Translated Interview Transcript

Heraeus | Dr. Ralf Takke (*1950)

Dr. Ralf Takke worked from 1983-2017 for Heraeus Fused Silica in Hanau, Germany, and was working on the development of new fused silica sorts and -applications. From 2001 on he was Vice President Optics for Heraeus.

Note: the most interesting parts are highlighted

00:00min – 00:25min

Question: What was the first moon landing like for you? Did you watch it on television?

RT: Even in terms of the technology, it was very interesting and incredibly exciting. A terrific adventure. Of course, television back then didn't have the HD quality we have now, and the image was just black-and-white. But what an exciting story!

00:25min – 00:48min

Question: What impressed you the most?

RT: It was the adventure itself, and the risk that all those people took. And especially the astronauts who actually managed to reach the moon's surface and return safely. That took a great deal of courage and pioneering spirit.

00:48min – 01:37min

Question: How does it feel for you today to be part of such an innovative company?

RT: First of all, I have a sense of pride, not for myself personally but for Heraeus, employing the kind of scientists and technologists who can accomplish such a feat. And this has continued throughout my career at Heraeus. In my experience, Heraeus Quarzglas has always worked at the cutting edge of technological development when it comes to optics, semiconductors, telecommunications, and so on.

01:37min – 02:29min

Question: What other revolutionary projects have involved quartz glass from Heraeus?

RT: I could name a long list: Let's start with the ones that had something to do with the moon landing or the retroreflector. First, the technology had to be tested. They needed a test chamber, called a solar simulation chamber, that replicated the

conditions in outer space. To simulate the sun, to simulate sunlight, you need a window through which this light is projected. This window consists of fused silica, and it was made by Heraeus, along with colleagues from Carl Zeiss, in a large simulation chamber.

02:29min – 03:10min

Question: Were there other projects in outer space?

RT: For example, they once built an entire satellite from Hanau-made quartz glass, for the Gravity Probe B project. The satellite carried gyroscopes to test Einstein's theory of relativity, specifically that the Earth's mass warps space-time. And, in fact, the satellite did measure this effect. All the glass contained in this satellite was quartz glass, and all of it came from Hanau.

03:10min – 03:45min

Question: What mindset is necessary to produce innovations?

RT: The essential mindset is creative thinking. Being excited by science and technology, and seeing how and where materials can be optimized to meet the user's needs. Take gravitational waves, for example: They're getting a lot of discussion lately, because it has been proved that they exist.

03:45min – 04:01min

Question: How do innovative projects and technologies come to be?

RT: It takes communication – with the scientific community, but especially with the customer, working together to determine the direction our thoughts should take.

04:01min – 05:26min

Question: And aside from outer space – what other technologies is Heraeus Quarzglas working on?

RT: Gravitational waves do exist; they have been detected using the Laser Interferometer Space Antenna (LISA). This optical instrument uses the same technology as retroreflectors. The objective is to measure distances very precisely. These gravitational waves are not traveling from here to the moon. The arms of the LIGO detectors on the Earth's surface are only 4 kilometers long. But the principle is the same, measuring distances with extreme precision. And when a gravitational

wave passes through the ground, the distance between two mirrors is slightly changed by this wave, and the detectors measure this. The optical instruments used for this purpose, their optical components, are made of fused silica. And once again, while only a few such instruments exist today, every single one of them relies on quartz glass – made in Hanau.

05:26min – 06:38min

Question: Could you give us an example of how the technology that's on the moon is used in everyday life?

RT: When you're driving to an unfamiliar place, you can get help from the navigation unit in your car. This small device uses satellite technology to guide you to your destination. Basically, it measures the distance to several satellites placed in outer space for this specific purpose. From these measurements, which are unique to each satellite, a small computer in the navigation unit can identify your location and guide you along your route. But for this to work properly, the position of each satellite must be very precisely known. And this position is measured with retroreflectors, or triple prisms, exactly like the ones on the moon.

06:38min – 07:13min

Question: What does it take to be a visionary?

RT: A visionary has the courage to take risks, to think ahead, to think collaboratively, to make the unthinkable thinkable – and then decide what to do about it. Unfortunately, it seems to me that we can only recognize visionaries – and identify the good ones – only after the fact. Because if your vision doesn't work out, you're not a visionary.

07:13min – 07:30min

Question: Does Heraeus take a visionary approach?

RT: Heraeus is a visionary. Heraeus is involved, in one form or another, in most of the modern technologies that people are talking about and using today.

07:30min – 07:53min

Question: Back then, did people at Heraeus believe the prisms would work?

RT: Today I think the experts at Heraeus did believe that the prisms would work, based on what they knew about the materials in quartz glass. We were always convinced of this, and I think we maintain that conviction.

07:53min – 08:06min

Question: How do you think Heraeus employees felt when the moon landing was a success?

RT: I believe many, if not most, of the people at Heraeus were very impressed.

08:06min – 08:35min

Question: What does the future of Heraeus look like?

RT: In my view, Heraeus is on an excellent path. From what I understand, Heraeus will remain a family-owned company for the coming years and decades. And I must say that I have always felt very comfortable there.