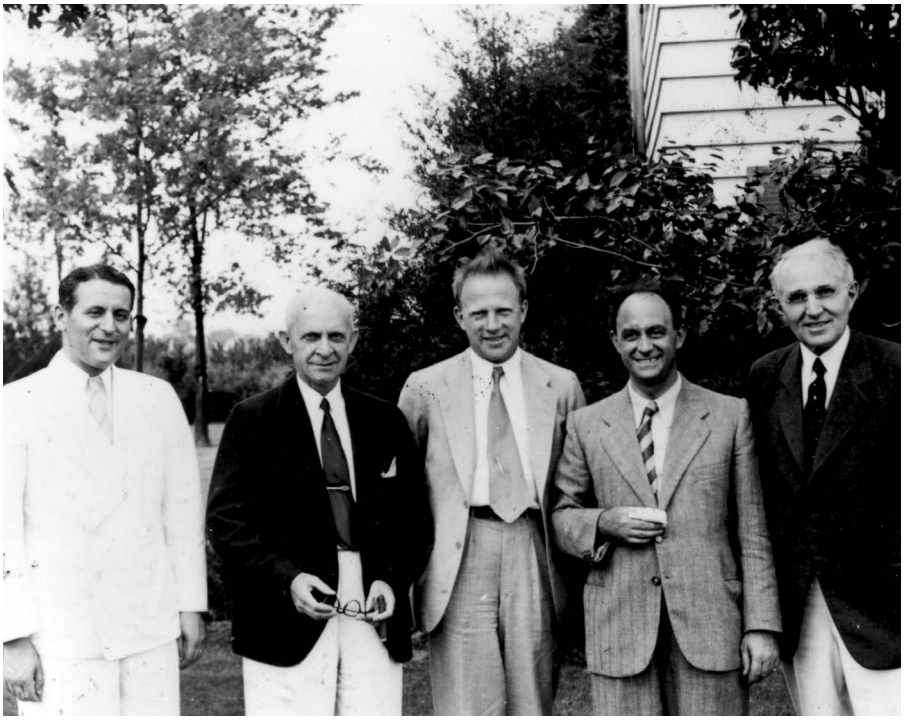
Heisenberg's lab in Haigerloch, Germany, where, in hiding, he had tried and failed to get a primitive nuclear reactor started in a former beer cellar. When US soldiers walked into Heisenberg's office, they found a photo of him taken in Michigan in 1939. Goudsmit was in it, too: he ran the summer school that Heisenberg was visiting at the time.

Goudsmit told this story in his spell-binding 1947 memoir, *Alsos* (the mission's code name). But van Calmthout's narrative is hugely enriched by details from other sources. These include letters from Goudsmit to his first wife, Jaantje, and now-declassified documents. Key among these are the transcripts of recordings collected by British intelligence while eavesdropping on Heisenberg and fellow physicists during their internment in a Cambridgeshire country house, Farm Hall (see A. Finkbeiner *Nature* **503**, 466–467; 2013).

Goudsmit realized as early as November 1944 that the Nazis' nuclear 'programme' never amounted to much. The question of why not is still controversial, and van Calmthout does a good job of describing its subtleties. One thing is clear. The 'official' version that Heisenberg presented postwar — that they could have built a bomb, but decided not to — became untenable after the Farm Hall transcripts were declassified in the 1990s. Those show that some of the interned scientists even mocked Heisenberg for being a "second-rater".

Although van Calmthout has a background in physics, *Sam Goudsmit* is not a scientific biography. It devotes little space to the intellectual development of ideas during what was the most momentous period in physics history so far. This makes the book accessible. But it has few references and no notes. Van Calmthout taps his source material liberally, but is coy on their details.

Goudsmit's later years might seem anticlimactic. He died in 1978; before that, he lived comfortably as a high-level official in a US national lab and as editor-in-chief of *Physical Review* and its spin-off, *Physical Reviews Letters*, which he founded in 1958. All along, he complained about how Big Physics had changed the field by necessitating expensive machinery. But his later achievements perhaps hold a lesson for an era in which despotism is once again on the rise globally. They show how Goudsmit's generation of scientists managed, despite the depredations and cruelties of Nazism, to persist long after the Reich had fallen. ■



AIP EMILIO SEGRÈ VISUAL ARCHIVES

L–R: Samuel Goudsmit, Clarence Yoakum, Werner Heisenberg, Enrico Fermi and Edward Kraus in 1939.

Davide Castelvecchi *is a physical-sciences reporter at* Nature.

ARCHAEOLOGY

Ancient cities rescued from rubble, bit by bit

Laura Spinney turns virtual tourist among digital reconstructions of monuments destroyed by war.

For more than 800 years, a minaret dominated the skyline of Mosul, Iraq. Nicknamed *al-Hadba*, or 'the hunchback', because of its 3-metre tilt, it belonged to the Great Mosque of al-Nuri, commissioned in the twelfth century. Mosque and minaret were reduced to rubble after Islamist terrorist group ISIS took the city in 2014.

Today, both can be seen in an exhibition at the Arab World Institute (AWI) in Paris. The reconstruction is digital, not physical, but the translation of the former into the latter is under way in now-liberated Mosul, thanks to a 5-year, US$50-million rebuilding project announced this year. The exhibition aims to show how digital technologies are redefining rescue archaeology and contributing to the preservation of our past.

Age Old Cities
Arab World Institute, Paris. Until 10 February 2019.

The Monumental Arch of Palmyra in Syria, destroyed by ISIS in 2015, was recreated first digitally and then in Egyptian marble — in which form it is currently touring the globe. That initiative was criticized for stripping the arch of its context. This exhibition avoids that error, and gives only a nod to the arch, the best-known product of digital archaeology so far.

The show focuses on four sites of historical importance in the Arab world: Mosul and Palmyra, along with Aleppo in Syria and Leptis Magna in Libya. All have seen empires rise and fall; all sit atop layers of rich archaeological material. Some are also, as this exhibition reminds us, living cities.

On a giant screen in the first room, the Old City of Mosul is projected in three dimensions. A fly-over view shows how ancient monuments are embedded in urban fabric, and how badly both have been damaged. Before our eyes, the monuments are rebuilt, virtually. Paris-based start-up Iconem partnered with the AWI to create these dense projections by combining data from aerial images taken by drones, pictures taken at ground level using a boom, and old photographs of the monuments before ▶

they were destroyed. The drones enabled Iconem's team to penetrate cities before they had been de-mined.

There are no physical objects in the exhibition. Through video documentaries and interviews, visitors learn that until very recently, several religious groups lived side by side in Mosul. One of the symbols of the city's multiculturalism was the tomb of Jonah — a prophet for Jews, Christians and Muslims — who was buried in the ancient Assyrian city of Nineveh, where Mosul now stands. After the city was liberated in 2017, Iraqi archaeologists discovered that ISIS had destroyed Jonah's tomb and dug a network of tunnels beneath. Exploring these, they stumbled on the remains of an Assyrian palace. Meanwhile, the previously hidden remains of a synagogue were discovered in the rubble of the Jewish Quarter.

"The decision to destroy and the decision to rebuild are political."

Aleppo's story is different. The damage there was collateral, the fallout from fighting between the Syrian regime and rebel forces between 2012 and 2016. At the centre of old Aleppo lies a magnificent thirteenth-century citadel, itself built over remains from the Roman period or even earlier. Syrian troops made the citadel their base; from here they bombarded the rebels in the city beyond, so it came through relatively unscathed. The city's souks, on the other hand, were badly damaged. Commerce is Aleppo's beating heart, and the marketplaces are being rebuilt. Exhibition visitors can wander virtually through them as they once were.

The 3D reconstructions of Palmyra and Leptis Magna face each other across a room, because of what they have in common and what sets them apart. Both are purely archaeological sites, not embedded in modern cities; but ISIS destroyed 80% of Palmyra, although it mostly spared the site's Roman theatre, where the group staged its executions. The lesser-known Roman site of Leptis Magna — dubbed the Rome of Africa — has been looted and neglected, and is threatened by rising seas. The pairing makes a larger point: war isn't the only threat to our material heritage, nor the only one to which digital reconstructions provide at least a partial response. Donning a headset, visitors can become virtual-reality tourists and see that for themselves.

ICONEM/DGAM

In a 3D reconstruction, a damaged souk in Aleppo, Syria, rises from its own rubble.

There is one glaring omission that makes this poignant exhibition even more timely. No mention is made of the Yemeni sites damaged by Saudi bombs, such as the almost-4,000-year-old Marib Dam. The AWI is partly funded by Saudi Arabia. And the omission underlines the fact that both the decision to destroy and the decision to rebuild are political — as Warsaw, Coventry and Dresden, ravaged in the Second World War, know only too well. ■

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ENVIRONMENTAL RE-ENGINEERING

Lake Lazarus: rewilding the US west

Amy Maxmen lauds a study on a bold project to re-engineer a dry lake bed.

At the start of the twentieth century, Owens Lake in southern California was one of the largest inland bodies of water in the United States. By the mid-1920s, it was gone, drained to provide water to a mushrooming Los Angeles. Over the past 30 years, the city has spent around US$2 billion to undo the damage. It has failed to restore the lake, but in *The Spoils of Dust*, Alexander Robinson describes how the effort has succeeded in another way: by creating a landscape no less valuable ecologically. By documenting the transitions the lake has undergone, he suggests a way forward for engineers, geologists, ecologists and landscape designers hoping to bring other environments back from the brink.

The Spoils of Dust: Reinventing the Lake that Made Los Angeles
ALEXANDER ROBINSON
Applied Research & Design (2018)

The despoiling of the lake (which was nearly the length of Manhattan, New York) began in 1913. Former president Theodore Roosevelt had ratified a plan for an aqueduct that would divert water from the