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What are some practical applications of nanotechnology and how is it transforming everyday life?

Nanocoatings of consumer goods like cars, household appliances, and clothing, based on the so-called dirt repellent "lotus effect", are a widespread application that saves energy and makes life easier. Another example can be found in the nanomedical arena. Nanosilver surface coatings of human implants or door handles in hospitals are designed to help avoid the spread of bacteria. UV-protecting nanoparticles in sunscreen have helped individuals avoid millions of cases of skin cancer. Similarly, we would not have the surface finishing of modern cellular phones without nanotechnology as only electronic nanocircuits make this possible. Furthermore, without an understanding of living systems on a molecular (nano) level, no new and advanced medical therapies for widely spread diseases will be possible in the future. In the material sciences, new tailor-made composites like CFK make airplanes and cars weigh less and more stable, helping save energy to a great extent. Nanoparticle filter membranes not only help foster new generations of efficient batteries for electric mobility vehicles, but also make diesel particle smog filters for cars.

Applied nanotechnology is everywhere in our lives. It makes life easier, safer, and paves the way for new products and future medical treatments.

Which recent developments in nanoscience research do you find most interesting?

A: The advanced understanding of nature's methods of recycling everything on an atomic or a molecular basis. Think of the plants that grow by self-assembling the molecules of soil and air through the natural life cycle. This should be a blueprint for a future consumer industry, which will need to cycle all items for reuse considering our limited resources on a finite earth.

B: Nanomedicine, which has entered the realm of new therapies, such as nano drug targeting or applications in cancer therapy.

Please describe your current research on the generation, investigation, and manipulation of micro- and nanoscopic structures.

Our research tries to understand the process of building living systems by experimental investigations with scanning tunneling microscopy of molecular self-assembly of organic molecules on mineral surfaces and thus reproducing the first

steps towards emerging life on earth four billion years ago. Our work also has applications in surface chemistry, solid state physics, and medicine.

What are the biggest questions yet to be solved by nanoscience research?

How can we contribute to saving our planet by organizing a sustainable lifestyle for 10 billion people on earth by the year 2050? Nanoscience ought to provide answers in all of the fields in which mankind is facing challenging issues in the near future, such as CO₂ reduction, energy saving, recycling, resources reuse, and advanced materials production. Nanoscience research will play an essential role in gaining new strength in Germany's export industry by making the German *Energiewende* possible.

More intellectually challenging questions include: How did life originate? Are we alone in the universe? And what is nature's "divine" principle behind energy minimizing self-assembly of all the matter around us, both living and nonliving?