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I have always been interested in the natural world. And when I was in elementary school one of my teachers suggested that I read The Chemical History of a Candle by Michael Faraday. And that stirred up a lot of questions for me. I hadn"t been interested in chemistry until then. That"s how it all started. I then went on to study quantum organic chemistry at the University of Kyoto.

In the early 1970s, I joined the Exploratory Research Team at Asahi Kasei Corporation to explore new general-purpose materials. The projects I worked on initially didn"t work out, so I was looking for a new research focus. At the time, there was great interest in polyacetylene, a fascinating electro-conductive polymer that had been predicted by Dr. Kenichi Fukui, Japan"s first Nobel Laureate in Chemistry, and discovered by Dr. Hideki Shirakawa, winner of the 2000 Nobel Prize for Chemistry.

At first, I explored practical applications for polyacetylene. But at the time, Japan"s electronics industry was looking for a new lightweight and compact rechargeable battery to power the mobile devices they were developing. Many researchers were working on this, but existing anode materials were unstable and raised serious safety concerns - a new anode material was required. My research on polyacetylene suggested that it could be used as an anode material (because lithium-like cations move in and out of it), so I started experimenting with it and it worked.

My basic research on lithium-ion batteries began in earnest in 1981, the year Professor Fukui won the Nobel Prize for Chemistry. Interestingly, research into lithium-ion batteries has been supported by eight Nobel laureates, which gives an indication of how challenging their development has been.

By 1983, I had come up with a new type of rechargeable battery using a combination of polyacetylene for the anode and lithium cobalt oxide for the cathode. Dr. John Goodenough, one of my fellow laureates, had identified lithium cobalt oxide, the first cathode material to contain lithium ions, in 1980.

All went well for a while. The prototype was one-third lighter than a standard nickel-cadmium battery, which was good, but we only achieved a slight weight reduction and were unable to reduce the size of the battery. This put the whole venture into question because miniaturization was a priority for the electronics industry.

The problem was the small relative density of polyacetylene, which made for a lightweight but bulky battery that was too big to be practical. We began looking for a higher density material with polyacetylene-like properties. The idea was to use a carbon material (it has a relative density of about 2.2 and is made of the same conjugated double bonds as polyacetylene). But no suitable carbon material existed, which was very disappointing.

However, the answer came from within Asahi Kasei; another research team had developed a new carbon material with a distinctive crystalline structure, known as Vapor-phase Grown Carbon Fiber (VGCF), that made it a good substitute for polyacetylene. I managed to get hold of a sample of the material and, sure enough, when we used it to make the anode, we created a lightweight and compact battery.

As we were not battery specialists at Asahi Kasei, in-house discussions about what industry needed led nowhere. And of course, you can''t just go to a battery manufacturer and expect them to share their confidential early stage research with you. But I met a former classmate of Asahi Kasei''s executive officer who was a battery company executive and he highlighted the importance of miniaturization - smartphone manufacturers needed batteries that could fit into narrow slots.

For me, this highlights how important it is for people from different fields to get together to discuss and exchange their ideas. Such collaboration is extremely important in fostering technological development as well as the broad circulation and uptake of new technologies.

The initial plan was to develop new polyacetylene-based materials, but as the research progressed, we realized multiple new materials were needed by industry - for cathodes, electrolytes, separators and so on. Rather than focusing on simply making a new anode, the image of a battery emerged. Asahi Kasei got into the battery field simply because it was researching new materials and was able to develop the lithium-ion battery precisely because it was not a specialist in the field.

Had I been a researcher with a battery manufacturer, I probably wouldn''t have encountered polyacetylene or VGCF. In the end, new materials and the freedom to develop them are what trigger new products.