Engineering a better planet - and our way to new ones!

Charles J. Kuehmann, Ph.D., AZ B ‘88

Vice President of Materials Engineering

at SpaceX and Tesla Motors

The Talk: Materials challenges abound in the pursuit of the interplanetary settlement of our solar system and in the transition to sustainable energy here on Earth. Lightweight structures that reliably operate in the extremes of space for long durations, high-temperature materials for reliable reuse in highly efficient rocket engines and heat shields, advanced materials for vehicle structure, and advanced energy storage that can be efficiently manufactured in high volumes, represent just a few of the opportunities for materials innovation to drive these ambitious goals. Not only do these materials need to be highly capable, they need to be cost effective and scalable in volume manufacturing.

Transition to sustainable electric vehicles for transportation will involve replacing a fleet of hundreds of millions of petroleum fueled vehicles as quickly as possible. In addition, installed renewable electricity production will have to scale in a similar fashion to ensure those vehicles are powered by the cleanest energy possible. Technical achievements have also shown we can reach and explore beyond the confines of our planet. Many new technologies will need to be employed and perfected to allow living in the harsh conditions of other worlds and in space.

The new materials and manufacturing methods enabling these goals need to make greater leaps in capability and in timeframes never before achieved. Fortunately, materials engineering has also made great strides in the last decade, embracing the integration of computational methods and advanced systems design into a framework we now call Integrated Computational Materials Engineering. The key word is integrated - removing the boundaries between engineering disciplines and considering systems as a whole are key to achieving our most ambitious goals. It’s a great time to be an engineer!

The Speaker: Dr. Charlie Kuehmann, AZ B ’88, has been a leader in computational materials design since its inception. In creating the first company dedicated to commercializing computational materials design, he has innovated the first materials and alloys from this new technology; from high-performance steels for race cars, aluminum alloys for aircraft, gear materials for helicopters, high temperature alloys for turbine engines, and even bubble-gum. As the computational materials design revolution has gained momentum and been embraced by government and private R&D organizations through the Accelerated Insertion of Materials and Materials Genome Initiative, Dr. Kuehmann has brought the technology to the consumer electronics industry and most recently to electric vehicles and spacecraft. Dr. Kuehmann currently leads the materials engineering organizations at both Tesla and SpaceX, driving material solutions to enable the world’s transition to a sustainable future, the commercialization of space and a multi-planetary civilization.

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