HEROES OF CHEMISTRY

Industrial scientists celebrate the JOYS AND HURDLES of bringing their products to the market

LINDA WANG, C&EN WASHINGTON

A NEW BLOOD THINNER for patients with abnormal heart rhythm that lowers their risk of stroke and blood clots. An oral drug to treat relapsed multiple myeloma cancer. A material that's durable like plastic but soft and flexible like rubber. A plastic that's extraordinarily clear, tough, and free of the controversial chemical bisphenol A. A drug that cures patients of the once-deadly hepatitis C virus. An oral pill for rheumatoid arthritis.

These six commercial products—Eliquis (apixaban), Pomalyst (pomalidomide), Insite catalysts, Tritan copolyesters, Harvoni (ledipasvir and sofosbuvir), and Xeljanz (tofacitinib citrate), respectively—have saved countless lives and improved the way people live and work, and none of it would have been possible without the efforts of industrial scientists, who inarguably are the unsung heroes of chemistry.

In August, during the American Chemical Society national meeting in Boston, ACS honored the teams of scientists from Bristol-Myers Squibb, Celgene, Dow Chemical, Eastman Chemical, Gilead, and Pfizer responsible for these life-changing inventions with its Heroes of Chemistry Award.

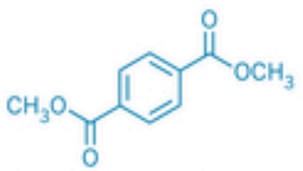
The award is the society's most prestigious honor for industrial scientists. More than half of ACS members in the U.S. now work in industry (52% in 2014, the latest figure available). Efforts continue within the society to raise awareness of their work and give them the recognition they deserve (C&EN, June 2, 2014, page 32).

C&EN asked a representative of each company's team to share some of the most memorable moments during the discovery and development of their product.

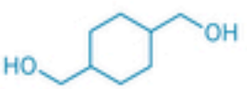
Polymer scientist Emmett Crawford remembers clearly the day he realized the

EASTMAN CHEMICAL

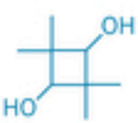
DURABLE Plastic bottles made using Eastman Tritan copolyesters.



Dimethyl terephthalate



1,4-Cyclohexanedimethanol



2,2,4,4-Tetramethyl-1,3-cyclobutanediol

THE WINNERS

The following are the recipients of ACS 2015 Heroes of Chemistry award:

Bristol-Myers Squibb
Robert Knabb, Patrick Lam, Michael Orwat, Donald Pinto, Mimi Quan, and Pancras Wong

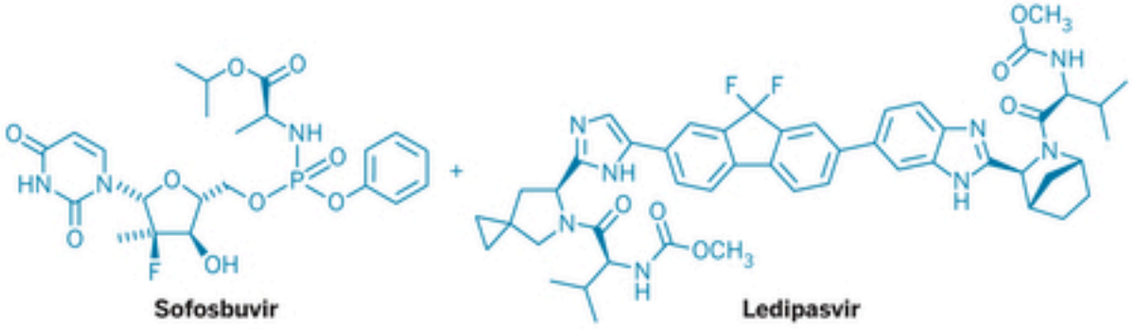
Celgene
Roger Shen-Chu Chen and George Muller

Dow Chemical
David Devore, Morris (Steve) Edmondson, Pradeep Jain, George (Bill) Knight, Brian Kolthammer, Shih-Yaw Lai, Robert LaPointe, David Neithamer, Peter Nickias, Jasson Patton, Robert Rosen, James Stevens, Francis Timmers, Daniel VanderLende, and David Wilson

Eastman Chemical
Benjamin Barton, Emmett Crawford, Ted Germroth, Christopher Killian, Anthony Messina, and David Porter

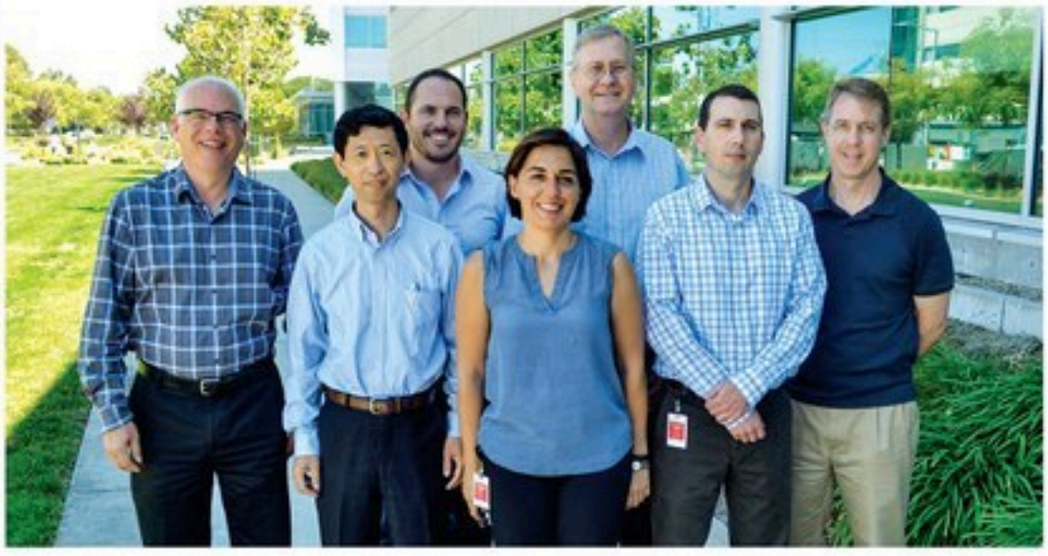
Gilead Sciences
Benjamin Graetz, John Link, Erik Mogalian, Rowchanak Pakdaman, Bruce Ross, Bob Scott, Michael Sofia, and Cheng Yong (Chris) Yang

Pfizer
Douglas Ball, Todd Blumenkopf (deceased), William Brissette, Matt Brown, Frank Busch, Paul Changelian, Robert Dugger, Eileen Elliott Mueller, Michael Fisher, Mark Flanagan, Elizabeth Kudlacz, Michael Munchhof, Sally Gut Ruggeri, Chakrapani Subramanyam, Frank Urban, and Rajappa Vaidyanathan



Sofosbuvir + Ledipasvir

Gilead Sciences' Harvoni



GILEAD SCIENCES

SAVING LIVES The Gilead team responsible for Harvoni: Front row, from left: John Link, Chris Yang, Rowchanak Pakdaman, Bob Scott, and Benjamin Graetz. Back row, from left: Erik Mogalian and Bruce Ross. Not pictured: Michael Sofia.

without all the horrible side effects. To dramatically exceed them is important for patients."

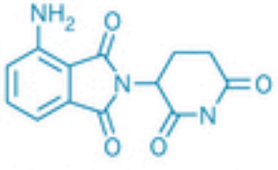
Harvoni patients can attest to the drug's effectiveness. Mark Melancon, who had contracted hepatitis C 25 years ago, says that after taking Harvoni, he now has no trace of the virus in his body, and his liver is beginning to repair itself. "Four weeks into it, and the virus was gone. Not detectable," he says. "To have this virus hanging over my head for 25 years and then it was just gone, I can't explain the feeling. The people who worked hard on this medication, they need to know that I appreciate it."

LINDA WANG/C&EN

HONORED Celgene's George Muller (left) and Roger Shen-Chu Chen celebrate at the Heroes of Chemistry banquet.

The satisfaction of helping patients is what drives George Muller as an industrial scientist. Muller is coinventor of **Celgene's** Polamyst for multiple myeloma.

"It's wonderful to be able to think that the work one did in the lab ended up helping patients," he says. "Over my career, I've met patients who were taking drugs on which I had worked. It's always amazing to see the positive effects on the lives of these patients. Some of them get their lives back."



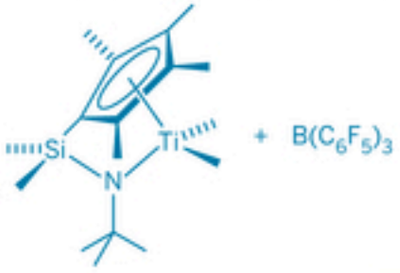
Celgene's Pomalyst

Muller says that during the course of developing Pomalyst, they made hundreds of compounds. "We worked on the project for probably 15-plus years," he says. The drug was approved in 2014.

In research and development, you often have to expect the unexpected. Bob Maughon, R&D vice president at **Dow Chemical,** says that one of the first times that Dow's Insite catalyst technology was scaled up, the product came out orange because of the high level of activator needed for catalyst activation.

The Insite family of single-site constrained geometry metallocene catalysts led to the creation of several clear polyethylene elastomers marketed under the brand names Engage, Nordel, and Affinity.

Maughon says the challenges the team experienced—including the need to remove the original products' orange hues—contributed to the eventual success of the catalysts. "It really helped to point out where they really had to focus, and they were able to get through that hurdle and make a great material in the end," he says.



Dow's Insite catalyst

DOW CHEMICAL

EVERYDAY PRODUCTS Dow's Insite catalysts are used in many commercial products, such as these condiment packets.

Nominations for the 2016 Heroes of Chemistry Awards will be open in January 2016. Visit http://www.acs.org/heroes for more information. ■