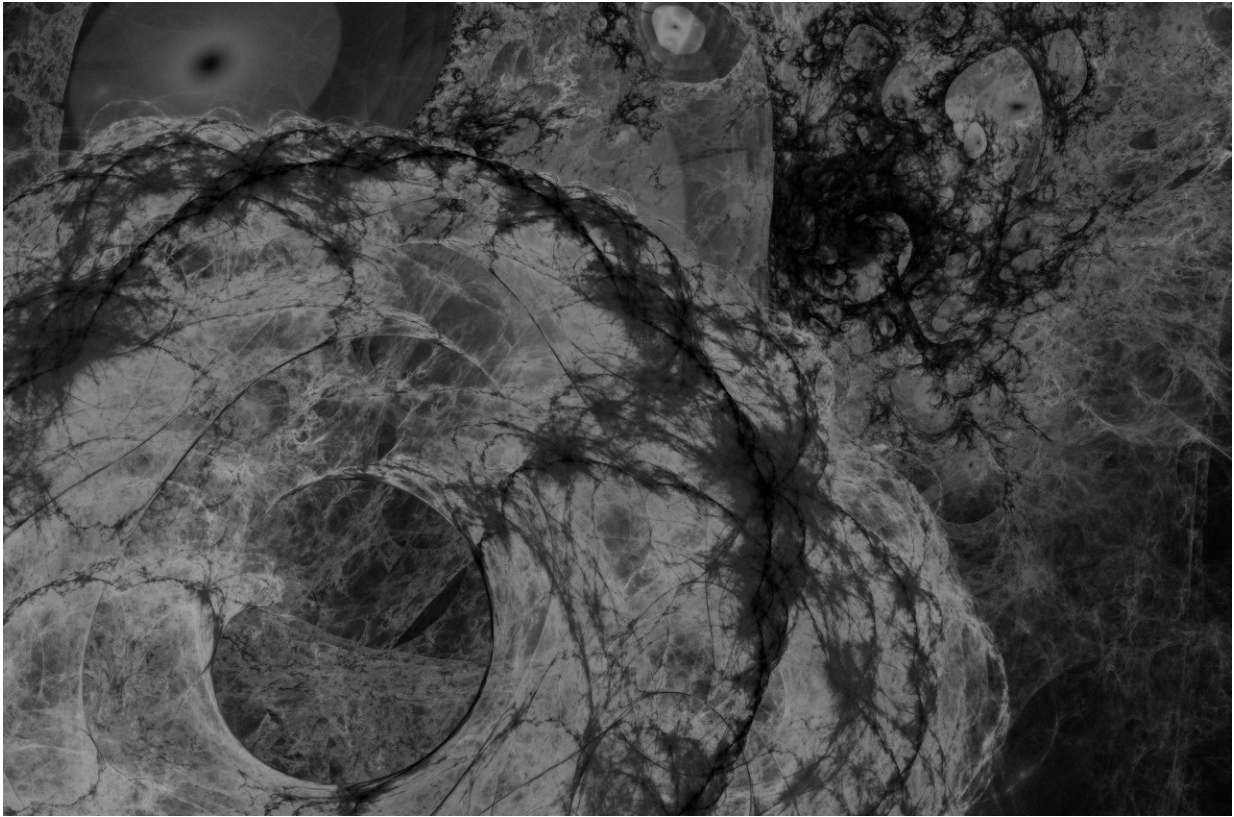


# Theoretical predictions help dark matter hunt

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A new Ph.D. thesis in the University of Jyväskylä, Finland, shows how utilizing tellurium as a detector material can help detect dark matter more effectively than currently used materials. The research also lays a

foundation for differentiating between collisions caused by dark matter and neutrinos, the so-called ghost particles, in dark matter detectors using xenon.

In his thesis, MSc Pekka Pirinen investigated ways to detect collisions between dark matter and [atomic nuclei](#) more effectively. A comprehensive study of collisions between neutrinos and most of the stable xenon nuclei was also performed for the first time using a complete microscopic nuclear framework.

Collisions between dark matter and regular matter would be an excellent source of information on the still-unknown 80 % of all matter in our Universe. Dark matter does not interact with light at all. Its existence has been deduced from surprisingly high rotational speeds of galaxies, among other things.

## **Tellurium gives a hand for hunting**

One of the most popular materials used in dark matter direct detection has in recent years been xenon. Pirinen hints in his dissertation that more effective materials can still be found. The element [tellurium](#) could be one.

"Based on my calculations it seems that isotope 125 of tellurium is more suitable for dark [matter](#) detection than the most popular current detector [materials](#). A method to build a detector using tellurium exists, but the problem is that tellurium is quite rare and expensive," says Pirinen.

MSc Pekka Pirinen defends his doctoral dissertation in Physics "Theoretical predictions of WIMP-nucleus and neutrino-nucleus scattering in context of [dark matter](#) direct detection" on Friday 7.12.2018 at noon 12.00 in the lecture hall FYS1. Opponent professor is Achim Schwenk(TU Darmstadt, Germany) and custos professor Jouni

Suhonen (University of Jyväskylä). The doctoral dissertation is held in English.

Pekka Pirinen graduated from Minna Canth senior high school in Kuopio in 2009. He started his studies in the department of physics at University of Jyväskylä in fall 2009 and he obtained his master's degree in theoretical physics in 2014. Pirinen began his Ph.D. studies in 2015. The research has been funded by the Magnus Ehrnrooth foundation and the University of Jyväskylä.

**More information:** Theoretical predictions of wimp-nucleus and neutrino-nucleus scattering in context of dark matter direct detection.  
[urn.fi/URN:ISBN:978-951-39-7619-4](https://urn.fi/URN:ISBN:978-951-39-7619-4)

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