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The New City Reader is a newspaper on architecture, public space and the city, published as part of "The Last Newspaper," an exhibition running at the New Museum of Contemporary Art from October 6, 2010–January 9, 2011. Conceived by executive editors Joseph Grima and Kazys Varnelis, the newspaper's content centers on the spatial implications of epochal shifts in technology, economy and society today. The New City Reader will consist of one edition published over the course of the project, with a new section produced weekly from within the museum's gallery space, each led by a different guest editorial team of architects, theorists and research groups. These sections will be available free at the New Museum and—in emulation of a practice common in the nineteenth-century American city and still popular in China and other parts of the world today—will be posted in public on walls throughout the city for collective reading.

The next issues will be WEATHER, guest edited by Jeffrey Inaba, C-Lab, and OBITUARIES, guest edited by Michael Meredith and Hilary Sample, MOS.

FOR WALL ASSEMBLY...

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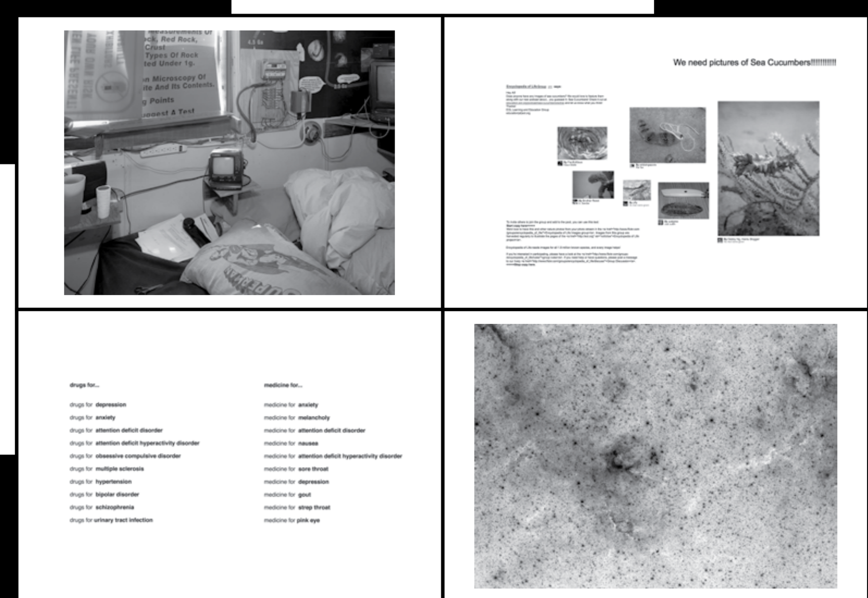

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"The Last Newspaper" is curated by Richard Flood and Benjamin Godsill. For more information please visit newmuseum.org

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DECEMBER 24, 2010

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The New City Reader

A Newspaper Of Public Space

CITIZEN SCIENCE

by David Benjamin and Livia Corona

Legend has it that on February 28, 1953, James Watson and Francis Crick walked into the Eagle pub in Cambridge, England, and finalized the most important biological discovery of the twentieth century. It was lunchtime. Watson was a research fellow, just 23 years old. Crick was slightly older, a Ph.D. student, and he was the one who announced to his fellow citizens, "We have found the secret of life."

Like many biochemists at the time, Watson and Crick had known that DNA existed and they were working to solve the mystery of its structure. Yet while some scientists were toiling over laboratory experiments, Watson and Crick were building cardboard models, and since they had less experience than others with these kinds of molecules, they were working "with the eye of the outsider." The structure these underdogs came up with in 1953, just ahead of others racing to the same goal, was the famous double helix of DNA.

This was news, as we now know without a doubt.

But at the time, the story was not picked up by The Times of London—nor by the venerable newspaper's new quarterly devoted to science—even after public announcement of the breakthrough at a conference on proteins in Belgium and official publication of the scientific paper in the journal Nature. Following a second talk about the discovery, entitled "Why You Are You," the News Chronicle of London ran the first newspaper article on the topic. The next day, the New York Times published its own six-paragraph report in the early edition, but the piece vanished from later editions, presumably to make space for more important news.

In retrospect this media blindspot seems incredible, and it is now widely recognized that newspapers have similarly missed several other big stories in their history of covering science. But in general, as much as any other medium of communication, the newspaper has offered clear reports on scientific advancements and helped establish what we, the public, know about science and how we know it. When the next Watson and Crick at the next prestigious university laboratory discover the next secret of life, we expect to read about it, promptly, in the newspaper.

Or not. Maybe these days we will see it first on a blog or in one of the open archives of pre-print papers that are rivaling the major science journals. Maybe these days the next Watson and Crick will actually be ten thousand collaborating puzzle-solvers scattered around the world. Maybe these days we, the public, will not really register the discovery until we do an experiment or two to verify it ourselves, on the kitchen table after the kids have gone to sleep.

This seems a little far fetched, we know. But two important developments are here and now: first, crowds of non-scientists are contributing in small ways to solving large science problems; and second, regular people are conducting their own science experiments without institutional laboratories. These developments, which are expanding but not entirely new, are encapsulated by the term Citizen Science, and this is the subject of the Science section of the New City Reader.

Citizen Science involves community, participation and new forms of public space. It connects to Big Science but also to the shared life of the city. Citizen Science includes personal stories as well as generalized discoveries, and although no one in their right mind would encourage the expert scientists working on climate change or new medicines to slow down or alter their methods, there is something beautifully democratic about how Watson, years after that historic lunch at the Eagle, reflected on his discovery and its relationship to the public: "It was simple; instantly you could explain this idea to anyone."

OUTSIDER SCIENCE

JOSEPH J. WOODSON'S SOLITARY CENSUS OF MARINE LIFE

by D. Graham Burnett

Several years ago I spent a pleasant summer week in La Jolla, doing the sort of thing that historians do: sifting old papers in an archive—in this case, the archives of the Scripps Institution of Oceanography. Outside, down the paradisical slope of a flowered hill, majestic rollers struck the soft sand. Inside, in the quiet, well-lit reading room, I riffled the daily correspondence of Carl Hubbs, in his day a very distinguished scientist of the sea. In the 1950s and early 1960s, Hubbs played a significant role in the campaign to save the Pacific gray whale from destruction, and I was interested in this episode and the larger issues it raised: the back and forth between scientific study and social action, the rise of popular conservation movements in the twentieth century, the natural history of the great whales.

And so, old papers. Lots of them. I perused a set of datebooks, for instance, trying to sort out if Hubbs had gone to an important conference on cetacean biology in 1963. Yep. He even kept the program—with notes! That counted as a find. I made a Xerox, then I spent the better part of a day thumbing through folders of correspondence: letters of recommendation, queries to publishers, answers to schoolkids—the residue of a life.

Now and again I jotted notes on a legal pad. I have those pages of notes in front of me now, and I can see that it was in folder 52 of box 54 that I turned up a genuine oddity: "amazing letter by a 'crank' who collects whale reports from sea captains," I scribbled hastily, and then, "semi literate—Hubbs writes gracious reply."

A strange world, full of enthusiasts and odd-balls. One keeps moving. There were many more boxes to review.

Little did I know, however, that this "crank" would reappear in the course of my research over the years to come. And reappear. And reappear. He eventually became a kind of familiar spirit who whispered from archives near and far. Over five years of research on my book on the science of whales in the twentieth century, I came to think of him as the poignant patron saint of unrealized scientific aspiration, a Quixote of citizen science who limned the category of outsider artists. And so, of this curious man, a word or two, by way of recovery.

Joseph J. Woodson Jr. lived in a small house in the Germantown district of Philadelphia in the years following World War II. He appears to have been the eldest son of a modestly successful building contractor from New York City, but his own career trajectory was not distinguished, and he seems to have drifted in and out of employment as a dock hand and construction worker on the waterfront of the City of Brotherly Love. At the age of five, on a summer visit to the New Jersey shore, the young Woodson was placed atop a stranded finwhale, from which perch he contracted a severe and durable case of cetaphilia—a nearly boundless enthusiasm for the earth's largest creatures.

Following up this youthful passion, he had, by the early 1950s, parlayed his dockside acquaintances into a growing network of overseas informants—oceangoing pen-pals he plied with queries about their encounters with sea-creatures. It was sometime in this period that he came across the works of the great nineteenth-century American proto-oceanographer, Matthew Fontaine Maury, who famously pioneered various globe-encompassing exercises in data gathering in the 1840s and 1850s: for instance, asking sailors to send him weather logs which he collated into quirky charts of winds and currents. Maury had even tried to make a map of whale distribution in the world's oceans, by species, by means of a vast synthesis of sightings and catches by American whaling vessels—Maury's whale charts got a cameo role in a footnote in Melville's "Moby Dick," where they buttress Ahab's claim to be able to track his oceanic nemesis. Inspired by this example, Woodson set out—on his own, unbidden and without support—to replicate a Maury-style system of cetacean census. Working up a mimeographed "Whale Report" form, Woodson began distributing these blank datasheets, which requested information about where a whale had been spotted, what direction it was headed, etc., to various sailors and officers in the merchant marine.

By early 1958 he had spent more than $1,000 of his own money on this idiosyncratic undertaking—this despite having been unemployed for the whole of 1957—and had begun to receive back very considerable numbers of dutifully filled-out forms. He had also, by this time, put himself into correspondence with many of the most significant whale biologists of the day, to whom he began forwarding copies of his reports together with various inquiries and proposals. Woodson's surviving letters—ineffably touching, rife with spelling errors, but displaying a strange and wonderful familiarity with technical questions in cetology—testify to his increasing desperation across the late 1950s and early 1960s. He plied a distinguished whale scientist in London with the depressing tale of his efforts to find some sort of employment on an oceanographic research vessel, and he periodically poured out his heart to his correspondents, explaining in the cover letter accompanying a fresh stack of whale reports that he feared he would not be able to continue his work for lack of resources, hope and colleagues.

But the reports kept coming. And he kept forwarding them on: to Norway, to Washington, to California, to London. To the scientists. Monthly. Eventually, in some cases, daily. A stream of data. Spottings. The records of glancing encounters in distant seas. Updates on his personal situation nearly always came in the packet, wrapped around a sheaf of whale-reports penned by salts, but copied by a lonely man in a small house in Philadelphia. A very landlocked man, who dreamed the watery globe. A small man who lived among visions of the world's largest creatures. A man who appears to have spent the whole of his life on Elwood Street in Germantown, Pennsylvania, forever thinking about the earth-encompassing migrations of the most cosmopolitan beasts.

In an archive in Scotland, in box 678 of a vast collection of materials left over by a defunct research institute that studied sea mammals in the 1960s, I found two thick binders of Woodson's missives, which had been sent to the chief scientist of the International Whaling Commission. The vast majority of them were unopened. I considered asking the archivist for permission to slit the old envelopes—in order to learn what became of the man and his project. But I thought better of it, and returned the whole lot to their cardboard casket, writing at the bottom of my skeletal page of notes, "This man must be <u>recovered</u>—in fact or fiction."

The question is: Which?

THE BIOLOGICAL TURK

by Alexandra Daisy Ginsberg

With its Turkish smoking pipe, sorcerer's beard and elaborate turban, the Mechanical Turk was a celebrated ruse, an eighteenth-century chess automaton wheeled out to beat the masters of the day. The artificially intelligent machine famously check-mated Benjamin Franklin and even Napoleon. But its secret was artificial artificial intelligence: a chess master concealed inside the elaborate wooden cabinet, sliding around inside the cramped space, evading detection as false doors revealed decoy mechanics inside.

More than two hundred years later, we are perhaps closer to the dream of true artificial intelligence. For instance, Stanford University's Kwabena Boahen is at the forefront of neuromorphic engineering, developing self-organizing silicon computing to emulate neuronal intelligence. But while efforts to reconstruct the elusive magic of human problem-solving and instinct in silicon continue, other researchers are finding novel ways to combine silicon computing with one of nature's best computers: our own grey matter.

Fold.it is a website developed at the Baker Laboratory at the University of Washington. Its tag line—"Solve Puzzles for Science"—coyly hints at the possibilities of tapping into the human super-computer and its efficient parallel networked architecture for scientific endeavor. Visitors to www.fold.it download the custom software, and begin to fold three-dimensional proteins in a competitive game environment. Using the allure of entertainment to encourage amateurs and experts alike to solve protein-folding problems, its simple brilliance is in its well-designed employment of the collective computing power of the crowd.

Protein science is notoriously complicated. Each protein is a three-dimensional building block, a key component in the workings of every cell in every living organism. Proteins are built from chains of amino acids, each constructed from atoms of carbon, oxygen, nitrogen, sulfur, and hydrogen. While this molecular string—manufactured in the cell from DNA's instruction code—contributes to the protein's function, its shape is key. The complex ways proteins fold are specific and repeatable for every protein. With molecular locks and keys built into the three-dimensional architecture, knowing the protein's precise structure helps us to know what it does.

Determining and predicting protein shape not only advances scientific knowledge, it could also enable development of new cures for a range of diseases, from Alzheimer's to HIV/AIDS. Potentially, new proteins could be designed specific to targeted functions. But since human proteins are built from chains containing as many as one thousand amino acids, the immense number of possible combinations means that an astonishing amount of computing power is required to determine their shape.

Fold.it's approach to protein science developed out of rosetta@home, one of many distributed computing projects that have enlisted the computing power of otherwise idle PCs around the world. These initiatives effectively create supercomputer networks that rival some of the world's most powerful machines. Launched in 2005, the rosetta@home software has been downloaded by 150,000 volunteers, who contribute their computers' power to compute protein shape.

The University of Washington's David Baker explains the evolution of a new approach to this problem, "Fold.it is really completely different, as it taps human intelligence, not just spare computing cycles." Even the most inexperienced human is better at solving complex spatial puzzles than the best computer. On the Fold.it site, non-experts learn the rules of protein folding through a series of starter puzzles, packing proteins, hiding hydrophobic elements and clearing clashes. They are soon ready to apply their innate human puzzle-solving skills to more complex folding, including the site's "Grand Challenges." The aim is to find novel predictions of a protein's structure from its amino acid sequence. In the process, science learns about proteins, and people learn about science. Generating evidence that human computing can find new solutions is one of Fold.it's goals. Its founders hope to encourage the biotech sector to recognize this as a genuinely viable method, not just PR. Baker is confidently collecting proof.

While Fold.it's elegantly designed system is new, citizen science has been contributing to scientific knowledge for years. The National Audubon Society's Christmas Bird Count has been enlisting citizen bird watchers since 1900, and professional astronomy has long benefit from crowd-contributed data. Citizen science has expanded greatly with the advent of the Internet, social networking and the global marketplace. The Fold.it game takes advantage of these capacities and uses ranking schemes, chat-rooms and wikis to build an engaged community—generally with more success than other ventures that employ distributed intelligence for scientific problems.

In the commercial world, Amazon's so-called Mechanical Turk is a crowdsourcing Internet marketplace that uses human minds to "solve problems and perform tasks that computers cannot yet be used for." Fold.it is the Biological Turk, taking total advantage of human intelligence and interfacing it with silicon. With Fold.it, the volunteer non-expert, equipped with well-designed tools, can offer more than the lowly paid employee of the Mechanical Turk, performing mundane tasks.

Equipped with the right tools, amateur scientists could become essential rather than just useful. The Fold.it website states, "For protein structure prediction, the eventual goal is to have human folders work on proteins that do not have a known structure." Baker confirms that, saying "more has come from users without much science background." Fold.it takes advantage of human intelligence traits, described by science journal <u>Nature</u> as "a superior spatial awareness; an ability to take short-term risks for long-term gain; and the converse, recognizing a dead-end early and knowing when to quit."

Baker believes that more areas in science could benefit from using the kind of innovations pioneered with Fold.it. And as projects are initiated and expanded, perhaps this kind of research could move from the web into physical space. Just as the International Genetically Engineered Machine competition—an undergraduate conference held annually at MIT—provides momentum for the field of synthetic biology, could thousands of top-ranked science game players be gathered in one space to make intensive progress solving problems? Perhaps this is the future of citizen science, where communities are united trying to solve the same problem in parallel rather than tinkering in series. In this evolution of DIY biology, collective intelligence, rather than distributed thinking, could be the future of the Biological Turk.

OPEN DATA

HOW DO WE WANT THINGS TO CHANGE?

by Usman Haque

(notes from the event "Data City: Doom or Boom," London, July 8, 2010)

Cities are heterogeneous—that's why we like them.

People always find ways to distinguish themselves from each other—this is the cause of both conflict and creativity.

Clearly, technology will affect the way we construct our cities. Ubiquitous computing offers the possibility of both citizen-led sense-making and authoritarian control structures.

So the question is not "Will things change?," nor "How will things change?," but "How do we want them to change?"

As CEO of Connected Environments Ltd. and founder of Pachube.com—which provides an open API for data connectivity and collects and connects data from sensors, energy meters, weather stations, building management systems, air quality monitors and almost anything that produces data around the world—I think I'm supposed to be espousing the view that open data is going to lead to more productive and sustainable lives, environments and cities.

But, in its simplicity, that could be a misunderstanding of what Pachube is all about. It is problematic on many levels to frame the conversation in terms of asking whether open data will change how we interact with our cities. Of course technology changes our relationship to our cities. Cities accrete technology, and technology is a manifestation and definer of social relationships.

Additionally, the question, "Will this change the way we interact with cities?," contains the idea that that we can somehow interact with cities as abstract entities that are separate from ourselves. On the contrary: cities are the accretions of interactions. They are not some static solidified entity that we, as consumers, simply interact with. We create and recreate our cities with every step we take, every conversation we have, every nod to a neighbor, every space we inhabit, every structure we erect.

Clearly, what we consider "conversations," "neighbors," "spaces" and "structures" will continue to change. The question is not "Will things change?," but "How do we want them to change?"

Opening up data, which is very popular right now, is certainly a useful first step. It enables a level of accountability that was not previously evident. But it's worth bearing in mind that simply opening up data is not enough. When a government organization allows access to its data, laudable as that is, close inspection is still required. We have to question how and why they opened up that data. Is it because it's non-threatening? How was it compiled or measured? What was the dynamic range? What data was left out? How might it have been used to obscure something else? In essence: how was the data created?

Opening up data can itself be considered a control structure—a means of representing action without doing anything at all, while continuing to justify mass invasions of private data created by and belonging to citizens.

The real question is not about making data public, but about finding ways for the public to make data.

How do all of us, as citizens, contribute to the data collection process? How do we learn and understand our environments through the data that we create, or rather craft, as data collection is at its heart a craft? How can it help us question the standards of evidence that we are asked to believe and comply with by authority figures, politicians, scientists, media personalities and religious leaders? This isn't to say that what they say is wrong; it's to say that it's more important for us to be active participants so that we understand much better and can also be part of the process of improving things.

This is why I launched Pachube. It's not simply about making data open. It's about developing a platform that makes it as easy as possible for everyone—citizens, organizations, companies and city managers alike—to produce, aggregate, share and compare environmental data, sensor data, energy data and any other sort of data you want—data that may be generated by devices, buildings, energy meters or even virtual environments.

It's about data crafting. It's also about a platform that works for players small and large. The asymmetry of the conversations between all these data-creating entities is worrying right now—and it's Pachube's task to encourage and make possible greater horizontality.

The Internet of things is coming.

It's clear we're going to be inundated with cities of sensor networks and all sorts of weird, wonderful and worrying data systems.

What concerns me most is how all of us can be part of the process of defining what that data is, how it is collected and what is done with it.

So again, the question is not "Will things change?," but "How do we want them to change?"

CITIZEN PANIC

by Seth Mnookin

(adapted and includes excerpts from the forthcoming book "The Panic Virus: A True Story of Medicine, Science and Fear")

There are some arenas in which the democratic assessment of information makes sense—it's a good bet that if a new Stephen King book has fifty thousand five-star ratings on Amazon, fans of Cujo and Carrie aren't going to be disappointed—but epidemiology, which uses enormous amounts of data to analyze health and disease on a population level, is not one of them. Determining cause and effect can be difficult even when conducting laboratory research, and epidemiologists don't have the luxury of setting up controlled experiments with a minimum of variables: They need to factor in the uncontrollable actions and unpredictable behaviors of anywhere from dozens to millions of individuals across an entire population. It's no wonder that the ambient statistical noise can prove deafening even to professionals who've spent decades processing information on such a large scale. That's exponentially truer for lay practitioners untrained in statistical analysis.

One well-known example of the pitfalls of amateur epidemiology occurred on Long Island in the early 1990s. In March 1992, 50-year-old Lorraine Pace was diagnosed with breast cancer. This came as a shock—not, Pace said, because a cancer diagnosis is always upsetting, but because she thought her healthy lifestyle should have protected her from the disease. Even more alarming to Pace was her sudden awareness of the large number of cancer patients in the area—eventually, she counted a total of twenty neighbors in West Islip who'd also been diagnosed with cancer in the past several years alone. This might have been an informal sampling, but it left Pace convinced that an unidentified toxin was stalking her community.

Frustrated with what she saw as a lack of official concern, Pace took matters into her own hands and founded the West Islip Breast Cancer Coalition. Every morning for months, the organization's members would meet in Pace's living room to add new data points to a giant, color-coded map: yellow dots for homes with malignant breast tumors, pink for benign tumors and blue for no tumors at all. After analyzing their data, they announced that cancer rates in their community were twenty percent higher than the state average.

The media and local politicians alike jumped on the story, much to the dismay of scientists who knew that epidemiological studies that start with desired outcomes in mind are almost by definition worthless. In this case, there were a number of obviously mitigating factors that hadn't been considered by Pace's group: West Islip has a high proportion of wealthy, white women with better access to health care than most of the country, which likely meant women were identifying benign tumors that went unnoticed in other communities; West Islip women tended to defer childbearing to later in life, which was known to increase the risk of breast cancer; and the citizens of West Islip tended to live longer than average, and cancer rates climb dramatically with age.

Ultimately, Pace's crusade spawned a controversy that raged for nearly a decade at a cost to taxpayers of more than $30 million. When, in 2002, an exhaustive federal study found that breast cancer rates in Suffolk and Nassau Counties on Long Island were in fact barely distinguishable from incidents of cancer nationwide, the news received a fraction of the attention the initial scare had caused.

If large-scale pattern recognition is hard to practice in your neighborhood, it's nearly impossible to conduct over the Internet. Even when you know that an online community selects for a certain type of person—say, politically minded liberals or ardent conspiracy theorists—sustained encounters with a small group of like-minded people almost inevitably lead to the conclusion that everyone thinks the way you do. This is a subject I explore in my book "The Panic Virus," which examines the controversies over vaccine safety that have exploded over the past decade. In the late 1990s, a handful of parents began trading stories online about their fears that a mercury-based preservative called thimerosal that was used in some vaccines had caused their children's autism. (Thimerosal has been absent from all childhood vaccines since 2001, and numerous studies have shown that the quantities in which it was used were safe.) A mailing list that started with a few dozen people grew to hundreds and then thousands—by which time the media had begun to take note, which had the effect of adding fuel to the fire. In this story, citizens were at odds with science, and the results remain less than ideal.

LEARNING BY EXAMPLE

AN INTERVIEW WITH EITAN GRINSPUN

by David Benjamin

David Benjamin Citizen science includes projects like citizens helping biologists fold proteins by playing a game. Since you are a professor of computer science at Columbia and an expert in computer graphics and vision, could you offer some examples of citizen science in computation?

Eitan Grinspun When you say citizens are helping biologists fold proteins by playing a computer game, I'll make the same statement, but I'll talk about it as computer science, because computer scientists think about how you take the protein folding problem and encapsulate it as pill-size tasks that can be done on one computer by one person in one hour. So how do you take this problem that in principle could take 100,000 hours on a super-computer and split it up into pieces that a kid can play with in a game? That's a computer science problem and not just a biology problem.

DB That makes sense. What other problems are citizens helping to solve?

EG Have you ever gone to a Web site—maybe you're buying tickets for something—and it says, here's a sloppy-looking word, please type this word in? This is called CAPTCHA, and it was one of the big breakthroughs on the Internet in terms of determining whether someone was a human [rather than a bot]. But it was also observed to be a lot of wasted work, because you have all these people reading and typing, and all they are doing is proving that they are human. So reCAPTCHA came along, and it's a project that's trying to scan in lots of antiquated books—books that they've had trouble using optical character recognition on. Every time they run into a block of text that they can't scan in, they save that block of text, and that's one of the images they show you when it's time to do a CAPTCHA.

DB So by typing in the word, you are contributing to science.

EG That's right, the project acquires information from the fact that you were just trying to buy a ticket. So that's people involuntarily contributing towards scanning in the world's greatest documents.

DB The idea of involuntary contribution to science is very interesting. But this does not really serve to increase citizen understanding of science. Is there something strange about citizens contributing to a project but not being able to understand the paper or the conference presentation?

EG One of the big questions you have to ask is why people are contributing. You came to me with this utopian notion that lots of people are getting up and saying, "Mr. Scientist, how can I help you?" And what I'm painting for you are a bunch of companies and academic organizations that are not relying on people wanting to help them. Rather, they are saying, "Mr. Citizen, we're going to give you something that you think is valuable, all you have to do is reveal some information about yourself." So Amazon's Mechanical Turk is giving them some money. Google is giving information. Facebook is giving connectivity to friends. They are all creating other motives by which these groups participate.

DB What about less commercial projects?

EG Everybody goes all around the world and they snap-snap-snap snapshot photos. Now you have all these photos online. And the same frigging thing gets photographed from every possible angle. What can we do with that information? Researchers at the University of Washington [from GRAIL, the Graphics and Imaging Laboratory] realized that for [places like] Notre Dame Cathedral, on Flickr, there are over 80,000 photos by lots of photographers. So what could be done with this? Well, if I showed you two photos of Notre Dame Cathedral, you could probably deduce that one was to the left of the other, or closer than the other. There are computer vision algorithms that do the same thing, guessing the relative position between two photos. Now if you have tons of photos, and for each pair you can guess their relative position, you start to a sense of their absolute positions. You have many views of the unknown building or statue from lots of different positions. And then you can use vision algorithms to reconstruct a 3D model of it, navigate it and superimpose a blend of the photographs on it.

DB So you get a realistic 3D model of a building or a city out of a bunch of Flickr photos—amazing! In general, it seems like there is not a single area of computer science that uses these techniques—it affects a lot of different areas.

EG People in any field of computer science would be fools not to recognize the value of this…I'm one of those fools. I haven't done anything like this.

EXPERIMENTAL COMMUNITIES

by Daniel Grushkin

Two years ago, I found myself spending late nights catching up on video presentations posted online from the International Genetically Engineered Machine—iGEM—undergraduate competition. Over the course of a summer the students had designed bacteria and yeast to do amazing, if often quirky, things. Some had made artificial blood from bacteria for use in transfusions. Some had coaxed DNA to fold itself into perfect rectangles for microscopic circuit boards. A few more fanciful students had cultured yogurt to combat plaque by competing for room on teeth. Watching the students giddily deliver their presentations produced a strange sensation in me. For the first time in my career as a journalist, I wanted to be something else. I wanted to be a biologist.

Apparently, I wasn't the only one watching. During the same period, a message board formed called "Do It Yourself Biology"—DIYbio, for short. The group organized around the idea that if a bunch of kids could engineer functioning organisms within three months, then an enthusiast might do it too without having to go back to school for a seven-year Ph.D.

Not long after, I invited half-a-dozen people—lawyers, college students, artists and scientists—to my apartment for what had been billed as "DNA and Pizza Night." Using nothing other than what was available in my kitchen, we extracted the genetic core from a pile of strawberries. It was a minor scientific challenge, something elementary school kids do in science class. But for me the white stringy glob of DNA encapsulated science's attempts to answer the most fundamental questions we can ask: What are we? Where do we come from? The scientists among us laughed at my awe, but to me, this was far more than child's play.

If you think about the fathers of biology, they weren't "biologists" as we think of them today. Darwin never had a professional posting at a university. Gregor Mendel, who illuminated the mysteries of heredity, was a monk. Sometime in the last century or so, as technologies and understanding developed, a gap opened between scientists and everyone else. Institutions gained a lock on research; hierarchies formed. If you wanted to be a scientist, you could either go into academia or join a corporation. There was no room for the dilettante. With academics beholden to grants and industrial scientists to profits, a whole dimension of scientific inquiry languished: science for the sheer wonder of it.

This December, a group of seven of us did something I never would have imagined during those late nights watching iGEM presentations. We built Genspace, the world's first community laboratory. In a former Brooklyn bank—now an art and design studio—we built the structure out of reclaimed windows and glass doors. We scavenged the lab benches from industrial kitchens and acquired equipment from a downsizing biotech company. Though hacked together, the lab meets all the Centers for Disease Control requirements for Biosafety Level One and is as safe as any professional lab.

Genspace is a nursery for would-be biologists. It doesn't matter whether members aim to design a product, cure a disease, make a discovery or satisfy a curiosity. What matters is the desire to tinker. Part of the plan is to demystify the science, to narrow the distance between professional genetic engineers and the rest of us. Other groups are following suit. BioCurious, a lab in San Francisco, is scheduled to go live this summer, and there are DIYbio collectives forming in cities from Los Angeles to Baltimore, Paris to Bangalore.

A decade ago, Time proclaimed this to be the "Century of Biotech." The editors envisioned biotech replacing computers as the principal technology of the new age. Looking back, computers only began to reshape our lives when ordinary people got their hands on them. If the editors turn out to be right, it will be because groups of citizen scientists, kept up at night by nothing other than a sense of curiosity, take the reins of this technology and join institutions at the forefront of the quest for knowledge.

Alec Soth, "Ray's place after the Los Alamos cave experiment." From the series "Broken Manual."

We need pictures of Sea Cucumbers!!!!!!!!!!!

Encyclopedia of Life Group pro **says:**

Hey All!
Does anyone have any images of sea cucumbers? We would love to feature them along with our new podcast about... you guessed it- Sea Cucumbers! Check it out at: education.eol.org/podcast/sea-cucumbers/extras and let us know what you think!
Thanks!
EOL Learning and Education Group
education(at)eol.org

By PacificKlaus
Klaus Stiefel

By wildsingapore
Ria Tan

By Debby Ng, Hantu Blogger
No real name given

By Brother Rewd
A. Sandler

By pfly
No real name given

By justjjoke
Just Judith

To invite others to join the group and add to the pool, you can use this text:
Start copy here>>>>>
We'd love to have this and other nature photos from your photo stream in the Encyclopedia of Life Images group. Images from this group are harvested regularly to illustrate the pages of the Encyclopedia of Life project.

Encyclopedia of Life needs images for all 1.9 million known species, and every image helps!

If you're interested in participating, please have a look at the group rules. If you need help or have questions, please post a message to our lively Group Discussion.
<<<<<Stop copy here.

Livia Corona, "Encyclopedia of Life."

drugs for...

drugs for **depression**

drugs for **anxiety**

drugs for **attention deficit disorder**

drugs for **attention deficit hyperactivity disorder**

drugs for **obsessive compulsive disorder**

drugs for **multiple sclerosis**

drugs for **hypertension**

drugs for **bipolar disorder**

drugs for **schizophrenia**

drugs for **urinary tract infection**

medicine for...

medicine for **anxiety**

medicine for **melancholy**

medicine for **attention deficit disorder**

medicine for **nausea**

medicine for **attention deficit hyperactivity disorder**

medicine for **sore throat**

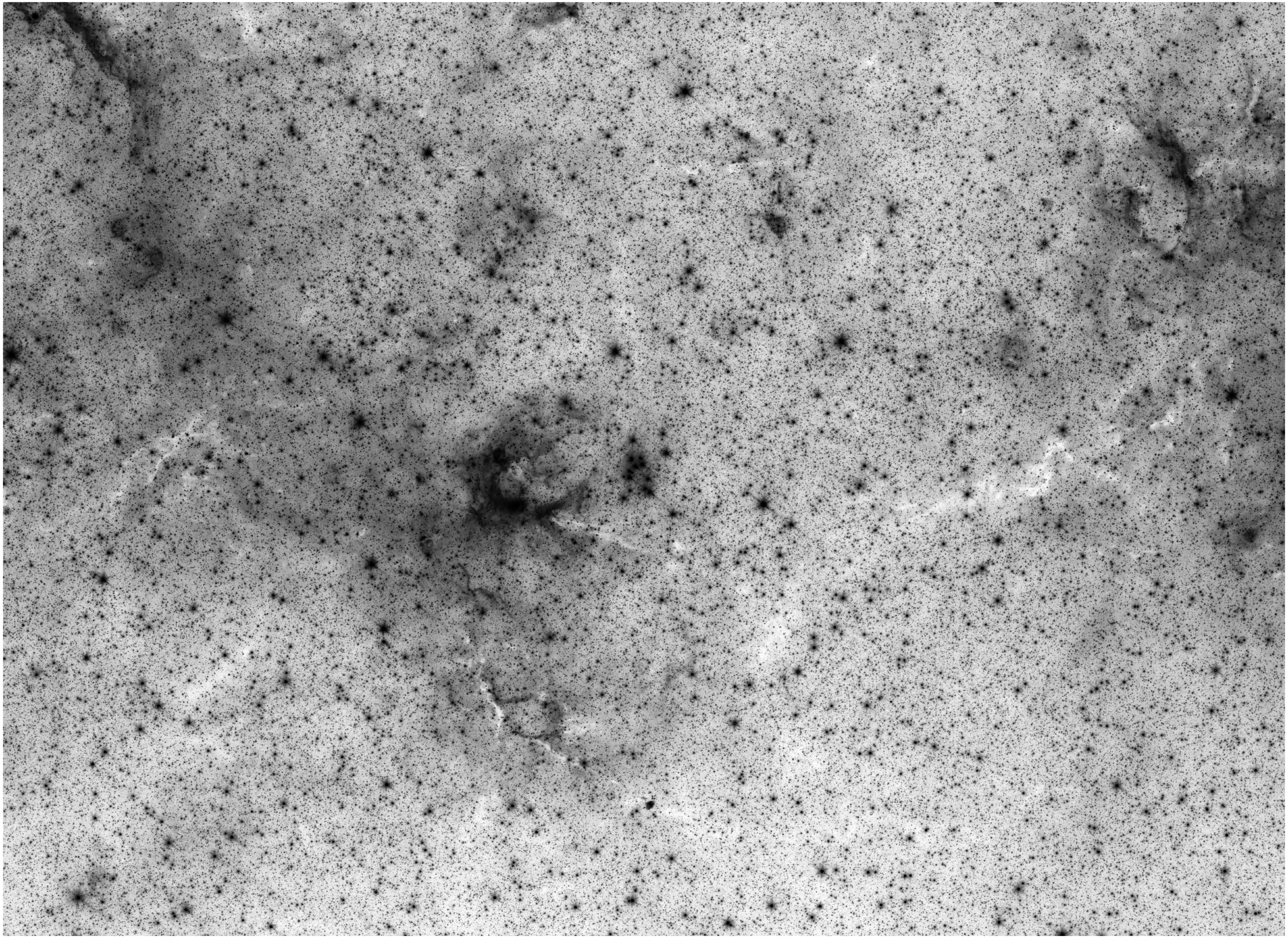
medicine for **depression**

medicine for **gout**

medicine for **strep throat**

medicine for **pink eye**

Emilio Chapela, “Drugs for... / Medicine for....” From the series “Ask Google.”



Mungo Thomson, “Negative Space (STScI-PRC2006-03a).” Four-color images, made from inverted photographs of outer space taken by the Hubble Space Telescope.