May 27, 2015

Today we have one of the wonderful days without selections recounting the latest outrage from governments.

One of medicine's biggest worries is bacteria strains that are resistant to antibiotics. Israeli researchers are finding ways to combat this resistance. It's the lede here today. Can you imagine a story about researchers anywhere in the Islamic world? The story was in **ARS Technica**.

... So, some researchers at Tel Aviv's Sackler School of Medicine came up with a clever idea: why not create a virus that gives bacteria something that's useful to them, but gets rid of antibiotic resistance at the same time? Under normal growth circumstances, the bacteria would readily pick up the virus, because it's useful. But, when faced with an antibiotic assault, they'd be helpless to resist it.

To create this magical construct, the researchers turned to a virus that infects bacteria called λ (familiar to anyone who's taken a class in gene regulation). λ has a mode of infection in which it inserts itself into the host genome and resides there, dormant until some point in the future. λ was modified so that it would remain dormant indefinitely.

To give this version of λ something that's useful to bacteria, the authors equipped it with the CRISPR-Cas9 system along with genes for targeting RNAs that would direct it to other viruses. Now, if those viruses tried to infect a cell with the modified λ already in it, they'd be cut to pieces. In essence, they were using a virus to make bacteria immune to another virus. Viral infections went down by three orders of magnitude.

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Washington Post tells us why there's so much BS about eating.

Here's how public thinking on food gets shaped: Every year, researchers publish hundreds of academic studies about the health effects of various foods - chocolate, kale, red wine, anything. Those studies, in turn, become fodder for newspaper articles, books and blog posts.

But how much of this torrent of information is worth the trouble? Surprising little, according to a number of key researchers.

In recent years, these skeptics have caused a stir by poking big holes in the nutritional science behind popular diet advice. Even the findings published in distinguished health journals have come under fire.

Collectively, their work suggests that we know far less than we think we do about what to eat.

"Is everything we eat associated with cancer?" a much noted paper in this vein asked. ...

A few weeks ago we had a review of David McCullough's book about the Wright Brothers. **NY Times** reviewed it also. Pickerhead has to plead guilty to too much interest in the Wright Bros.. However, it is an interesting story in that these two men spent very little money compared to the government funded efforts of Samuel Langley. Just another example of Pickerhead's Iron Rule of Government - It always f**ks up.

... The Wrights have been a welcome inspiration to David McCullough, whose last big book, "The Greater Journey" (2011), was about assorted, unrelated Americans venturing to Paris in pursuit of culture and badly needed a better raison d'être. And Mr. McCullough's primary audience is not kids, though many of them may appreciate "The Wright Brothers." He writes for fathers, as in Father's Day, with publication dates usually well timed for that holiday. (Marketing aside, anyone can enjoy them.) So the same dads who got blue-ribbon gifts of "1776," "John Adams," "Truman," "Mornings on Horseback" or other McCullough chestnuts should enjoy the way this author takes the Wrights' story aloft

Merely by choosing them, Mr. McCullough makes his subjects extra-estimable. And in the case of the Wrights that may be fitting. If Wilbur, the older, bossier and more rigorous brother, ever had an impassioned relationship with any human being who was not a blood relative or fellow aviation enthusiast, this isn't the book to exhume it. Mr. McCullough appreciates Wilbur's aloofness, intelligence and austerity, even after he became a celebrity. During the Wrights' grand, two-day welcome home whoop-de-do in Dayton, a New York Times reporter caught them sneaking off to work in their shop three times on the first day. ...

WSJ Essay on some modest looking models on display in a New York museum

***Among the treasures** in "Sculpture in the Age of Donatello: Renaissance Masterpieces From Florence Cathedral," on view through June 14 at New York's Museum of Biblical Art, are two rather plain wooden models. Placed alongside breathtaking sculptures by leading artists of the 15th century, these unadorned representations of the dome and lantern that crown the Florence church seem ordinary by comparison—until one discovers that they were likely crafted by the very genius whose architectural and engineering talents made the construction one of the marvels of the age. ...*

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NY Times reports on stone tools found in Kenya.

One morning in July 2011, while exploring arid badlands near the western shore of Lake Turkana in Kenya, a team of archaeologists took a wrong turn and made a big discovery about early human technology: Our hominin ancestors were making stone tools 3.3 million years ago, some 700,000 years earlier than previously thought.

The findings promise to extend knowledge of the first toolmakers even deeper in time, probably before the emergence of the genus Homo, once considered the first to gain an evolutionary edge through stone technology.

"Immediately, I knew that we had found something very special," said Sonia Harmand, a research associate professor at Stony Brook University in New York, in a telephone interview from Nairobi, Kenya. ...

ARS Technica

Engineered virus protects bacteria while eliminating antibiotic resistance

CRISPR/Cas9 system isn't just for engineering human genomes.

by John Timmer

Editing the sequence of bases in a DNA molecule is pretty straightforward in a test tube. Until recently, editing the DNA of a living organism had been a very large challenge, one that was more often avoided than taken up. But a system bacteria use to defeat viruses has been repurposed to make a versatile DNA editing system.

The system, called CRISPR-Cas9, takes short pieces of RNA as input. Any places it spots the same sequence in a DNA molecule, it makes a cut. Those cuts will then generally be repaired using any DNA sequence that roughly matches it. If researchers provide an edited version of the sequence, then the edits get incorporated into the cut DNA.

The system made news recently when it was used to edit the DNA of fertilized human embryos. But it's seen plenty of other uses, from targeting HIV infections to creating a mutagenic chain reaction that can spread through populations of pests. Now, some researchers have turned it against another threat: antibiotic resistance

It's not an obvious thing to target. Editing the DNA of bacteria involves getting DNA inside populations of bacterial cells in settings like hospitals. The most convenient way to do that is with a virus. And, if you're going to target bacteria with a virus, you might just as well use a virus that kills them, right?

Yes and no. Having a killer virus simply selects for bacteria that can resist infection, setting off an evolutionary arms race between the bugs and the virus. Meanwhile, the problem of antibiotic resistance is still with us.

So, some researchers at Tel Aviv's Sackler School of Medicine came up with a clever idea: why not create a virus that gives bacteria something that's useful to them, but gets rid of antibiotic resistance at the same time? Under normal growth circumstances, the bacteria would readily pick up the virus, because it's useful. But, when faced with an antibiotic assault, they'd be helpless to resist it.

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inserts itself into the host genome and resides there, dormant until some point in the future. λ was modified so that it would remain dormant indefinitely.

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So, in theory, wiping out antibiotic resistance in a hospital setting could be as simple as spraying the engineered λ virus, along with whatever virus it provides resistance to. In fact, if you engineered a virus that did several useful things for the bacteria, it could become possible for it to spread through wild populations via horizontal gene transfer.

That's the good news. The bad news is that it should be possible for evolution to modify the λ in a bacterial genome so it maintains its viral resistance abilities, but loses its ability to wipe out antibiotic resistance. In addition, λ only infects *E. coli*, and there are strains of that bacteria that are already resistant to it. Targeting other significant disease-causing bacteria will be a challenge.

Still, it's a creative approach that could pay dividends in some contexts. And it's possible that other researchers will figure out ways of extending the approach so it's more widely effective.

Washington Post

Why what we think about eating is so often wrong

by Peter Whoriskey

Here’s how public thinking on food gets shaped: Every year, researchers publish hundreds of academic studies about the health effects of various foods - chocolate, kale, red wine, anything. Those studies, in turn, become fodder for newspaper articles, books and blog posts.

But how much of this torrent of information is worth the trouble? Surprising little, according to a number of key researchers.

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“Is everything we eat associated with cancer?” a much noted paper in this vein asked.

Published in the American Journal of Clinical Nutrition, the paper reviewed the academic studies conducted on common cookbook ingredients. Of the 50 ingredients considered, 40 had been

studied for their impact on cancer. Individually, most of those studies found that consumption of the food was correlated with cancer. When the research on any given ingredient was considered collectively, however, those effects typically shrank or disappeared.

"Many single studies highlight implausibly large effects, even though evidence is weak," the authors concluded.

Indeed, much of the field appears to be beset with doubt. And now comes the controversies sparked by the U.S. Dietary Guidelines - the governmental diet recommendations that are being updated this year. In February, we learned that the government is poised to withdraw its longstanding warning about consuming foods that are rich in cholesterol. At the same time, the government's advice on salt, saturated fats and other foods are under attack, too. The ongoing back-and-forth over these foods tends to buttress the skeptics' argument that public health authorities have too often issued nutrition advice before the science was settled.

With the public comment period on the Dietary Guidelines ending this week, it seemed like a good time to connect with David B. Allison, of the University of Alabama-Birmingham, one of the leading skeptics. In recent years, Allison and his colleagues have taken aim at an array of frequently dispensed nuggets of nutrition advice -- for example, that eating fruits and vegetables aids in weight loss or that skipping breakfast might cause weight gain.

More generally, Allison and others have pointed to problems in the way that nutrition research is conducted, criticizing everything from the way that food intake is measured, which is often imprecise and deeply flawed, to the inferences that scientists draw from their findings.

In conversation,Allison was exceptionally stinting in his diet advice - unwilling to stray much beyond the fact that we need food to live, and that if we eat too much we get fat.

One final note: The professor's skepticism applies to nutritional claims made by the government as well as to those made by the food industry, and in fact, Allison and the university has received funding from both, as his disclosures show.

Nutrition science seems to be undergoing an enormous state of flux. Officials are poised to drop their longstanding warning about cholesterol in foods; the evidence for the government's warning about salt has shifted; and scientists are still arguing over what kinds of fats are good and bad for you.

Is this normal?

Yes and no.

All scientific knowledge is provisional. That is accepted. We learn.

On the other hand, the extent to which we are changing in nutrition now seems greater than it is in some other fields, and much of what we once considered rock solid science being called into question.

[Given all this change], there are people wondering, "Hey guys, could we just hold on a second?"

We've put a man on the moon. We've mapped black holes and distant galaxies. Why is it so hard to figure out what we should eat?

There are many reasons.

For one, there is a presupposition that eating some things is better than eating other things. But is it? It's like ESP - some people might ask 'Why can't you find good evidence of ESP?' Maybe it's because there is no ESP.

Another reason is it's really difficult to do the kinds of experiments we'd like.

When we start to talk about how long do you live on this diet, or whether you get a cancer or stroke, that is not so easy to study in humans. You need large numbers of people to eat what you tell them for a very long period of time. Typically, you want thousands of people over a period of years. You can immediately see that if you can get them to do it at all, could you even afford to do the study? Those kinds of studies are very rare.

You've written about how scientists themselves distort what is known, mainly by making the evidence they have seem stronger than it really is. For example, you counted up instances in which researchers wrote that skipping breakfast "caused" weight gain, when in fact their study merely showed that skipping breakfast is associated with weight gain.

What are the motives here?

There's more than one. One is innocent. Some people just didn't think it through. That's not an excuse – it's still sloppy bad science.

Others may be well-meaning but they think they generally already know what is good and bad. They want to do as much as possible to convince everyone that what they think is 'good' is actually good and what they think is 'bad' is bad.

A third factor is a kind of moral passion or indignation.

Given, all of these ways that the science can go wrong, what do we actually know about what's good for us?

There are a few things we are certain about. We know that you can't live without food, and that if you eat too much, you get fat. There are certain essential nutrients - vitamins and minerals - that you need to have. You should make sure there is no lead or mercury or other toxins in your food.

After that the knowledge base gets thinner and thinner.

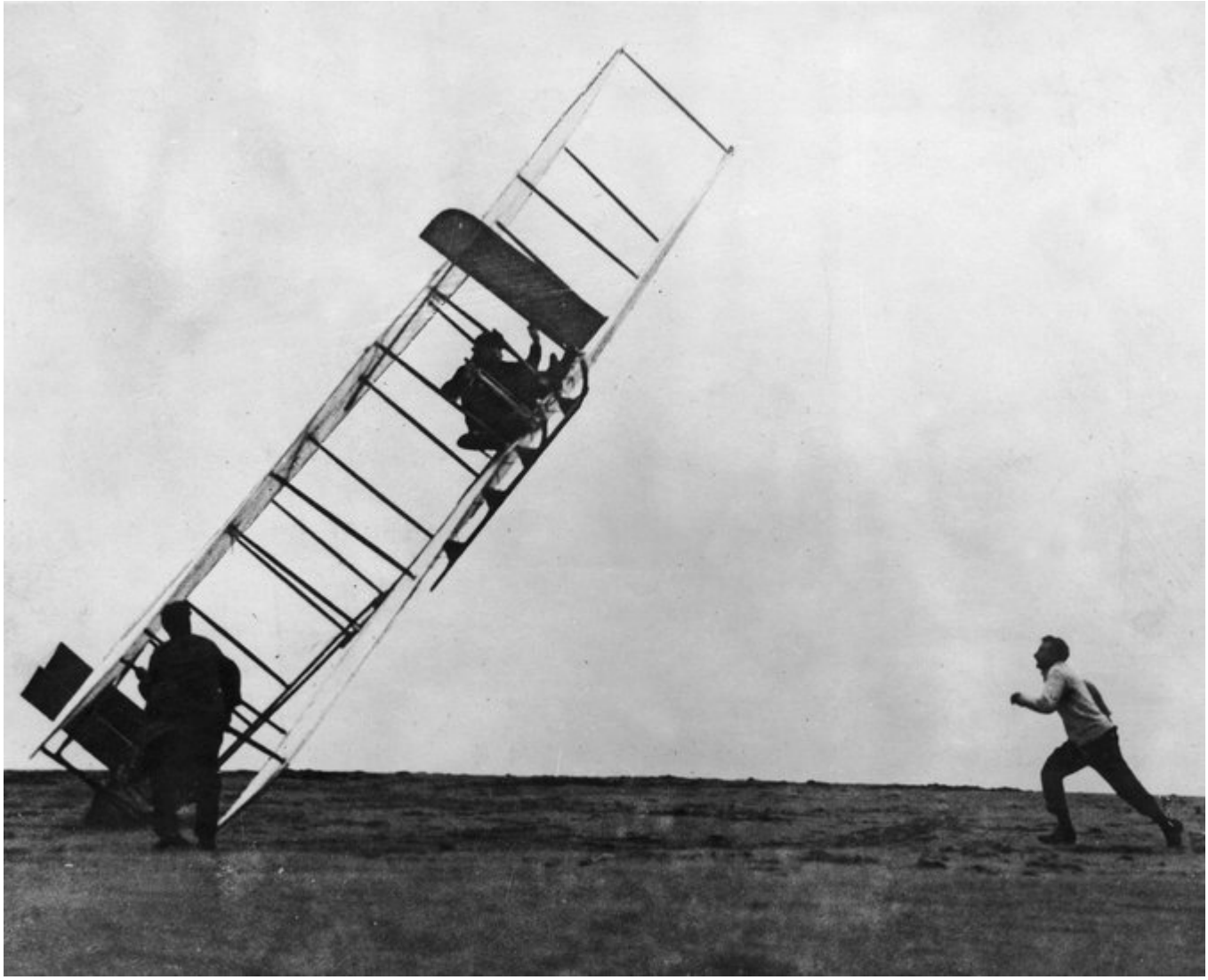
Maybe you shouldn't have a diet that is extremely high in saturated fat or trans fats or sugars. Do we know this beyond any reasonable doubt? No. But we know enough to say this could be considered a prudent diet.

But that's the way we need to tell people. We need to say, 'We think,' not 'We know.' We need to be careful about is not pretending we know more than we really do.

NY Times
‘The Wright Brothers’ by David McCullough

A lot of books about the Wright Brothers are written for children. Maybe that’s because these two aviation pioneers are better known for their work than for anything personal, and because inventing the first viable airplane is more exciting than anything else about them. Or because the Wrights’ asceticism and single-mindedness sound so uncomplicatedly heroic.

It must also have helped that these solemn-looking loners from Dayton, Ohio, triumphed over the perception that they were merely bonkers. “We couldn’t help thinking they were just a pair of poor nuts,” a resident of the area near Kitty Hawk, N.C., would recall about seeing Wilbur and Orville Wright stand for hours watching giant seabirds as they soared over the beach. The Wrights would flap along, using their own wrists and elbows to learn the motion of the birds’ wings.



Orville Wright lands one of the early Wright gliders badly, as his brother Wilbur watches

The Wrights have been a welcome inspiration to David McCullough, whose last big book, "The Greater Journey" (2011), was about assorted, unrelated Americans venturing to Paris in pursuit of culture and badly needed a better raison d'être. And Mr. McCullough's primary audience is not kids, though many of them may appreciate "The Wright Brothers." He writes for fathers, as in Father's Day, with publication dates usually well timed for that holiday. (Marketing aside, anyone can enjoy them.) So the same dads who got blue-ribbon gifts of "1776," "John Adams," "Truman," "Mornings on Horseback" or other McCullough chestnuts should enjoy the way this author takes the Wrights' story aloft

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The brothers, five years apart, grew up to do everything together. Though Wilbur was much more dominant — he wrote better and seemed a natural leader — he and Orville were careful to share whatever opportunities came their way. After the 18-year-old Wilbur was hit with a hockey stick (by a 15-year-old future murderer, whose victims would include his parents and brother) and suffered debilitating facial injuries, he gave up on the idea of leaving Dayton for a higher education. Instead, he lived out his teens as a recluse and reader. Then he and Orville developed a love of bicycles, learned to make them and started their own business. In the plus ça change department, it's interesting to read how Dayton's alarmists of the 1890s saw the bicycle as something that could corrupt innocent youth, cause children to stray far from home, keep them from reading books, encourage sexual freedom and so on.

This concise, exciting and fact-packed book sees the easy segue between bicycling and aerial locomotion, which at that point was mostly a topic for bird fanciers and dreamers. But there were automobiles in Dayton's streets, so who knew what might happen in its skies? The Wrights read everything they could about flight and wrote to anyone who might reply, from the first experimenters to the Smithsonian Institution. Relying on their imaginations, inexpensive materials, bicycle-related ideas about steering and modest sums they earned at the shop, they would ultimately embarrass the Smithsonian and its grandiose, government-funded flying experiments that were conducted on (and generally flopped right back into) the Potomac.
Photo

The setting for their own experiments had been carefully chosen. Without having seen Kitty Hawk, part of North Carolina's Outer Banks, the Wrights learned that its steady, moderate winds and its expansive soft beach were ideal for testing gliders and then modified versions with motors. The beauty of that first Kitty Hawk flight in 1903 was the solitude on a windswept beach in which Orville, flying against the wind and staying aloft in spite of it, changed the course of history.

Many competitors lay in wait, of course. One opportunistic French friend even made the Wrights sound like his protégés. But once Wilbur, the relative charm ambassador of the family, went to France to discuss the Wright plane's future (after the United States government had more or less ignored it), the Wrights' prominence grew too important to ignore. Wilbur found himself demonstrating air feats for kings, while Orville, having crashed a plane in a demonstration flight

outside Washington, was out of commission for a while. (Orville would become more famous later on.)

He was nursed by his sister, Katherine, the scoldy but dependable member of the extremely close-knit Wright family. There were also two other brothers not nearly as close as the bachelors Orville and Wilbur, who could seem like twins. And there was their father Milton, a bishop of a Protestant denomination. The Wrights avoided flying together in a plane until Milton reached his 80s and felt he had nothing to lose — and a tremendous thrill to gain.

Mr. McCullough presents all this with dignified panache, and with detail so granular you may wonder how it was all collected. He is helpful in explaining just how this book was put together: with his own substantial library research and reading, the help of an assistant who did much necessary traveling, a translator, the good people of Kitty Hawk, a huge amount of Wright family data and even a Royal typewriter specialist to keep his instrument in working order. The Wrights loved recording that kind of information. Why shouldn't he?

THE WRIGHT BROTHERS

By David McCullough

320 pages. Simon & Schuster. $30.

WSJ

Architectural Epiphany in Tuscany

Filippo Brunelleschi's dome for Santa Maria del Fiore is a feat of engineering so revolutionary that it faced doubters at every step of its realization.

by Stuart Isacoff

Among the treasures in "Sculpture in the Age of Donatello: Renaissance Masterpieces From Florence Cathedral," on view through June 14 at New York's Museum of Biblical Art, are two rather plain wooden models. Placed alongside breathtaking sculptures by leading artists of the 15th century, these unadorned representations of the dome and lantern that crown the Florence church seem ordinary by comparison—until one discovers that they were likely crafted by the very genius whose architectural and engineering talents made the construction one of the marvels of the age.

Filippo Brunelleschi's massive dome for Santa Maria del Fiore (Basilica of Saint Mary of the Flower) still astounds. His contemporary, artist Leon Battista Alberti, gazed with envy on it, "rising above the skies, ample to cover with its shadow all the Tuscan people…. Since this work seems impossible of construction in our time," he wrote, "if I judge rightly, it was probably unknown and unthought of among the Ancients." Indeed, the design, realized between 1420 and 1436, revolutionized everything that was known about erecting such structures. Naturally, doubters appeared every step of the way.

In fact, the likely purpose of these models, says Daniel Zolli, a Harvard-based scholar who helped curate the exhibit, was to convince skeptics of the legitimacy of Brunelleschi's vision,

though they omit important internal details. “He’s conveying a sense of the miracle,” says Mr. Zolli, “but he’s not showing his hand.”

Assembled with old Italian marquetry techniques and held together through dovetailed pieces, the first model shows the dome in three fragmentary parts; the whole is trimmed with horizontal decorative molding. The second model, completed later, is of the lantern that eventually sat on top. Their once colorful decorations were lost due to a flood in Florence in 1966. Yet, even in their bare state, these dark wood creations are striking as representatives of the complex journey toward completion of one of the Renaissance’s grandest achievements.

It all began when the Commune of Florence in 1294 announced plans to replace a crumbling fifth-century church on the site of Santa Maria del Fiore with “a more beautiful and honorable temple than any in any other part of Tuscany.” It was to be capped with the widest dome that anyone had ever seen. In 1296 a foundation stone was laid. But by 1418, after more than a century of effort had gone into raising the building, a gaping hole remained where the dome had been planned.

The cathedral’s 140-foot span was so wide that traditional methods of covering it were inapplicable. At a competition in 1418 to find a solution, two men who had already gone head-to-head in a 1401 contest for the design of the church’s Baptistery doors joined the fray: Filippo Brunelleschi and Lorenzo Ghiberti. In that initial competition, where each had been asked to create a scene in bronze based on Abraham’s sacrifice of Isaac, a panel of 34 judges had chosen Ghiberti as the winner. The 28 reliefs he created were famously declared by Michelangelo to be “so fine that they might fittingly stand at the Gates of Paradise,” and that has been their nickname ever since.

This time, in preparation for the match, Brunelleschi set out with his friend Donatello to Rome to study its ancient structures, especially the Pantheon, with its own huge dome. He found that the Pantheon's designers had employed some clever techniques, counteracting the natural forces of push and pull (downward and outward) on its vault by making the walls thicker where the stress was greatest, at the base. Higher up, they used lightweight materials, including concrete, to create a double-layered dome that got thinner as it rose, allowing it to bend and curve. He collected these ideas, added some of his own, and returned to Florence.

Even after it was clear that Brunelleschi was the man for the job, political maneuvering on the part of his opponents remained a stumbling block. Painter and historian Giorgio Vasari reported that at one point Brunelleschi was called "an ass and a babbler," and ejected from the assembly. Philosopher Giovanni da Prato even traded insulting sonnets with him. Told that he had to share responsibility for the project with Ghiberti, Brunelleschi purportedly feigned illness for a while, provoking a state of complete panic in his critics over how to proceed. He had made his point.

Why all the hostility toward Brunelleschi? According to notes by Msgr. Timothy Verdon, director of the Museo dell'Opera del Duomo, in the exhibit's catalog, one factor was simple envy; another was "fear of failure. For generations Florentines had dreamed of seeing their cathedral finished, as a famous 14th-century fresco showing the church makes clear; the north flank of the church, the religious and civil authorities arrayed in serried ranks, as if the new cathedral were to symbolize the entire social order, the prestige of 'Christendom.'"

Yet once the project was under way, Brunelleschi's inventiveness seemed unbounded. He created a floating platform on beams cantilevered from the dome's base that rose nearly 197 feet above the ground. He designed a double-layered dome with hidden circular chains of stone, iron and wood for support. He instructed the workmen to lay bricks in a unique herringbone pattern, with larger bricks interrupting smaller ones at right angles, to create a more solid bond, and invented machines to facilitate the project, like a *magna rota* or "great wheel" to lift materials, and a new kind of tower crane called a *castello* to move them at great heights.

Finally, in 1436, the dome was complete (except for the lantern, which would not be finished until 1467, 21 years after Brunelleschi's death). Even before Vasari's astonishing 16th-century frescoes of the "Last Judgment" adorned the dome's interior, it was a breathtaking sight. On March 25, 1436, Pope Eugene IV officiated at the consecration, surrounded by bright-robed instrumentalists and choristers performing a motet by Guillaume Dufay, "Nuper rosarum Flores." The composer used secret-number mysticism to construct his piece, selecting the proportions of Solomon's temple (as described in I Kings 6) as a rhythmic template—as if to proclaim the new cathedral a resurrection of the holiest church ever known. Fourteen prisoners were released in honor of the occasion.

One witness to the proceedings described the experience "as though the symphonies and songs of the angels and of divine paradise had been sent forth from Heaven to whisper in our ears an unbelievable celestial sweetness. Wherefore in that moment I was so possessed by ecstasy that I seemed to enjoy the life of the blessed here on earth."

Those present received two masterpieces on that day: one by a venerated musical master, the other by an architect whose creation still stands as a symbol of the city and an emblem of the artistic heights achieved in the Age of Humanism.

Mr. Isacoff's latest book is "A Natural History of the Piano"

NY Times

Stone Tools From Kenya Are Oldest Yet Discovered

by John Noble Wilford

One morning in July 2011, while exploring arid badlands near the western shore of Lake Turkana in Kenya, a team of archaeologists took a wrong turn and made a big discovery about early human technology: Our hominin ancestors were making stone tools 3.3 million years ago, some 700,000 years earlier than previously thought.

The findings promise to extend knowledge of the first toolmakers even deeper in time, probably before the emergence of the genus Homo, once considered the first to gain an evolutionary edge through stone technology.

"Immediately, I knew that we had found something very special," said Sonia Harmand, a research associate professor at Stony Brook University in New York, in a telephone interview from Nairobi, Kenya.

Within an hour, Dr. Harmand and Jason E. Lewis, co-leaders of the project, traced the source of the artifacts scattered in a dry riverbed to datable volcanic sediments at the top of a nearby hill. The stones showed that at least some ancient hominins — the group that includes humans and their extinct ancestors — had started intentionally knapping stones, breaking off pieces with quick, hard strikes from another stone to make sharp tools sooner than other findings suggested.

After further field research and laboratory analysis, the findings at the site known as Lomekwi 3 were described Wednesday in the journal Nature.

What the sharp blades were used for is not yet known. Nor is the identity of the toolmakers.

No bone fossils have been found at the discovery site. But in all likelihood, Dr. Harmand and Dr. Lewis said, the tools were produced by a more primitive member of the human family well before the appearance of the genus Homo. The earliest known Homo specimen, announced more than two months ago, lived 2.8 million years ago in what is now Ethiopia. The earliest previous evidence of toolmaking, also from Ethiopia, was dated 2.6 million years ago.

A stone tool recovered in West Turkana, Kenya, which dates to 3.3 million years ago.

“These tools shed light on an unexpected and previously unknown period of hominin behavior, and can tell us a lot about cognitive development in our ancestors that we can’t understand from fossils alone,” said Dr. Harmand, who is also affiliated with France’s National Center for Scientific Research. “Our finding disproved the longstanding assumption that Homo habilis was the first toolmaker.”

Alison Brooks, an anthropology professor at George Washington University and a research associate at the Smithsonian Institution, who was independent of the discovery team, pronounced the finding “truly pathbreaking.” She said it “reaffirms the argument that the repeated and competent manufacture of useful sharp edges, on which we came to depend, may have been a driving factor in the evolution of our genus, both anatomically and cognitively.”

In a sense, the deeper record of stone technology was no surprise to paleoanthropologists. Previous examples, especially the 2.5-million-year-old artifacts collected at Olduvai Gorge in

Tanzania, were thought to be too well made to have been a recent innovation. How far back the evidence for this stone technology extends is anyone's guess, the experts say.

In a commentary in the journal, Erella Hovers, an archaeologist at the Hebrew University of Jerusalem, wrote that some form of toolmaking may have extended back to the last common ancestor of chimpanzees and hominins, as much as seven million years ago.

Dr. Hovers and other scientists not involved in the new research said that the dating of the material appeared solid and that the objects were deliberately produced tools, not scraps of rock broken by accident or natural causes.

"Because the sediments in these layers are fine-grained, and a flake found by the authors could be fitted back onto the core from which it had been detached," Dr. Hovers said, "it is unlikely that the tools accumulated through stream activity or that substantial disturbance of the sediments occurred after the tools had been discarded."

Eric Delson, a paleoanthropologist at Lehman College of the City University of New York and a researcher at the American Museum of Natural History, noted that once in a generation, the age of humanity's first known use of tools increases significantly. "Harmand's find is the longest jump back in time," he said, "nearly three quarters of a million years, to a period when the only known hominin fossils belong to Australopithecus," the genus most famously represented by the "Lucy" skeleton and found throughout East Africa.

Another possibility is a hominin known as Kenyanthropus platyops, whose fossils were found in the region of Lake Turkana. But Dr. Delson cautioned that fossils of this genus are "poorly known and still questionably distinct" as a separate hominin entity.

Dr. Delson said the discovery of what Dr. Harmand and her colleagues are calling the Lomekwian industry raises several questions: namely, are these really tools, and what were these hominins, whoever they were, doing with implements far larger and heavier than the small and simple flakes and cores that characterized the more recent 2.6-million-year-old technologies?

Even now, researchers doubt that they have reached the earliest origins of stone tool technology. As Dr. Hovers said, "Why not dig deeper in time?" The Lomekwi 3 site, she added, "may not be the final — or rather, the first — word on the roots of human technology."

Dr. Harmand and Dr. Lewis will return to Lake Turkana this summer to search for more clues to the identities of the toolmakers. "Now we have a better idea of what we should look for," Dr. Harmand said.


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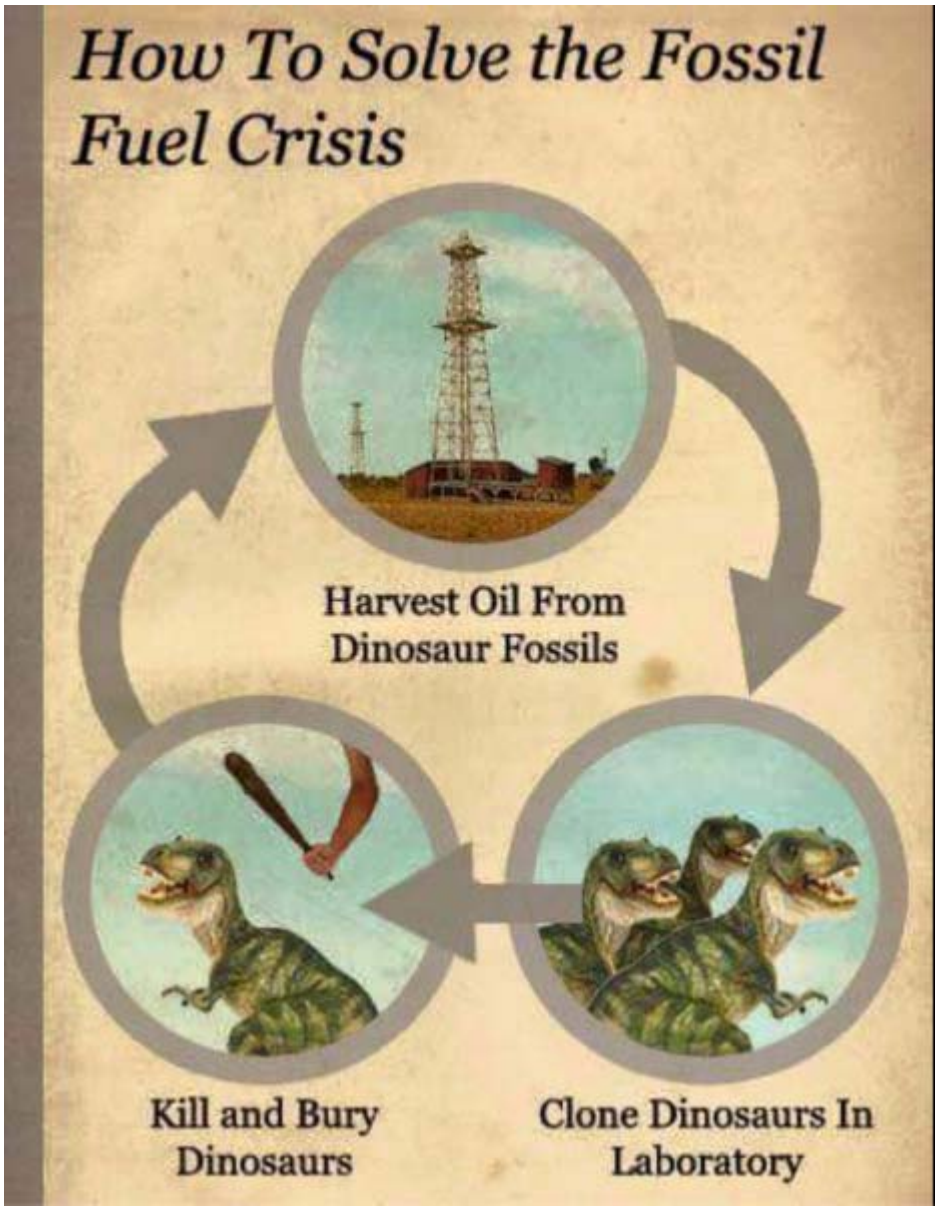
IRONY is watching Seattle enviros protest oil...

in kayaks made from petroleum


How To Solve the Fossil Fuel Crisis
Harvest Oil From Dinosaur Fossils
Kill and Bury Dinosaurs
Clone Dinosaurs In Laboratory