It's not every day we get a new blue

An undated photo provided courtesy of Mas Subramanian shows his unexpected invention, a blue pigment known as YInMn. Before the development of YInMn Blue — named for its chemical components' symbols on the Periodic Table of Elements: yttrium, indium and manganese — it had been 200 years since the last inorganic blue pigment was created.
Courtesy of Mas Subramanian via The New York Times.

by Evan Nicole Brown

NEW YORK (NYT NEWS SERVICE).- Nautical, mystical and the de facto shade of several social networks, blue is a color that has deep cultural cachet, while being nearly impossible to find in nature. The blues that abound in nature — a butterfly, a navy beetle, even blue eyes — are not natively blue, according to scientists, but instead are reflections of light, the impression of blue.

Since antiquity, blue has been associated with rarity and expense; ultramarine — a pigment originally made from grinding lapis lazuli, a semiprecious gemstone found in Afghan mines — was once worth as much as gold.

Today, our blues are created by chemists in labs. But that doesn't mean creating new shades is easy or common.

Before 2009, when a team of chemists at Oregon State University developed a color now known as YInMn Blue (quite unexpectedly), it had been 200 years since the last inorganic blue pigment was created. (That one was cobalt, discovered by French chemist Thénard in 1802.)

Now, YInMn Blue is available to artists as a paint and for commercial use. (The Environmental Protection Agency approved it for industrial coatings and plastics in 2017.) It has a home in the archive of the Forbes Pigment Collection at Harvard University, and has even inspired an addition to the spectrum of Crayola crayons — a striking shade called "Bluetiful."

A Star Is Born

The shade was invented by Mas Subramanian, a professor of materials science at Oregon State University, who was working with a team of graduate students to develop an inorganic material that could be used for

electronic devices. When a sample he had put in the furnace came out a vivid, vibrant hue of ultramarine, Subramanian said he immediately realized “the brilliant, very intense blues” were like nothing he had seen before, and would be better suited to use in paint than on pieces of technology.

“I was very curious why manganese did this because manganese is not known in pigments. So I was kind of surprised and thought maybe we made a mistake,” he said in an interview. “Then we decided to repeat the experiment.”

The blue proved stable, but it could also be slightly altered to get variations in hue. “We decided ‘OK, this is interesting for the pigment industry,’” Subramanian said.

The name for the new blue is derived from its chemical components’ symbols on the periodic table of elements: yttrium, indium and manganese.

The beauty of YInMn Blue is that it is not only able to be widely duplicated via Subramanian’s formula, but is also nontoxic, making it safer to use — and perhaps more eco-friendly too. “People think nearly everything related to the periodic table has some toxicity attached to it,” Subramanian said. “But this material so far is very stable, it doesn’t leach out in the rain or any acid conditions.”

(Cobalt, on the other hand — though a boon for 19th-century artists who had previously relied on pigments cultivated from rare, cost-prohibitive gemstones like lapis lazuli — turned out to be extremely toxic.)

“I know from experience that blue is a difficult color to make,” Subramanian said. “Most of the blues in nature are not real blues because they are all mostly made from the way light reflects from objects.”

Yet, together, at an extremely high temperature of 2,300 degrees Fahrenheit, the chemical compounds yttrium, indium and manganese combined to create an actual blue. And unlike organic plant-based hues that are less durable over time, this chemically derived color will not change.

Previous Pigments

The Forbes Pigment Collection at the Harvard Art Museums houses more than 2,500 pigments; YInMn Blue has recently been added and was prominently featured in a small display case on the fourth floor. Narayan Khandekar, a senior conservation scientist and director of the Straus Center for Conservation and Technical Studies at the Harvard Art Museums, has been following the development of this pigment for years, and requested some of the earliest YInMn samples to add to the collection.

When pigments hit the market, Khandekar said, he and his team immediately get to work tracking down samples “because we believe that these are things that are going to be used in artist materials in the future.” Even when YInMn was fairly new, before it was commercially available, a prototype of a tube of artists paint in the color was made by the paint company Derivan and given to the Forbes Collection.

Subramanian’s blue also made it into the collection because it is a rare example of a wholly modern pigment, in contrast to the many pigments from the Middle Ages that are housed in the collection.

“It’s kind of an amazing thing that he was able to just look at something that was an accident. And then recognize how it could be applied to something that he had no experience with whatsoever,” Khandekar said of Subramanian. “You’ve got synthetic ultramarine, which came along in 1826, but that was

synthesizing an already known pigment."

There will be naysayers — those who say they can't see much of a difference between ultramarine and YInMn Blue. But, Subramanian said: "This is a very special discovery because this is the first time my discovery has reached to the society with so much diversity — artists, architects, the fashion industry, even the cosmetics industry. I never would have imagined my discovery would go this far." He added: "This changed my life."

Khandekar agreed. "It's not often that you come along with a synthetic inorganic pigment," he said.