

Material Shapes the Ages Exhibition

Information, photographs, and video footage

Big Bang in a Crystal

Multiferroics are a new type of material that combines magnetic and electrical properties in a unique way. The crystal materials can be useful for building electronic devices with ultra-low power consumption, but multiferroics can do much more. The pattern of electrical charges in ErMnO₃ (see image below) simulates the processes that happened in the early universe right after the Big Bang.

Unlike many other materials that have either a magnetic or an electric order, multiferroics possess both. They are magnetically and, at the same time, electrically polarized. As a consequence, they align themselves both along magnetic and along electrical fields. The physical mechanisms that bring about the magnetic and electric order inside the material coupled. The unique properties make it possible to influence the magnetization through more efficient electrical fields, rather than magnetic fields. In computing, data is continually written to magnetic hard drives, multiferroics; however, could present significant energy savings in future of computing.

Bios / publications

Nicola Spaldin, Full Professor at the Department of Materials

https://www.ethz.ch/en/utis/search.MTc3MjY0.html?pagetype=people&search=nicola+spaldin&language=en&lang_filter=false

References

ETH Zurich Professor Nicola Spaldin - video
<https://www.youtube.com/watch?v=SfVQi4w8ebw>

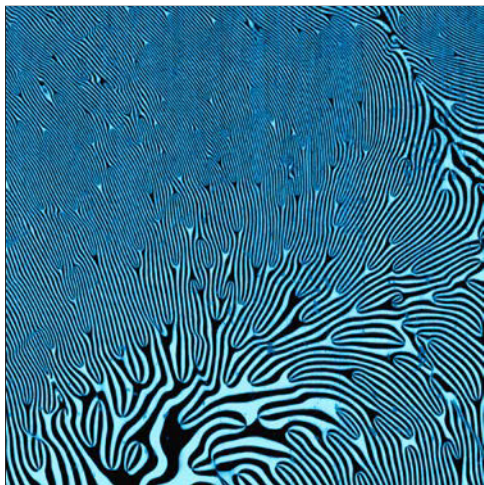
ETH Zurich Department of Materials
<http://www.theory.mat.ethz.ch/>
<http://www.theory.mat.ethz.ch/research/multiferroics-and-beyond.html>

Perfect Inversion – article
<https://www.ethz.ch/en/news-and-events/eth-news/news/2018/08/perfect-inversion.html>

Big Bang under the Microscope – article
http://www.ethlife.ethz.ch/archive_articles/130103_cosmic_strings_su/index_EN.html

Images

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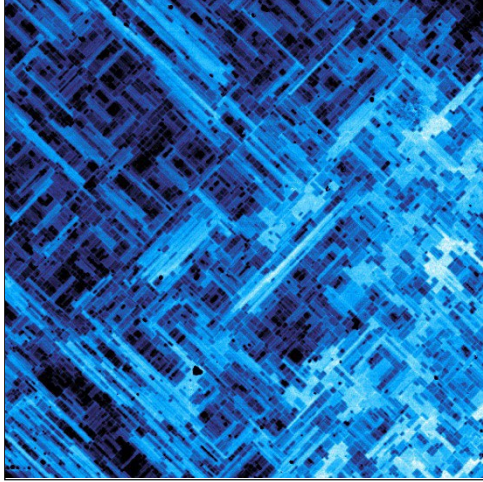


Big Bang in a Multiferroic Crystal

The pattern of electric charges in ErMnO₃ (image above) simulates processes that happened in the early universe right after the Big Bang.

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Background Information



Multiferroic Crystal - SMOonLSAT

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