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"There's not necessarily a one for one mimicry necessary, it is just the starting point...one thing leads to another and you have so much you can do with just an initial idea."

Advice from Sissi Liu

Sissi Liu is the CEO and co-founder of Metalmark Innovations. Metalmark, with Liu at the helm, is designing new technologies to improve the world of air purification, sustainability, and beyond. The ingenuity of Metalmark's air purification strategy comes from the model organisms that the company has used for designing its materials. These organisms are the Metalmark family of butterflies, whose wings are composed of unique nano and microstructures. The structures are most well-known for producing the iridescent colors on the wings of butterflies. The nanostructures created by Metalmark Inc. mimic those of butterfly wings and are then enhanced to achieve sustainable air purification. The material is coated on filters to trap and break down air pollutants without producing secondary contaminants, and is more durable than common air filters — thus

Sissi Liu

CEO and co-founder of Metalmark Innovations

producing significantly less waste than standard purification devices. Even though Liu has led the charge in commercializing Metalmark's technology, she has not always been interested in working with sustainable technology. While completing her degree in economics and math at Wellesley College, Liu's initial goal was to work for the Federal Reserve. However, during this time, internet start-ups were booming and beginning to reveal the growing opportunities for entrepreneurship in technology. While still in college, Liu became engrossed in the start-up world at MIT — just down the road from Wellesley.

From there, Liu took her interests in entrepreneurship, and ventured into the world of technology startups. It was here that Liu was reminded of her early childhood interests in sustainability. Growing up, Liu was influenced by Daoist ideas of maintaining harmony with nature, and achieving balance between the sometimes conflicting forces of humans and nature. Liu recalls that, through these philosophies and her connection with nature as a youth, she maintained and developed a personal mission of sustainability in her career. In some of her previous work in the cleantech sector, Liu worked in helping startups bring new methods of energy production to market as a venture capital investor or consultant. At Joule Unlimited, for example, Liu led business development to commercialize the company's technology to

convert carbon dioxide to fuels and chemicals via photosynthetic cyanobacteria.

Liu argues that while developing alternative methods for energy production is important, there is much more to sustainability than that. At the heart of the problem is our survival in the context of the planetary environment. Sustainability is about improving human health, wellness, and quality of life while minimizing the impact on the environment and other species. Metalmark brings this idea to light, by portraying how the versatility of a distinct material can lighten our environmental impact. Liu is clearly a visionary, and the products at Metalmark highlight just how exciting these butterfly-inspired materials are today, and also how they might impact the future. For example, these materials could vastly reduce precious metals in fuel cell construction, which might decrease destructive mining efforts in already vulnerable ecosystems. There are so many barriers to sustainability around us, and Liu and Metalmark are targeting a few of them with their new materials. However, humans still have a long way to go in achieving sustainability. Liu's advice to the next generation is to keep learning about nature, because the solutions are all around us. Liu says that although the path to success may not always be clear, it is the challenges and unknowns that make her most hopeful for the new day.

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