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# Battery Safety Science Symposium

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## Keynote Address

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2019 Nobel Prize in Chemistry

### *Lithium Batteries: Future Trends and the Energy/Safety Trade-off*

Rechargeable lithium batteries are almost 50 years old. There is a continuing demand for higher and higher energy densities. In order to significantly go beyond the 200-250 Wh/kg (600 Wh/liter) of today's cells, it is essential to replace the workhorse graphitic carbon anode. In the ideal case lithium metal would be used, but to do this its reactivity must be controlled and eletrodeposition must be better understood. As a minimum, the organic carbonate electrolytes must be replaced by ether based systems (as pioneered by Exxon) that are known to plate lithium more effectively. On the cathode side, the oxide material must be pushed to its limit, and in the case of high Ni NMCs, this increases their reactivities. The trade-off between energy, reactivity and safety will be discussed.

### About the speaker

Dr. Stanley Whittingham is a SUNY distinguished professor of chemistry and materials science and engineering at Binghamton University. He has been a pioneer in fast ion transport in solids, in intercalation reactions and whilst at Exxon, developed the first rechargeable lithium batteries. He was the driving force behind the formation of materials chemistry programs and graduate degree programs in materials S&E. He received the 2019 Nobel Prize for the Li-ion battery, he is a Fellow of the Royal Society (FRS) and a member of the National Academy of Engineering. He is now championing the need for a cleaner environment and the role that storage can play.