

Garment with gills will do nicely as we swim to the bank

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Credit: amphibio

A breathable garment has been designed for underwater wear and it has futurists thinking along the lines of a wearable that we actually may need for daily tasks. To what extent would this clothing come in handy if sea levels rise up beyond your dreams?

Royal College of Art graduate Jun Kamei has built a working prototype of Amphibio.

This is not a fun item for the next Paris runway. Breathable underwater garments could be tomorrow's functional wearable gill. *Coats? Aisle 2. Gills? Aisle 4.*

"By 2100, a temperature rise of 3.2°C is predicted to happen, causing a [sea level rise](#) affecting more that 30% of the global population and submerging the megacities situated in the coastal areas." That is the thought for the day from Kamei's [site](#).

Dezeen and other publications have been showing what Jun Kamel developed as a wearable that you put on in order to breathe underwater. Kamel is a Royal College of Art graduate who did what sharp minds do in the arts and sciences; he looked to nature for some bio-vibes.

Kamel described himself as "a Biomimicry designer with experience in material science research and product design." Mark Wilson in *Fast Company* connected the dots between Kamei's biomimicry focus and his research for this gill [garment](#).

"Kamei created the gill after studying the bodies of diving insects. Their skin is superhydrophobic, repelling [water](#) so greatly that it creates a tiny oxygen barrier between them and the water. This barrier not only keeps them dry, it also acts as a gas exchange, allowing oxygen dissolved in the water to be filtered out, into their [bodies](#)."

So, the garment behaves as gills. The garment has two parts, (1) mask, covering nose and mouth, and (2) gill wearable. His material for the gills was talked about in June in *3D Printing Industry*. The article described "three, multimaterial 3D printed rings worn like a bib around a person's neck" with hydrophobic and elastomeric material in the mix. "The

microscopic pores in the material allow air to pass through, but stop any water from penetrating it," said Natashah Hitti in *Dezeen*.

The term hydrophobic is key to understanding how the garment was designed to work under water.

("Materials with a special affinity for water—those it spreads across, maximizing contact—are known as hydrophilic. Those that naturally repel water, causing droplets to form, are known as hydrophobic," said an MIT item in earlier years. 'Both classes of [materials](#) can have a significant impact on the performance of power plants, electronics, airplane wings and desalination plants, among other [technologies](#), says Kripa Varanasi, an associate professor of mechanical engineering at MIT.'")

The designer's next step is to develop the device so that it can be tested on humans, said *Dezeen*.

Natashah Hitti wrote "Although it currently doesn't produce enough oxygen to sustain human [breathing](#), it is able to successfully extract oxygen from water, and release carbon dioxide back in – meaning it has the potential to be used for breathing." *3d Printing Industry* similarly pointed out that "At present, the Amphibio gills are not suitable to replace your typical scuba [gear](#)."

He is thinking hard about reaching the next stage with this 3D printed garment, nonetheless.

Fast Company asked, "Can Kamei improve his own technology to be more efficient? Could we one day wear something like the Amphibio instead of large scuba tanks to go diving?"

"The material can further be tuned to improve its oxygen intake

property," he was quoted as saying in response.

As for his vision of why the gill garment might be utilitarian rather than whimsical, don't get all doomsday on it. Think of the bright side, living on the oceans as well as on land.

More information: www.junkamei.com/amphibio/

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