the University of Cologne in Germany and former member of Genzel's team at the Max Planck Institute for Extraterrestrial Physics in Garching. Using a technique known as speckle imaging, the groups took data in snapshots to avoid blurring caused by the turbulence in Earth's atmosphere. Later, both teams used adaptive optics, which uses a mirror to correct for the distortion. This allowed for longer exposures, to capture more light and boost sensitivity, also allowing them to track the motion of stars in three dimensions. The conclusion that there is a supermassive black hole at the Milky Way's centre was the culmination of team efforts and "many papers and many projects", says Eckart.

Genzel is known for being a hard worker, says Eckart, who still collaborates with the laureate. "He's very concise, and a very good scientist," he says. Ghez, he adds, is "a very focused person who goes at the problems in a very direct way".

Ghez, now at the University of California, Los Angeles, is just the fourth woman to win the physics prize — the Nobel award with the fewest female winners. In 2018, laser physicist Donna Strickland ended a 55-year drought when she became the third woman to win it.

"I take very seriously the responsibility associated with being the fourth woman to win the Nobel [physics] prize," Ghez said at a press conference following the announcement. "I hope I can inspire other young women into the field."

Additional reporting by Nisha Gaind and Holly Else.

VIROLOGISTS WHO DISCOVERED HEPATITIS C WIN MEDICINE NOBEL

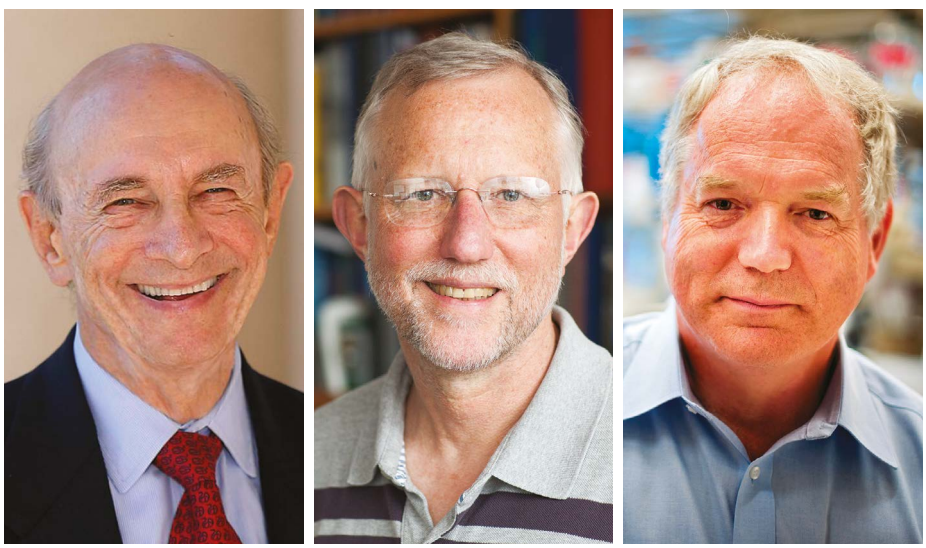
Harvey Alter, Charles Rice and Michael Houghton share the award for research on a deadly virus.

By Ewen Callaway & Heidi Ledford

A trio of scientists who identified the virus responsible for many cases of hepatitis and liver disease — hepatitis C — have won the 2020 Nobel Prize in Physiology or Medicine.

The winners are Harvey Alter at the US National Institutes of Health in Bethesda, Maryland; Michael Houghton, now at the University of Alberta in Edmonton, Canada; and Charles Rice, now at the Rockefeller University in New York City. Their work on the hepatitis C virus paved the way for effective treatments for the infection that are now available.

The World Health Organization (WHO) estimates that 71 million people worldwide are chronically infected with hepatitis C, which causes nearly 400,000 deaths per year, mostly from cirrhosis and liver cancer.



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Harvey Alter, Charles Rice and Michael Houghton (left to right) won the 2020 Nobel prize in medicine for their research on the hepatitis C virus.

The prize is well deserved, says Ellie Barnes, who studies liver medicine and immunology at the University of Oxford, UK. "It stands out as an emblem of great science," she says. "We've got to a point where we can cure most people who are infected." The prizewinners will share an award of 10 million Swedish kronor (US$1.1 million).

Blood-borne pathogen

In the 1970s, Alter studied the transmission of hepatitis, or liver inflammation, as a result of blood transfusions. Earlier work had identified the hepatitis A and B viruses, but Alter showed that a third, blood-borne viral pathogen could transmit the disease to chimpanzees.

Houghton, then working at Chiron Corporation in Emeryville, California, and his colleagues identified the virus on the basis of genetic material from infected chimpanzees, showing that it was a new kind of RNA virus that belonged to the Flaviviridae family. They named it hepatitis C virus.

A team led by Rice, then based at Washington University in St. Louis, Missouri, used genetic-engineering techniques to characterize a portion of the hepatitis C genome that is responsible for viral replication, demonstrating its role in causing liver disease.

At a press conference, Alter noted that it took researchers at Chiron six years to clone a tiny fragment of the hepatitis C viral genome, and expressed doubt that such painstaking research would be carried out today. "Nowadays, if you don't have an immediate endpoint it's hard to get funding," he said. "It's much more difficult for people now — especially young people — to pursue research."

The results of research by the prizewinners and others has led to significant improvements in hepatitis testing and treatment. In the past decade, harsh and poorly effective treatments for the infection have been replaced by drugs that directly block the virus. These medicines have the potential to cure the vast majority of hepatitis C infections, but their high cost has limited access in many countries.

The WHO has set a goal of eradicating the hepatitis C virus by 2030, which Barnes says could be achievable. But to do so, she adds, might require a vaccine. Progress on developing such a vaccine has been slow, owing in part to the wily nature of the virus. The genetics of each strain of hepatitis C virus differ drastically: Barnes estimates that hepatitis C is ten times more diverse than is HIV, and "infinitely" more so than the coronavirus that causes COVID-19. And it is difficult to conduct clinical trials in the populations most vulnerable to the hepatitis C virus.

None of these problems is insurmountable, Barnes says. "The virus was discovered 30 years ago and we still don't have a vaccine," she adds. "We still have people infected and dying of hepatitis C. From that point of view, the story's not over."

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