provided in this Agreement shall not be a waiver of prior or subsequent rights.

This Agreement and each party's obligations shall be binding on the representatives, assigns and successors of such party. Each party has signed this Agreement through its authorized representative.

_____	_____
Signature of Disclosing Party	Signature of Receiving Party
BLA BLACK ANGEL DAVID RYKER	
_____	_____
Typed or Printed Name of Disclosing Party	Typed or Printed Name of Receiving Party
	_____
	Date: _____/_____/20_____

5/14/2016

THIS DOCUMENT MAY BE COVERED BY THE FOLLOWING.
The Intelligence Identities Protection Act of 1982 (Pub.L. 97–200, 50 U.S.C. §§ 421–426)
50 U.S.C. § 421 : US Code - Section 421: Protection of identities of certain United States undercover intelligence officers, agents, informants, and sources
ONE, NONE OR MORE PARTIES LISTED MAY BE COVERED BY THIS ACT

STATE OF _____)
COUNTY OF _____)

Sworn to and subscribed before me this _____ day of _____, 20____.

_____
NOTARY PUBLIC

My Commission Expires: _____


Paul J. Sulla, Jr.
WE ARE ANONYMOUS. WE DO NOT FORGIVE.
WE DO NOT FORGET. EXPECT US.

Exhibit 28


WE ARE ANONYMOUS. WE ARE LEGION. WE DO NOT FORGIVE, WE DO NOT FORGET. EXPECT US.
KNOWLEDGE IS FREE.
PARADISE CORRUPTION


WE ARE ANONYMOUS
EXPECT US
BLACK ANGEL

DEFENSE ADVANCED
RESEARCH PROJECTS AGENCY

Autonomous Diagnostics to Enable Prevention and Therapeutics (ADEPT)

Dr. Amy Jenkins

The Autonomous Diagnostics to Enable Prevention and Therapeutics (ADEPT) program supports individual troop readiness and total force health protection by developing technologies to rapidly identify and respond to threats posed by natural and engineered diseases and toxins. A subset of ADEPT technologies specifically support use by personnel with minimal medical training, delivering centralized laboratory capabilities even in the low-resource environments typical of many military operations. The program is part of a portfolio of DARPA-funded research aimed at providing options for preempting or mitigating constantly evolving infectious disease threats.

The ADEPT program's four thrusts cover simple-to-use, on-demand diagnostics for medical decision-making and accurate threat-tracking; novel methods for rapidly manufacturing new types of vaccines with increased potency; novel tools to engineer mammalian cells for targeted drug delivery and in vivo diagnostics; and novel methods to impart near-immediate immunity to an individual using antibodies.

ADEPT has pioneered use of nucleic-acid-based anti-infective technologies, valuable for their efficacy and adaptability. These tools—primarily coded genetic instructions to the body on how to produce its own protective antibodies against a specific threat—have the advantages of being easily manufactured at scale using largely synthetic processes, transported and stored without many of the cold-chain logistics required by traditional medical countermeasures, delivered with near-immediate efficacy, and safely expressed in the body for only a limited duration, causing no permanent alteration to the genome.

A preliminary effort at the University of Illinois at Urbana-Champaign (UIUC), tasked with developing systems to detect pathogenic bacteria quickly, shifted to target COVID-19. Leveraging digital design and rapid prototyping on production manufacturing systems, the team demonstrated a point-of-care assay and system that requires only a smartphone to collect and process diagnostic images. The UIUC performer detected SARS-CoV-2 from nasal swab samples in 30 minutes, and developed test cartridges that can quickly scale up to hundreds of thousands of tests.

Researchers at Stanford University are developing biosensors that can quickly spot an attack on a cell membrane – the first step of CoVID-19 (or any) infection. The team is using the platform to identify mechanisms to inhibit CoVID-19 membrane attack; the technology can be readily multiplexed enabling fast high-throughput drug screens.

Treat & Prevent:

DARPA technology contributes to preventing future COVID-19 infections through novel vaccine technology and more pervasive environmental aerosol monitoring, and to treating the disease through novel antibody treatments, rapid drug discovery, and domestic active pharmaceutical ingredient manufacture.

ADEPT/P3

As part of the ADEPT program in 2011, DARPA began investing in nucleic acid vaccines. The hypothesis was that rather than delivering antigens to the immune system, we could deliver genes that encode the antigen and allow the human body to produce the antigen from its own cells, triggering a protective immune response. In December 2020, former ADEPT performer Moderna's RNA vaccine received FDA Emergency Use Authorization (EUA) approval for the prevention of COVID-19.

In FY2016, DARPA initiated the Pandemic Prevention Platform (P3) program aimed squarely at the rapid discovery, testing, and manufacture of antibody treatments to fight any emerging disease threat. P3 convincingly demonstrated how to find and manufacture antibodies in less than 90 days (vs. years), using influenza, Zika, and MERS as test cases. As the COVID-19 outbreak began early in 2020, P3 research pivoted to address the novel coronavirus.

In November, 2020, AbCellera announced that a human monoclonal antibody (mAb) identified as part of the P3 program and in conjunction with the National Institute of Allergy and Infectious Diseases (NIAID) Vaccine Research Center (VRC), bamlanivimab (LY-CoV555), had been granted emergency use authorization (EUA) from the U.S. Food and Drug Administration (FDA) for the treatment of patients 12 years of age and older with mild to moderate COVID-19 to prevent hospitalization. AbCellera was able to obtain a sample of blood at the end of February 2020 via an intergovernmental panel, and identified over 1,000 potential antibody candidates. The mAb is being developed in collaboration with Eli Lilly and Company.

On January 21, 2021 the company announced that bamlanivimab reduced the risk of contracting symptomatic COVID-19 among residents and staff of long-term care facilities by up to 80%. This was followed by a second

COMPANY PEOPLE CONTACT

GALVANI BIOELECTRONICS

Transforming patient lives through pioneering precision neuromodulation

OUR COMPANY

Galvani Bioelectronics is a pioneering medical research company dedicated to the development of bioelectronic medicines to treat chronic diseases. Formed through a partnership between two global healthcare companies, GlaxoSmithKline (GSK) and Verily Life Sciences (formerly Google Life Sciences), a subsidiary of Alphabet Inc. Galvani Bioelectronics combines GSK's life science knowledge with Verily's expertise in software and electronics for clinical applications.

OUR VISION

Galvani is developing therapies to treat disease through implant-based direct modulation of specific neural signals to organs central in chronic disease. These therapies are designed to be safe, precise in their therapeutic effect, and minimally invasive in their delivery through use of small and efficient wireless electronics and keyhole surgery. Connected software will ensure that patients and physicians can effectively control and optimise the therapy.

gsk do more feel better live longer + verily

Exhibit 30

Galvani Bioelectronics

From Wikipedia, the free encyclopedia

Galvani Bioelectronics is a Stevenage, United Kingdom-based[5] bioelectronics R&D company.

Galvani Bioelectronics

Type	Subsidiary
Industry	Bioelectronics
Founded	November 2016[1]
Founders	GlaxoSmithKline Verily Life Sciences [2]
Headquarters	Stevenage[3], United Kingdom[1]
Key people	Kristoffer Famm (President)[4]
Parent	GlaxoSmithKline (55% equity interest)[3]
Website	galvani.bio

History [edit]

It was founded by Alphabet Inc. subsidiary Verily Life Sciences and British pharmaceutical company GlaxoSmithKline (GSK) in November 2016.[1][2] The partnership to form the company was announced on 1 August 2016.[3]

Verily has a 45% equity interest, while GSK has a 55% equity interest, making GSK the effective owner.[3] The initial agreed upon investment between the two companies is up to £540 million over a period of seven years[3][6] and will be used "to develop prototype devices aimed at controlling a variety of chronic conditions."[7] Additionally, both companies agreed to contribute their existing intellectual property rights.

References [edit]

1. ^ *a b c* "Galvani Bioelectronics Website". *Galvani Bioelectronics*. Retrieved 24 December 2016.
2. ^ *a b* "Galvani Bioelectronics". *Verily Life Sciences website*. Retrieved 24 December 2016.
3. ^ *a b c d e* Temperton, James (1 August 2016). "GSK and Google just created a £540m bioelectronic health firm". Wired. Retrieved 24 December 2016.
4. ^ "Kristoffer Famm Ph.D. - Galvani Bioelectronics". *Galvani Bioelectronics*. Retrieved 25 December 2016.
5. ^ Kollewe, Julia (2017-08-28). "Electroceuticals: the 'bonkers' gamble that could pay off for GlaxoSmithKline". *the Guardian*. Retrieved 2018-08-03.
6. ^ "Bioelectric Medicine Market Focusing Long-Term Professional Industry and Making New Commitments to the Sustainable Future". *Worldanalytics24.com*. 23 January 2019. Retrieved 2019-01-31.
7. ^ "Galvani Bioelectronics". *FierceBiotech*. Retrieved 2020-07-13.

FREQUENCY THERAPEUTICS

Former Pfizer President of R&D Joins Biotech Startup, Frequency Therapeutics

March 31, 2017 HHTM

John LaMattina, PhD

WOBURN, MASSACHUSSETTS — Frequency Therapeutics, a biotech firm developing drugs to re-create sensory cells in the inner ear, announced the appointment of John LaMattina, PhD, as a member of its Scientific Advisory Board and Senior Advisor to the CEO.

According to the company's press release, Dr. LaMattina is the former President of Pfizer Gobal Research and Development and Senior Vice President of Pfizer, Inc. During his tenure at Pfizer, the company discovered and developed many innovative and highly successful new drugs, including: Zoloft, Chantix, Lyrica, and many others.

About Frequency Therapeutics

Frequency Therapeutics is a leader in the development of medicines designed to activate progenitor cells within the body to treat degenerative diseases. The Company's progenitor cell activation (PCA) approach stimulates progenitor cells to create functional tissue with the aim of developing disease modifying therapies. The Company's lead product candidate, FX-322, is designed to regenerate auditory hair cells to restore hearing function. In a FX-322 Phase 1/2 study, statistically significant and clinically meaningful improvements in key measures of hearing function in patients with sensorineural hearing loss were observed. FX-322 is being evaluated in multiple ongoing clinical studies in patients with sensorineural hearing loss. The Company also is evaluating additional diseases where its PCA approach could create functional tissue, including in a pre-clinical program in multiple sclerosis.

Headquartered in Woburn, Mass., Frequency has an ex-U.S. license and collaboration agreement with Astellas Pharma Inc. for FX-322, as well as additional collaboration and licensing agreements with academic and nonprofit research organizations including Massachusetts Eye and Ear, Mass General Brigham and the Massachusetts Institute of Technology, The Scripps Research Institute and Cambridge Enterprises Limited, Cambridge University, UK. . For more information, visit www.frequencytx.com and follow Frequency on Twitter @Frequencytx.

Exhibit 31

View source version on businesswire.com: https://www.businesswire.com/news/home/20210208005168/en/

APRIL GLASER SCIENCE 02.09.2016 08:00 AM

A Skeptic Infiltrates a Cruise for Conspiracy Theorists

Conspira-Sea is a seven-day cruise where fringe thinkers can discuss everything from crop circles to mind control on the open sea.

Exhibit 32

70

The Ruby Princess cruise ship docked at Port Everglades in Fort Lauderdale on November 3, 2014. ALAMY

SAY YOU'RE NOT one to believe the mainstream media. Maybe you think climate change is an elaborate hoax or the medical community is trying to hide the myriad dangers of vaccinations. Perhaps you are utterly convinced the government is overrun by reptilian beings.

Where on Earth can you go to get away from it all, and mingle with those who share your views? Well, Conspira-Sea, of course. It's a seven-day cruise where fringe thinkers can discuss everything from crop circles to mind control on the open sea. Last month's cruise featured a caravan of stars from a surprisingly vast galaxy of skeptics and conspiracy theorists, including Andrew Wakefield, known for his questionable research and advocacy against vaccines. Also aboard was Sean David Morton, who faced federal charges of lying to investors about using psychic powers to predict the stock market.

But they had an outsider among them, and not one from another planet. Harvard-educated attorney Colin McRoberts is writing a book about people who believe in conspiracy theories, and used a crowdfunding campaign to book passage on the cruise. He blogged about his adventure and told us all about it---including the bit where the IRS arrested Morton when the ship returned to port.

__What were some of the conspiracies discussed on board?

__

We had about a dozen presenters of all different stripes. Some technical or scientific experts, but only one scientific speaker, Wakefield, had a legitimate education. The rest were into new-age or were conspiracy theorists in the traditional sense. Or aliens. They all had their various specialities.

__And what were the attendees like? __

The people on the cruise tended to be there with a primary focus on one or two big issues. They were there to learn about vaccines. Or they were there to find out more about astrology. But they were interested in everything else. I didn't talk to anybody who wasn't willing to kind of go outside their comfort zone.

Most people had advanced degrees, for the most part master's. I talked to at least one woman who had a PhD, in counseling. There were also some people there who were blue collar. I talked to one person who was a metal worker, another who was a nurse. And I talked to a teacher and a couple who own a new-age bookstore. There was a pretty decent diversity in terms of backgrounds.

What was the relationship between the attendees and observers like you on board?

It was a very tense environment on the boat. There were a couple of instances in which the journalists on board had been treated poorly by a couple of the presenters. One of the journalists was ambushed in the Internet cafe by a couple who had accused her of being an agent of the CIA. She managed to persuade

them that she was not an undercover agent.

Did anyone succeed in indoctrinating people?

The anti-GMO track was probably the most effective in terms of changing people's behavior. The primary speaker worked very hard, not at convincing people that GMOs are evil, but in giving specific tools for convincing others that GMOs are evil. Which was, the ethics of it aside, a savvy way to activate some communicators and try and shift actual behavior in the real world.

__Wakefield was the most prominent personality on board. What was his presentation like? __

I think Wakefield is unhappy with the fact that his career has now taken him to a conspiracy conference in which he's sharing billing with the third dimensional delegates of the galactic roundtable. He sees himself as someone who can champion his issues as an issue of public health, and instead he winds up in sort of a side show.

In his presentation, he launched into a very direct, very passionate, and I think a very heartfelt defense of his own words, explaining essentially that he was unjustly demonized. I got the impression that he was wanting a sort of redemption story. I think this is his second arc. He's trying to redeem himself and start over, not as a medical expert, but as an issue activist.

What do you think motivates these fringe theory evangelists?

I thought that both of the pseudo-legal speakers were con-men. People left with specific, terrible, dangerous advice that could really ruin their lives. There's definitely a streak of con-artistry in a man that gets up and tells you this is how you get rid of your debts, and doesn't say, oh and by the way, I'm under indictment for doing this. Sean David Morton didn't know that he was going to be arrested right after he got off the boat. But he knew the IRS had raided him, I found out later, and was fighting the raid in trial for using some of the legal tricks

he talked about in his presentation.

At the same time I think those presenters believed what they were saying. It turns out that both pseudo-legal speakers were both doing it themselves. And that really surprised me because I didn't think that anybody would really spend that kind of time and effort learning how to pull these tricks off and not realize at some point that it will never work.

__What do the attendees get out of the cruise? __

I think a lot of people who get stuck in an ideology that's based on some irrational idea, like how Bigfoot exists or that vaccines cause autism or that GMOs are poisonous or the legal stuff, they kind of define the idea in opposition to the mainstream. So I think what a lot of them are looking for is a community and a culture that supports them and doesn't judge them for having this unusual belief. They come together not just on a cruise ship, but in a community.

Is there anything we can learn from the attendees?

We tend to receive information filtered through our friends, and colleagues, and

build a community around themselves of people who are also in opposition to science.

That happens to everybody, not just conspiracy theorists. We all do it. And that's why I think it's so important for us to kind of get outside of our little communities, step across the aisle, and have that conversation with someone who is different.

Dec 10, 2016, 10:52pm EST

Are Chiropractors Backing The Anti-Vaccine Movement?

Bruce Y. Lee Senior Contributor
Healthcare
I am a writer, journalist, professor, systems modeler, computational and digital health expert, avocado-eater, and entrepreneur, not always in that order.

This article is more than 4 years old.

Dr Andrew Wakefield (center) was the first clinician to suggest a link between autism in children... [+]

Today Andrew Wakefield was a keynote speaker at the International Chiropractors Association's Annual Conference on Chiropractic and Pediatrics in Maui, Hawaii. Yes, the same Andrew Wakefield, who in 2010 was stripped of his medical license in the United Kingdom for

Exhibit 33

ethical violations and failure to disclose potential financial conflicts of interest. The same Wakefield who published a subsequently discredited and retracted study in the *Lancet* linking vaccines to autism that the *British Medical Journal (BMJ)* described as an "elaborate fraud". The same Wakefield who produced and directed an anti-vaccine "documentary" film, *Vaxxed: From Cover-Up to Catastrophe*, that pushed conspiracy theories about the Centers for Disease Control and Prevention (CDC) and vaccines. The same Wakefield who has not been able to provide scientific evidence to support his claims. Is this really the best way for a professional association and a conference to gain scientific legitimacy?

The Annual Conference on Chiropractics and Pediatrics now has something in common with the "Conspira-Sea Cruise," a week-long cruise hosted by the tour company Divine Travels to have conversations about--you guessed it--"conspiracies." Both have invited Wakefield as a guest speaker. David Gorski writing for *Popular Mechanics* mentioned some of the others on the cruise's preliminary list of speakers such as:

- **Robert O. Young:** who has claimed that the cause of all cancers is excess acidity and has been selling books and programs promoting alkaline diets. (Who would have thought that the Cancer Moonshot is just to make better Tums tablets?)

- **Robert Strecker:** who has claimed that HIV/AIDS is a man-made (or actually human-made) disease that was spread by the government (because the government just does not have enough to problems to address).

- **Len Horowitz:** who describes himself as the "King of Natural Healing" and has been trying to sell an herbal cream that he claims will make skin cancer fall off your body in less than 3

weeks.

The preliminary speaker list probably reflected the final list of speakers, unless the cruise was itself a conspiracy. As April Glaser reported for *Wired*, the cruise speakers included people who have broken the law such as Sean David Morton, who was indicted and fined by the U.S. Securities and Exchange Commission for making false (as opposed to truthful) claims to investors about psychic abilities to predict the stock market. (Apparently, his psychic abilities did not help him predict that the SEC would catch him.)

What Horowitz, Young and a number of others on the cruise have in common is that they are all trying to sell treatments that compete with existing treatments approved and supported by legitimate government agencies such as the Food and Drug Administration (FDA) and the scientific community. So, could conspiracy theorists have something to gain financially by discrediting the government and the scientific community? Could there be personal agendas behind certain conspiracy theories? In other words, could there be conspiracies behind conspiracy theories?

Let's go back to the "anti-vaccine movement." But before we do so, let's clearly distinguish "anti-vaxxers" from those who have earnest concerns or questions about vaccines, but are not staunchly opposed to the idea of vaccination. Vaccines are not 100% safe. Nothing is. Not even stuffed animals. (This is not to say that the risks of vaccines and stuffed animals are the same.) Indeed, vaccines can cause both minor and major side effects. But scientific studies have shown that the risks of major side effects are very low and have not shown any connection between vaccines and autism. The benefits of vaccines seem to far outweigh potential risks. Nonetheless, wondering about vaccine safety is perfectly reasonable. Science, medicine and public health need to keep

monitoring the safety of existing products and pushing for even safer products. Products can always get better. Science can always advance. A reasonable amount of skepticism can be healthy.

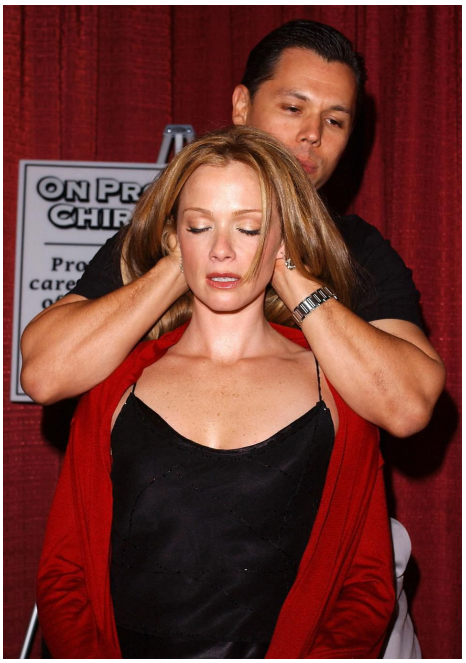
By contrast, the "anti-vaccine movement" seems to include some organized attempts to present information not necessarily supported by science and convince you to stop vaccinating yourself or your children. As she wrote in *Time* (actually in time for *Time*), Meghan Moran, Ph.D., an associate professor of health, behavior and society at the Johns Hopkins Bloomberg School of Public Health, led a study that analyzed 480 anti-vaccination websites and found many false claims and attempts to discredit the government and medical practitioners. In fact, some websites seem to be masquerading as legitimate vaccine authorities by using titles such as "national" and "information." Do these websites really represent honestly concerned citizens or actually organizations with hidden agendas?

How many chiropractors are behind these efforts? Well, some chiropractors may see potential financial gain if vaccination rates go down. Try doing a web search for "chiropractors" and "vaccination," "infectious disease," "influenza," "measles" and other vaccine-related topics and you'll some interesting claims about how chiropractic techniques can help prevent and treat infectious diseases. For example, in a website from the Chiropractic Leadership Alliance, Dr. Christopher Kent wrote:

> Even more impressive are some of the spectacular results reported by early chiropractors in patients with infectious diseases. One example where chiropractic care provided a beacon of light was the 1917-18 influenza epidemic, which brought death and fear to many Americans... The results were

> spectacular. Rhodes reported that in Davenport, Iowa, medical doctors treated 93,590 patients with 6,116 deaths—a loss of one patient out of every 15. Chiropractors at the Palmer School of Chiropractic adjusted 1,635 cases, with only one death. Outside Davenport, chiropractors in Iowa cared for 4,735 cases with only six deaths—one out of 866.

This statement has about as much science as a Barbie doll. Yes, of course, more people died from the flu under a doctor's care than a chiropractor's care, because most people really sick with the flu probably went to doctor rather than chiropractor. You could probably find similar patient mortality statistics for plumbers or cheese-makers. (If you go to a cheese-maker to get medical treatment, you have more problems than you realize.) Kent went on to make similar claims about smallpox, measles, scarlet fever and gonorrhea. He concluded, "In a world where we are faced with antibiotic-resistant bacteria, and viral diseases where effective treatments are lacking, the role of chiropractic care in allowing for optimum immune system function deserves thorough exploration."



A *USA Today* piece reported that "about 19%" of chiropractors are being vocal about opposing vaccines. The story quoted chiropractor Josh Handt as saying, "[The job of] chiropractic is to allow the body to function optimally without taking anything out or putting anything in," which is a very broad, vague, sweeping claim that essentially says nothing and applies to most health

Chiropractic adjustment such as the one actress Lauren Holly (right) is receiving here can help with... [+]

professionals including doctors, physical therapists and nurse practitioners. No, doctors don't think, "Hmm, what can I remove or put into the patient?"

Certainly, chiropractic techniques have proven to be helpful for certain musculoskeletal conditions. But trying to extend techniques and methods well beyond what they are intended to do is analogous to having a hammer and just trying to find ways to make the hammer seem more useful and thus more sell-able. "Oh, look, the hammer can be used as a spatula. Oh, I can use a hammer to brush my teeth. And who needs toilet paper when you have a hammer?"

Again, not all chiropractors necessarily have that agenda. There are chiropractors who use evidence-based approaches and recognize the strengths and limitations of their techniques. However, you have to wonder about the International Chiropractors Association's motivation behind featuring Wakefield as a speaker, especially without providing a balancing scientific talk. When people are staunchly opposed to vaccines, the medical profession or government agencies, how much of it is true belief and how much is a hidden financial agenda? How's that for a conspiracy theory about conspiracy theorists?

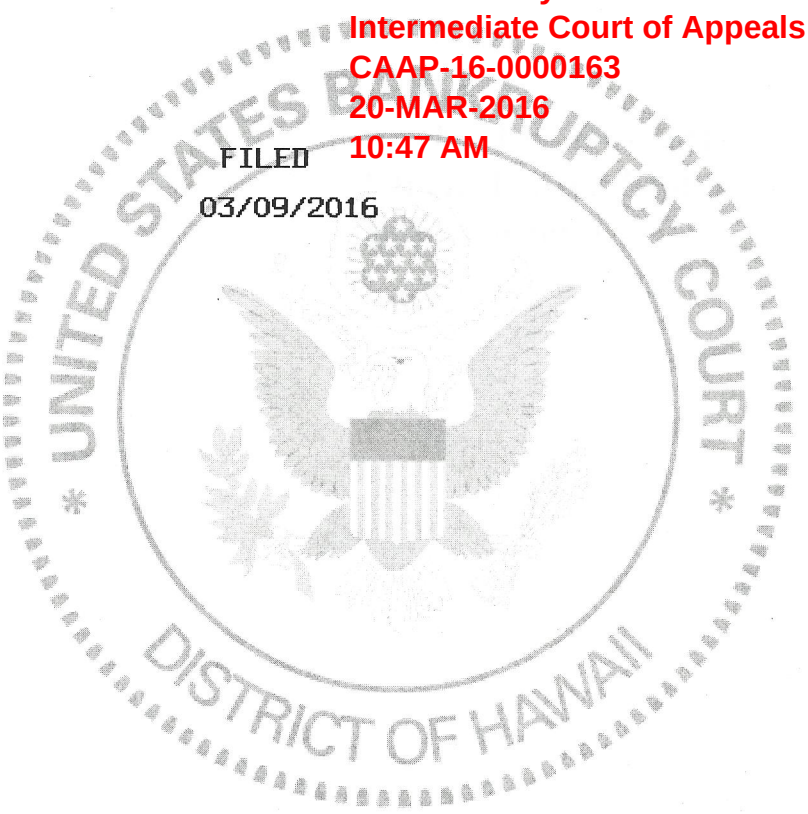
Follow me on Twitter or LinkedIn. Check out my website.

Bruce Y. Lee

I am a writer, journalist, professor, systems modeler, computational and digital health expert, avocado-eater, and entrepreneur, not always in that order. Currently, I am... **Read More**

United States Bankruptcy Court
District of Hawaii

Notice of Bankruptcy Case Filing



A bankruptcy case concerning the debtor(s) listed below was filed under Chapter 13 of the United States Bankruptcy Code, entered on 03/09/2016 at 3:24 PM and filed on 03/09/2016.

Leonard George Horowitz
P.O. Box 75104
Honolulu, HI 96778
808.946.6999
SSN / ITIN: xxx-xx-5563

The bankruptcy trustee is:

Howard M.S. Hu
1132 Bishop Street, Suite 301

Honolulu, HI 96813
(808) 526-3083

The case was assigned case number 16-00239 to Judge Robert J. Faris.

In most instances, the filing of the bankruptcy case automatically stays certain collection and other actions against the debtor and the debtor's property. Under certain circumstances, the stay may be limited to 30 days or not exist at all, although the debtor can request the court to extend or impose a stay. If you attempt to collect a debt or take other action in violation of the Bankruptcy Code, you may be penalized. Consult a lawyer to determine your rights in this case.

If you would like to view the bankruptcy petition and other documents filed by the debtor, they are available at our *Internet* home page http://www.hib.uscourts.gov/ or at

Exhibit 34

the Clerk's Office, 1132 Bishop Street, Suite 250, Honolulu, Hawaii 96813, , .

You may be a creditor of the debtor. If so, you will receive an additional notice from the court setting forth important deadlines.

Michael B. Dowling
Clerk, United States
Bankruptcy Court

IN THE DISTRICT COURT OF THE FIRST JUDICIAL DISTRICT
STATE OF IDAHO, IN AND FOR THE COUNTY OF BONNER

THE ROYAL BLOODLINE OF DAVID, a Washington state corporation sole; HEALTHY WORLD, LLC, a Nevada domestic limited liability company; LEONARD G. HOROWITZ, an individual,

Plaintiffs,

v.

HEALING CELEBRATIONS, LLC, an Idaho limited liability company; HEALTHY WORLD CELEBRATIONS, LLC, an Idaho limited liability company; JACQUELINE G. LINDERBACH, an individual; RHONDA GOADE, an individual,

Defendants;

and

THE MANIFESTATION OF DIVINE WILL, a Washington corporation sole, TETRAHEDRON, LLC, a dissolved Idaho limited liability company, HEALING CELEBRATIONS, LLC, a dissolved Idaho limited liability company; and HEALTH WORLD DISTRIBUTING, LLC, a dissolved Idaho limited liability company,

Intervenors,

JACQUELINE G. LINDENBACH, an individual, THE MANIFESTATION OF DIVINE WILL, a Washington corporation sole, TETRAHEDRON, LLC, a dissolved Idaho limited liability company, HEALING CELEBRATIONS, LLC, a dissolved

Case No. CV-2011-0001409

ORDER APPROVING STIPULATION ADOPTING RECEIVER'S REPORT AND RECOMMENDATIONS WITH MODIFICATIONS; AUTHORIZING RECEIVER TO TAKE CERTAIN ACTIONS; AND OTHERWISE DISMISSING CLAIMS

Exhibit 35

Idaho limited liability company; HEALTH WORLD DISTRIBUTING, LLC, a dissolved Idaho limited liability company, HEALTHY WORLD CELEBRATIONS, LLC, an Idaho limited liability company; HEALING CELEBRATIONS, LLC, an Idaho limited liability company,

Counter-Claimants,

v.

LEONARD G. HOROWITZ, an individual, THE ROYAL BLOODLINE OF DAVID, a Washington state corporation sole, HEALTHY WORLD, LLC, a Nevada domestic limited liability company,

Counter-Defendants;

JACQUELINE G. LINDENBACH, an individual, THE MANIFESTATION OF DIVINE WILL, a Washington corporation sole, TETRAHEDRON, LLC, a dissolved Idaho limited liability company, HEALING CELEBRATIONS, LLC, a dissolved Idaho limited liability company, HEALTH WORLD DISTRIBUTING, LLC, a dissolved Idaho limited liability company; HEALTHY WORLD CELEBRATIONS, LLC, an Idaho limited liability company; HEALING CELEBRATIONS, LLC, an Idaho limited liability company,

Third-Party Plaintiffs,

v.

SHERRI KANE, an individual, HEALING CELEBRATIONS, LLC, a Nevada limited liability company, TETRAHEDRON, LLC, a Nevada limited liability company; HEALTHY WORLD DISTRIBUTING, LLC, a Nevada limited liability company,

Third-Party Defendants.

This matter comes before the Court pursuant to the STIPULATION FOR ENTRY OF ORDER ADOPTING THE RECEIVER'S REPORT AND RECOMMENDATIONS WITH MODIFICATIONS, stipulated among the parties, DR. LEONARD G. HOROWITZ (hereinafter "Horowitz"), JACQUELINE G. LINDENBACH (hereinafter "Lindenbach"), and SHERRI KANE (hereinafter "Kane"), for the adoption of the Receiver's Report and Recommendations as filed on October 13, 2013, with the modifications and additions contained in said STIPULATION; and the Court having reviewed said STIPULATION, and good cause appearing therefore;

IT IS HEREBY ORDERED as follows:

1. IT IS HEREBY ORDERED that to the extent necessary and authorized herein, FORD ELSAESSER, the Receiver appointed by the Court pursuant to this Court's Order Appointing Receiver (hereinafter "Receiver"), shall be authorized to take all actions necessary to fulfill the provisions set out below.

2. This Court has jurisdiction over all of the parties to this action, and such parties are bound by the terms and conditions set forth below.

3. IT IS FURTHER ORDERED that as of the date of the entry this Order, but no later than ten days from the date of entry of this Order, Horowitz and the Horowitz Entities shall have the sole and exclusive right to sell, distribute, license, or otherwise produce and distribute the Horowitz Products, as that term is defined in the Receiver's Report and Recommendations. Lindenbach and the Lindenbach Entities shall cease selling, producing, distributing, or referring to in any way or manner the Horowitz Products. To the extent Lindenbach and the Lindenbach Entities have sold Horowitz Products, or have referred to Horowitz Products in the past, such

believes that a fair valuation of the Steam Vent Inn property, given all the pending and outstanding litigation, and the inability to apply it to commercial use, is appropriately valued at $550,000.

5.7 The Hilton Acres property, located on the Old Kalapana Highway, Pahoa, Hawaii, was acquired in 2004, and title was held in the name of Horowitz corporation sole. The property was conveyed to Leonard Horowitz and Sherri Kane in 2012. The property was valued by Leonard Horowitz at an estimated value of $180,000 in the court proceeding before this Court, and this appears to be a fair valuation of the property, which is adjacent to the Steam Vent Inn property.

5.8 The Waiopae Road vacation land property, Pahoa, Hawaii, was an undeveloped waterfront lot near Pahoa, Hawaii, which was purchased by the parties in 2003, for $60,000. The property previously was held in the name of the HOROWITZ CORPORATION SOLE, and title was transferred to Leonard Horowitz and Sherri Kane in 2012. The property was sold at or about the time of the Court hearing for $87,000 which appears, in all respects, to be a fair valuation of the property. The Receiver recommends that Horowitz be credited with the $87,000 proceeds which apparently was received by Horowitz, or by Horowitz and Kane.

5.9 In summary, the Receiver recommends that the Court attribute a value of $625,000 to the MASSACHUSETTS REAL ESTATE; $461,919 to the IDAHO REAL ESTATE; and $817,000 to the HAWAII REAL ESTATE.

VI. PRODUCTS DISCUSSION

6.1 The most difficult valuation issue facing the Receiver is valuation of the various PRODUCTS sold by the LINDENBACH ENTITIES and the HOROWITZ ENTITIES. As noted

in the DECISION, the parties sell what appear to be identical products, as well as "similar" products through various websites that they control. What is very clear is that sales by both the LINDENBACH ENTITIES and the HOROWITZ ENTITIES have been reduced dramatically since the "separation" of the sales operations by the parties that occurred subsequent to their divorce. Currently, Horowitz and the HOROWITZ ENTITIES maintain and control websites that sell PRODUCTS and fulfill orders; and Lindenbach and the LINDENBACH ENTITIES do likewise. There have been numerous disputes, primarily raised by Horowitz, with third party operations, such as Amazon.com, that have likely hurt the sales of both parties, but particularly, of Lindenbach.

6.2 Sales of the PRODUCTS prior to the divorce and subsequent "division" have approached as much as $1 million a year. Currently, based on financial reports provided to the Receiver by Horowitz and Lindenbach, the combined sales of the PRODUCTS are likely to produce gross revenues of $400,000.

6.3 Given a general rule of thumb for business valuations equal to one year's gross, the best estimate of the Receiver is that the valuation of the businesses related to the PRODUCTS, all combined, is currently in the range of $400,000. Absent a clear division of the PRODUCTS, this valuation will likely result in further decline.

6.4 It is the recommendation of the Receiver that the majority of the PRODUCTS be awarded to Horowitz, with certain PRODUCTS being awarded to Lindenbach. The Receiver believes this will result in an equitable division of the former community property, now jointly held property, and will allow each of the parties to go forward with defined and distinct PRODUCTS, websites, etc. A key to the success of any division, in the Receiver's opinion, will

needs to be acted on by the parties or the Court. Likewise, with regard to the LINDENBACH CORPORATION SOLE or the HOROWITZ CORPORATION SOLE, the Receiver recommends that no action need be taken, other than the transfer of the respective Horowitz and Lindenbach interests in the real property, as recommended above, should such recommendations be adopted by the Court.

11.3 The Receiver is prepared to testify concerning all aspects of this Report and Recommendations herein.

Respectfully submitted this _15th_ day of October, 2013.

____/s/ Ford Elsaesser_____
Ford Elsaesser

Exh CC

3:00 PM
01/02/12
Accrual Basis

Healthy World Distributing, LLC
Profit & Loss
January through June 2011

	Jan - Jun 11
Ordinary Income/Expense	
Income	
donations received	406.44
Healing Celebrations	
Cost of Goods Sold	-783.16
Discounts	-78,966.53
Paid by Healing Celebrations	-1,600.54
QB Sales	
webstore orders-HCL	116,323.93
QB Sales - Other	225,953.98
Total QB Sales	342,277.91
Healing Celebrations - Other	-6,340.62
Total Healing Celebrations	254,587.06
HWO-Healthy World Organization	
HWD - profit of a HWO sale	774.50
HWO - Cost of Goods Sold	22,677.54
HWO-Healthy World Organization - Other	20,843.68
Total HWO-Healthy World Organization	44,295.72
Oxylift Commissions	-3,151.58
Oxysilver Commissions	-11,004.47
Refund	360.30
Shipping/Handling Charged	9,167.44
Tetrahedron	
Cost of Goods Sold	-60.53
Discounts	-10,492.39
Income-Service	-2,067.86
QB Sales	
webstore orders-TI	9,824.16
QB Sales - Other	27,285.61
Total QB Sales	37,109.77
Tetrahedron - Other	-1,906.42
Total Tetrahedron	22,582.57
www orders	1,143.66
Total Income	318,387.14
Cost of Goods Sold	
Cost of Goods Sold	101,868.33
Total COGS	101,868.33
Gross Profit	216,518.81
Expense	
Advertising/promotion	964.09
Automobile Expense	1,807.88
bank fee	275.96
Cleaning/Maint. - office	90.00
Commissions	
Oxysilver Affiliate Commissions	1,717.73
Total Commissions	1,717.73
Computer Repairs	600.00
Consulting	
Danielle Roth	9,717.00
Donna Carrillo	65.00
Erika Meyer	9,388.25
Roger Nelson	500.00
S & P Construction	17,425.80
Consulting - Other	0.00
Total Consulting	37,096.05
Insurance	527.43

Exhibit 36

5:24 PM
12/31/11
Accrual Basis

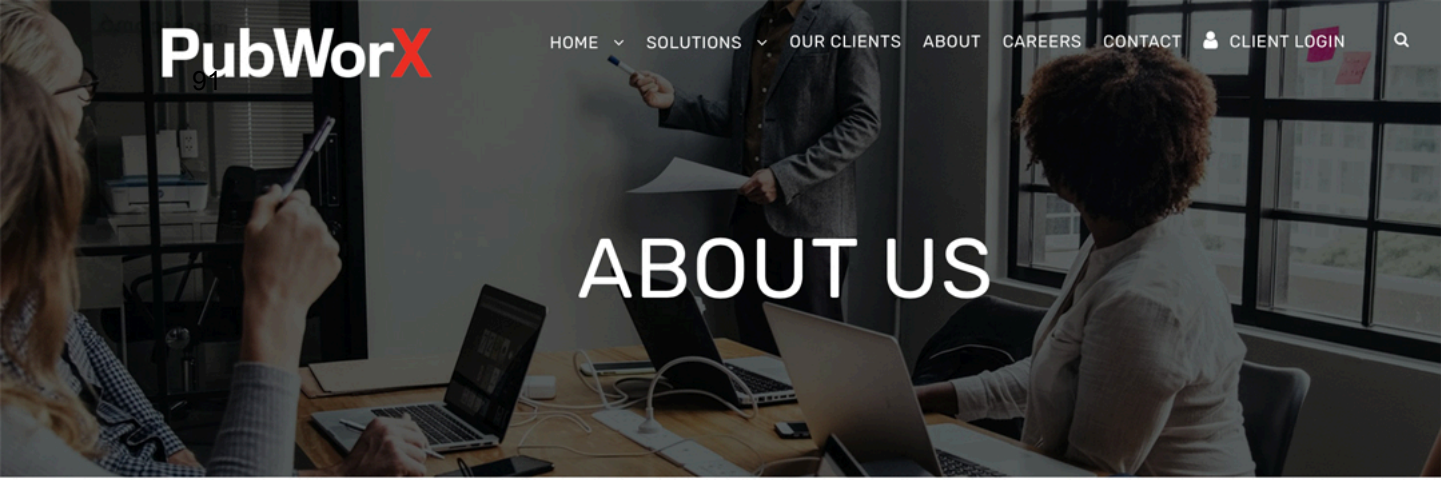
Healthy World Distributing, LLC
Profit & Loss
January through December 2010

	Jan - Dec 10
Ordinary Income/Expense	
Income	
donations received	4,294.54
Expense Reimbursements Received	139.54
Healing Celebrations	
Cost of Goods Sold	-2,528.70
Discounts	-120,886.65
QB Sales	
webstore orders-HCL	218,550.28
QB Sales - Other	360,059.21
Total QB Sales	578,609.49
Healing Celebrations - Other	2,000.00
Total Healing Celebrations	457,194.14
Refund	-133.73
Shipping/Handling Charged	13,768.06
Tetrahedron	
Cost of Goods Sold	-121.51
Discounts	-22,331.18
Income-Service	510.14
Medical Veritas Downloads	15.00
QB Sales	
webstore orders-TI	32,245.47
QB Sales - Other	51,014.24
Total QB Sales	83,259.71
Total Tetrahedron	61,332.16
www orders	1,722.63
Total Income	538,317.34
Cost of Goods Sold	
Cost of Goods Sold	0.00
Total COGS	0.00
Gross Profit	538,317.34
Expense	
Advertising/promotion	30,844.66
Automobile Expense	8,066.56
bank fee	957.11
Cleaning/Maint. - office	80.00
Commissions	
Genesis Holdings	2,693.16
Oxysilver Affiliate Commissions	19,520.50
Commissions - Other	1,023.17
Total Commissions	23,236.83
Computer Repairs	2,042.52
Consulting	
Alena Horowitz	1,745.29
Art Thompson	12,110.00
Danielle Roth	12,366.27
David Dees	750.00
Donna Carrillo	695.00
Erika Meyer	11,341.26
Kristen Johnson	1,171.47
Nina Fitzpatrick	3,918.12
Roger Nelson	14,725.00
S & P Construction	31,890.11
Consulting - Other	3,200.00
Total Consulting	93,912.52

5:24 PM
12/31/11
Accrual Basis

Healthy World Distributing, LLC
Profit & Loss
January through December 2009

	Jan - Dec 09
Ordinary Income/Expense	
Income	
donations received	2,281.51
Expense Reimbursements Received	3,887.74
Healing Celebrations	
Cost of Goods Sold	-52.58
Discounts	-130,135.38
QB Sales	1,252,967.41
Total Healing Celebrations	1,122,779.45
Oxylift Commissions	100.00
Oxysilver Commissions	692.20
Refund	757.37
Restocking Fee	143.11
Shipping/Handling Charged	26,735.68
Tetrahedron	
Cost of Goods Sold	-319.16
Discounts	-38,545.31
Income-Service	-3,073.07
QB Sales	230,181.76
Total Tetrahedron	188,244.22
Total Income	1,345,621.28
Cost of Goods Sold	
Cost of Goods Sold	0.00
Total COGS	0.00
Gross Profit	1,345,621.28
Expense	
Advertising/promotion	54,196.81
Automobile Expense	11,656.02
bank fee	530.39
Cleaning/Maint. - office	3,051.00
Commissions	
Genesis Holdings	6,706.95
Oxysilver Affiliate Commissions	41,564.35
Total Commissions	48,271.30
Computer Repairs	4,008.11
Consulting	
Art Thompson	4,560.00
Donna Carrillo	12,497.50
Jen Galanty	500.00
Kristen Johnson	3,303.15
Melissa Elkins	2,530.53
Nina Fitzpatrick	2,386.50
Rob Potter	85.00
Robert Carrillo	13,113.76
Roger Nelson	480.00
S & P Construction	16,234.50
Sherri Kane	1,107.27
Consulting - Other	252.00
Total Consulting	57,050.21
Donation	1,150.00
Editing/Copywriting	1,500.00
Equipment Rental	175.00
Internet fees	35,420.48
Inventory Adjustments	35.09



PubWorX was founded in 2016 as a partnership between Hearst and Condé Nast to offer scale and innovation to the magazine industry. In 2017 ProCirc, the largest and most innovative consumer marketing outsourcing company in the country, was acquired by PubWorX. With 225+ experts from across the publishing industry, PubWorX ProCirc offers custom solutions to satisfy the consumer marketing, circulation management, production and paper procurement needs of any publisher – large or small.

Exhibit 37

HelloTenMedia

Our Story Leadership Our Partners Contact Us >

Exhibit 38

THE WALL STREET JOURNAL.

RE

Hearst, Apple Reach iPad Deal

By Russell Adams

Updated May 5, 2011 12:01 am ET

PRINT TEXT

In a big win for Apple Inc., Hearst Corp. said it agreed to sell subscriptions to the iPad editions of a range of its magazines through iTunes.

Starting with their July issues, iPad apps for Esquire, Popular Mechanics and O, The Oprah Magazine, will be available through a service from Apple that allows customers to sign up for subscriptions inside the apps and get billed automatically. Subscriptions to all three publications will be sold for $1.99 a month or $19.99 a year.

Exhibit 39

Submitting music to iHeartRadio

Both artists and labels can submit music to iHeartRadio through aggregators that have distribution agreements in place with us.

These companies work directly with independent artists to deliver music to iHeartRadio:

- CD Baby (https://www.cdbaby.com)
- DistroKid (https://distrokid.com/)
- Empire Distribution (https://www.empi.re/)
- RouteNote (https://www.routenote.com/)
- Identity Music (https://identitymusic.com/)
- TuneCore (https://www.tunecore.com)

These companies work directly with independent labels to deliver music to iHeartRadio:

- FUGA (https://fuga.com/services/)
- House Planet (https://www.houseplanetdistribution.com/distribution/)
- Ingrooves (https://www.ingrooves.com/label-inquiries/)
- The Orchard (https://www.theorchard.com/contact-us/)

Additional distributors that deliver music to iHeartRadio:

- AWAL (https://www.awal.com/)
- Believe (https://www.believedigital.co.uk/)
- Black Hole Distribution (https://www.blackholedistribution.net/
- Catapult (https://www.catapultdistribution.com/)
- Consolidated Independent (https://www.ci-support.com/public)

Exhibit 40

Solfeggio Eclectica

Leonard G. Horowitz
Nov 2018 • 11 Songs

Leonard G. Horowitz

Tracks

1	The Root of Grounding (Path to Wellness): First Chakra Therapy I	Leonard G. Horowitz
2	Spirit Energy Rising: First Chakra Therapy II	Leonard G. Horowitz
3	Creative Confidence: Second Chakra Therapy	Leonard G. Horowitz
4	Free Will Power: Third Chakra Therapy	Leonard G. Horowitz
5	Bee in Love: Fourth (Heart) Chakra Therapy	Leonard G. Horowitz
6	Blue Moana: Fifth Chakra Therapy	Leonard G. Horowitz
7	Ego-Washing: Sixth Chakra Therapy	Leonard G. Horowitz
8	The Bridge: Seventh (Crown) Chakra Therapy	Leonard G. Horowitz
9	963 Concerto: Perfect Circle of Sound	Leonard G. Horowitz
10	174 Ecstatic Dance: Perfect Circle of Sound	Leonard G. Horowitz
11	285 Electric: Perfect Circle of Sound	Leonard G. Horowitz

Similar Artists ›

For You ›
Hit Nation
Thomas Rhett
Rock Nation

Chat About Solfeggio Eclectica

Exhibit 41

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Structure-Guided Drug Design Could Yield Fast-Acting Remedies for Complex Neuropsychiatric Conditions

Focused Pharma program will pursue new drugs that work quickly and deliver lasting remedies for conditions such as chronic depression and post-traumatic stress

OUTREACH@DARPA.MIL
9/11/2019

In the wake of the Iraq and Afghanistan wars, the mental health crisis among U.S. military veterans remains unrelenting, despite the best efforts of healthcare researchers and providers to confront the scale and scope of the problem. According to a 2018 report from the Department of Veterans Affairs, an average of twenty U.S. veterans commit suicide each day.

Exhibit 42

97

To address the acute need for improved treatment options, DARPA today announced Focused Pharma, a program that seeks to revolutionize mental healthcare by developing completely new psychotherapeutic drugs to quickly remedy prevalent neuropsychiatric conditions such as post-traumatic stress, depression, anxiety, and substance abuse. While the neurophysiology underlying these conditions may be distinct, an aspect in common is the presence of a deleterious, repetitive thought process that negatively impacts an individual's ability to function. For someone with post-traumatic stress, it involves re-experiencing trauma and the feelings associated with it; for depression it can take the form of a recurrent internal editor that attaches negative connotations to normal life events; for addiction it is the preoccupation with acquiring and using the substance of choice.

The goal of the Focused Pharma program is to develop novel compounds that directly affect specific neurotransmitter signaling processes that are often implicated in neurophysiological dysfunction, while overcoming limitations of current approaches. The envisioned drugs would selectively target and bind to specific neurotransmitter receptors, and activate only specific neural signaling pathways that may impact the conditions of interest.

"Focused Pharma will work to develop fast-acting drugs that have lasting impact, going beyond treating the symptoms of mental illness to tackle its underlying neurochemical roots," said Dr. Tristan McClure-Begley, the DARPA program manager.

At present, psychotherapy, psychopharmacology, and direct brain stimulation are the most effective means of treating the symptoms of neuropsychiatric conditions. While valuable, these approaches also have substantial drawbacks that make them less than ideal for treating a challenge on the scale of mental healthcare for the military community. Existing medications exhibit variable effectiveness from one individual to another, can lead to undesirable side effects, can take weeks to months to observe therapeutic benefits even when paired with counseling, and do nothing to prevent relapse once a patient stops taking them. In the case of psychotherapy and direct brain stimulation, finite availability of treatment makes it difficult to meet high demand over wide areas, and direct brain stimulation requires surgery.

In creating Focused Pharma, DARPA examined evidence from privately funded human clinical studies demonstrating that certain Schedule 1 controlled drugs that engage serotonin receptors show promise of rapid and long-lasting therapeutic effect in treating neuropsychiatric conditions such as chronic alcohol dependence, post-traumatic stress, and treatment-resistant depression following only limited doses. However, because such drugs act on many neurotransmitter receptors and receptor subtypes in the brain without specificity and indiscriminately activate numerous signaling pathways, they produce significant side effects, including hallucination. These effects, coupled with their unpredictable consequences, render the drugs unusable in a military healthcare setting.

Researchers supporting the program will have to address a series of challenges, innovating beyond the state of the art in molecular pharmacology and functional chemical neurophysiology. Additionally, they will be responsible for validating the effectiveness of their compounds in animal models that are robust and accepted as preclinical models. DARPA has scheduled a review at the mid-point of the program to validate the hypothesis that the efficacy of these drugs can be de-coupled from side effects, and will terminate the effort if research does not support that hypothesis. Focused Pharma will not include human clinical trials, but at the end of the scheduled four-year program researchers must have an Investigational

98

New Drug application ready for submission to the U.S. Food and Drug Administration.

“Our fundamental hypothesis is that drugs with biased activation of specific signaling pathways downstream of the receptor may be sufficient to induce a therapeutic effect that is uncoupled from deleterious neurological effects. Recent advances in neurotransmitter receptor structure-guided drug design are allowing us to generate the tools we need to test that hypothesis,” McClure-Begley said. “It is research we need to undertake given the scale of the mental health crisis our veterans face, and if it works, the payoff is a completely new, safe, and effective therapeutic option that transforms complex and previously intractable mental conditions into something more acutely treatable.”

DARPA is hosting a Proposers Day on October 1, 2019, in Arlington, Virginia, to provide additional information about Focused Pharma to interested researchers. Please visit https://go.usa.gov/xVRry for details. The registration deadline is September 24, 2019.

The Broad Agency Announcement includes full program details, as well as instructions on how to submit research abstracts and proposals. It is available at https://go.usa.gov/xVPVZ.

# # #

Media with inquiries should contact DARPA Public Affairs at outreach@darpa.mil

Tweet @darpa

TAGS

| Bio-complexity | Chemistry | Health | Neuroscience | Therapy |

SIMILARLY TAGGED CONTENT

Biological Technologies
Biostasis Proposers Day Webinar
PReemptive Expression of Protective Alleles and Response Elements (PREPARE) Proposers Day
A Dose of Inner Strength to Survive and Recover from Potentially Lethal Health Threats
Breakthroughs Inspire Hope for Treating Intractable Mood Disorders

Algernon Pharmaceuticals Signs Agreement with Charles River Laboratories for DMT Preclinical Studies

February 08, 2021 08:05 ET | Source: Algernon Pharmaceuticals

VANCOUVER, British Columbia, Feb. 08, 2021 (GLOBE NEWSWIRE) -- Algernon Pharmaceuticals Inc. (CSE: AGN) (FRANKFURT: AGW) (OTCQB: AGNPF) (the "Company" or "Algernon") a clinical stage pharmaceutical development company is pleased to announce that is has signed an agreement with Charles River Laboratories for preclinical studies of AP-188 ("N,N-Dimethyltryptamine or DMT") for the Company's stroke clinical research program. Algernon's preclinical study of DMT will be conducted at the Charles River research facility in Finland.

Charles River Laboratories, Inc. is an American corporation specializing in a variety of preclinical and clinical laboratory services for the pharmaceutical, medical device and biotechnology industries. It also supplies assorted biomedical products and research and development outsourcing services for use in the pharmaceutical industry.

moderna

Moderna Therapeutics and Charles River Laboratories Announce Strategic Collaboration to Scale Moderna's Nonclinical Development Efforts for Novel mRNA Therapeutics

June 6, 2016

Partnership will support Moderna's expanding pipeline and help accelerate discovery programs and development candidate progress into the clinic

CAMBRIDGE, Mass. and WILMINGTON, Mass., June 6, 2016 —Moderna Therapeutics, a clinical stage pioneer in the development of messenger RNA (mRNA) Therapeutics™ and Charles River Laboratories International, Inc. (NYSE: CRL), a leading early-stage contract research organization (CRO), today announced a strategic collaboration to support Moderna's nonclinical discovery and development efforts. Charles River will be a key partner as Moderna continues to grow and advance its pipeline spanning multiple drug modalities and therapeutic areas, conducting nonclinical activities to progress development candidates through investigational new drug (IND)-enabling studies and into the clinic.

"With ten programs in development across our internal efforts and external collaborations, Moderna continues to generate development candidates and discovery programs at an accelerated pace through our unique mRNA therapeutics research engine. This strategic relationship will help enable the scale, efficiency and speed needed to support the full breadth of discovery programs underway and to continue advancing our development candidates," said Stéphane Bancel, Chief Executive Officer of Moderna. "In particular, this collaboration will allow us to accelerate GLP toxicology study timelines, which will be instrumental as we continue to progress our development candidates into the clinic. Charles River's expertise across discovery and nonclinical development activities, combined with their familiarity with our novel platform, make them an excellent partner for Moderna. The ability to work with Charles River in its Massachusetts facility will enhance the collaboration, given its proximity to our operations in Cambridge."

Moderna's pipeline is composed of a series of novel drug modalities, each representing a distinct application of the company's proprietary core expression mRNA platform to encode proteins that achieve a therapeutic benefit. Moderna's current modalities include infectious disease vaccines, personalized cancer vaccines, rare disease-associated intracellular/transmembrane liver proteins, intratumoral cancer therapy, and secreted antibodies and proteins. Moderna is leveraging these modalities to advance drugs across a broad spectrum of therapeutic areas via its wholly owned ventures as well as a growing ecosystem of partners.

For nearly 70 years, Charles River has been in the business of providing the research models required in research and development of new drugs, devices and therapies. Over this time, the company has expanded upon its core competency of in vivo biology to develop a diverse portfolio of discovery and safety assessment services, both Good Laboratory Practice (GLP) and non-GLP, which is able to support clients from target identification through preclinical development. Utilizing Charles River's broad portfolio of products and services, which can be tailored to specific research requirements, enables clients to create a more flexible drug development model which reduces their costs, enhances their productivity and effectiveness, and increases speed to market.

"We are very pleased to enter into this strategic relationship with Moderna," said James C. Foster, Chairman, President and Chief Executive Officer of Charles River Laboratories. "We look forward to employing our unique portfolio and extensive scientific expertise to support Moderna's nonclinical discovery and development needs and advance its mRNA platform."

About Charles River

Charles River provides essential products and services to help pharmaceutical and biotechnology companies, government agencies and leading academic institutions around the globe accelerate their research and drug development efforts. Our dedicated employees are focused on providing clients with exactly what they need to improve and expedite the discovery, early-stage development and safe manufacture of new therapies for the patients who need them. To learn more about our unique portfolio and breadth of services, visit www.criver.com.

Charles River Contacts:

Investors:
Susan E. Hardy
781-222-6190
susan.hardy@crl.com

Media:
Amy Cianciaruso
781-222-6168
amy.cianciaruso@crl.com

Exhibit 44

About Moderna Therapeutics

Moderna is a clinical stage pioneer of messenger RNA Therapeutics™, an entirely new *in vivo* drug technology that produces human proteins, antibodies and entirely novel protein constructs inside patient cells, which are in turn secreted or active intracellularly. This breakthrough platform addresses currently undruggable targets and offers a superior alternative to existing drug modalities for a wide range of diseases and conditions. Moderna is developing and plans to commercialize its innovative mRNA drugs through its own ventures and its strategic relationships with established pharmaceutical and biotech companies. Its current ventures are: Onkaido, focused on oncology, Valera, focused on infectious diseases, Elpidera, focused on rare diseases, and Caperna, focused on personalized cancer vaccines. Founded by Flagship VentureLabs™, Cambridge-based Moderna is privately held and currently has strategic agreements with AstraZeneca, Alexion Pharmaceuticals, and Merck. To learn more,