

Direct detection: the future*

Peter Cox

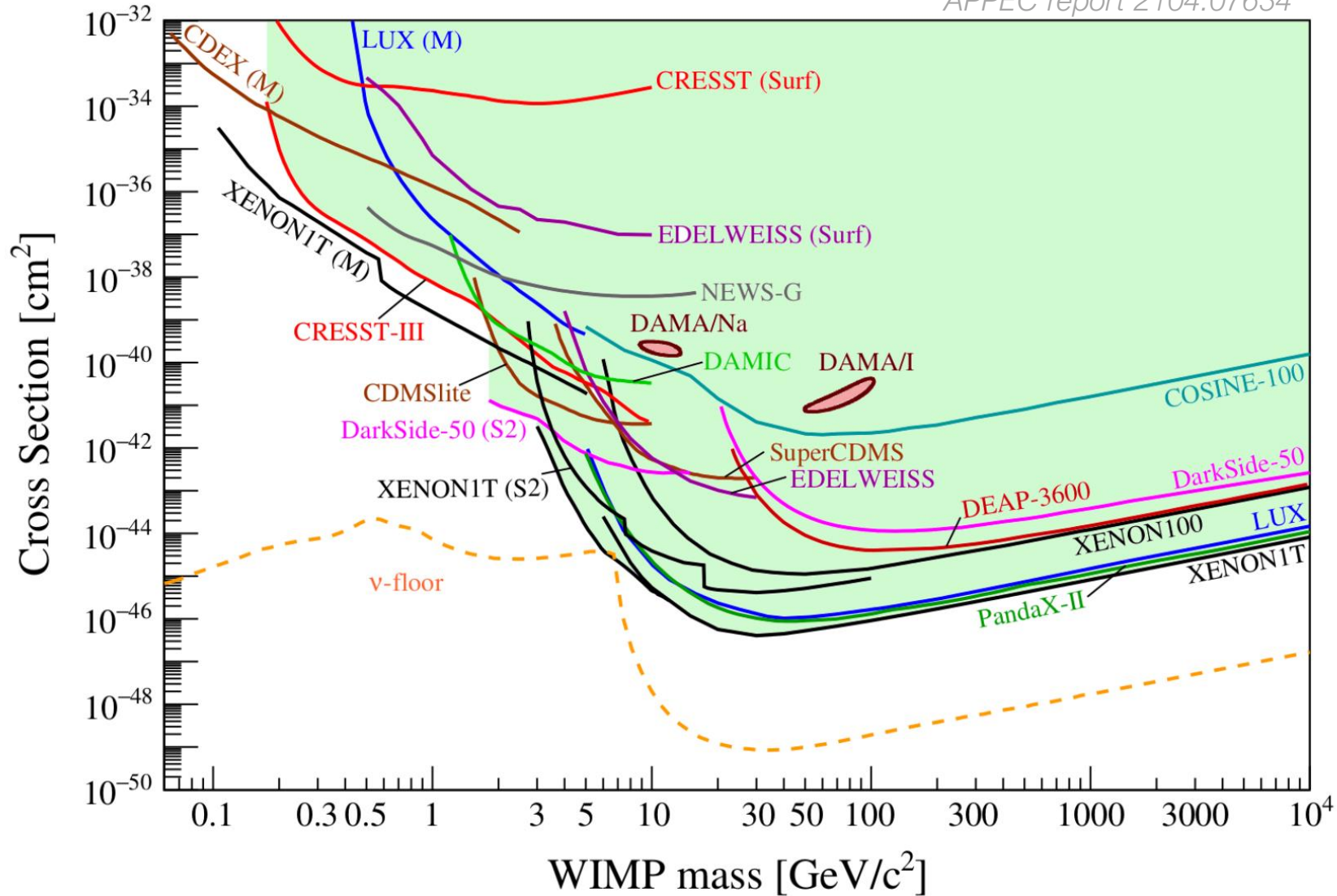
The University of Melbourne



**Disclaimer: a high-level overview, by a theorist*

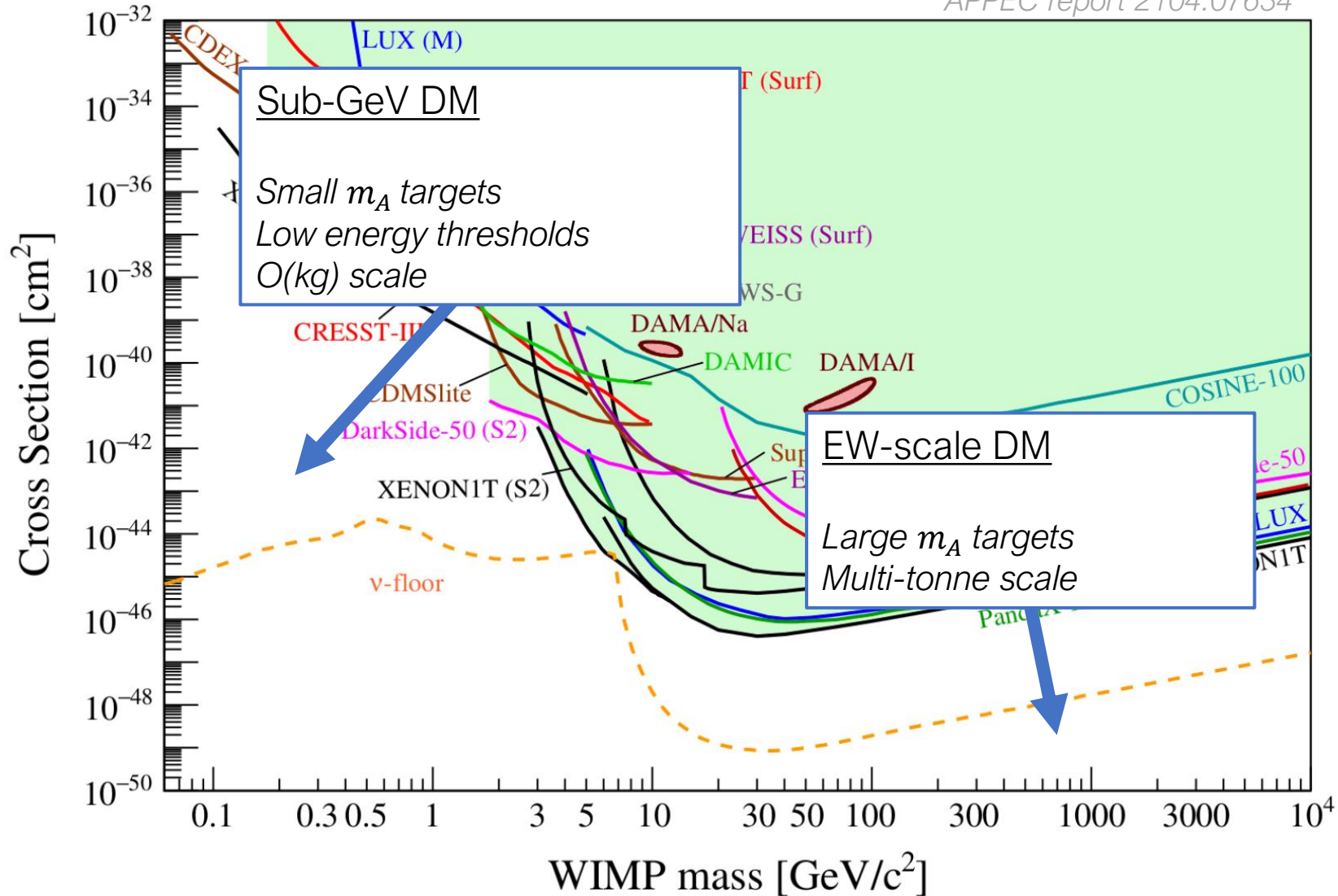
Where we are now

APPEC report 2104.07634



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The future (high mass)

Current generation

PandaX-4t, LZ, XENON-nT ~5t Xe
commissioning/data taking

Future

DarkSide-20k 46t Ar (2025)

DARWIN ~40t Xe

ARGO ~300t Ar

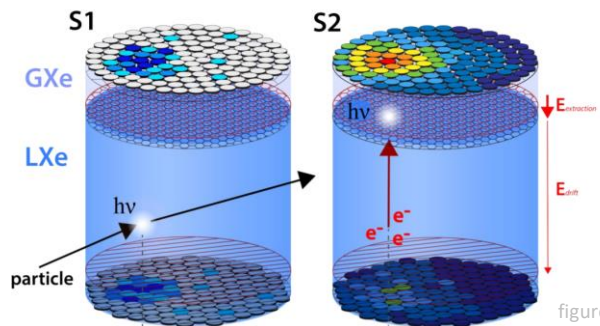
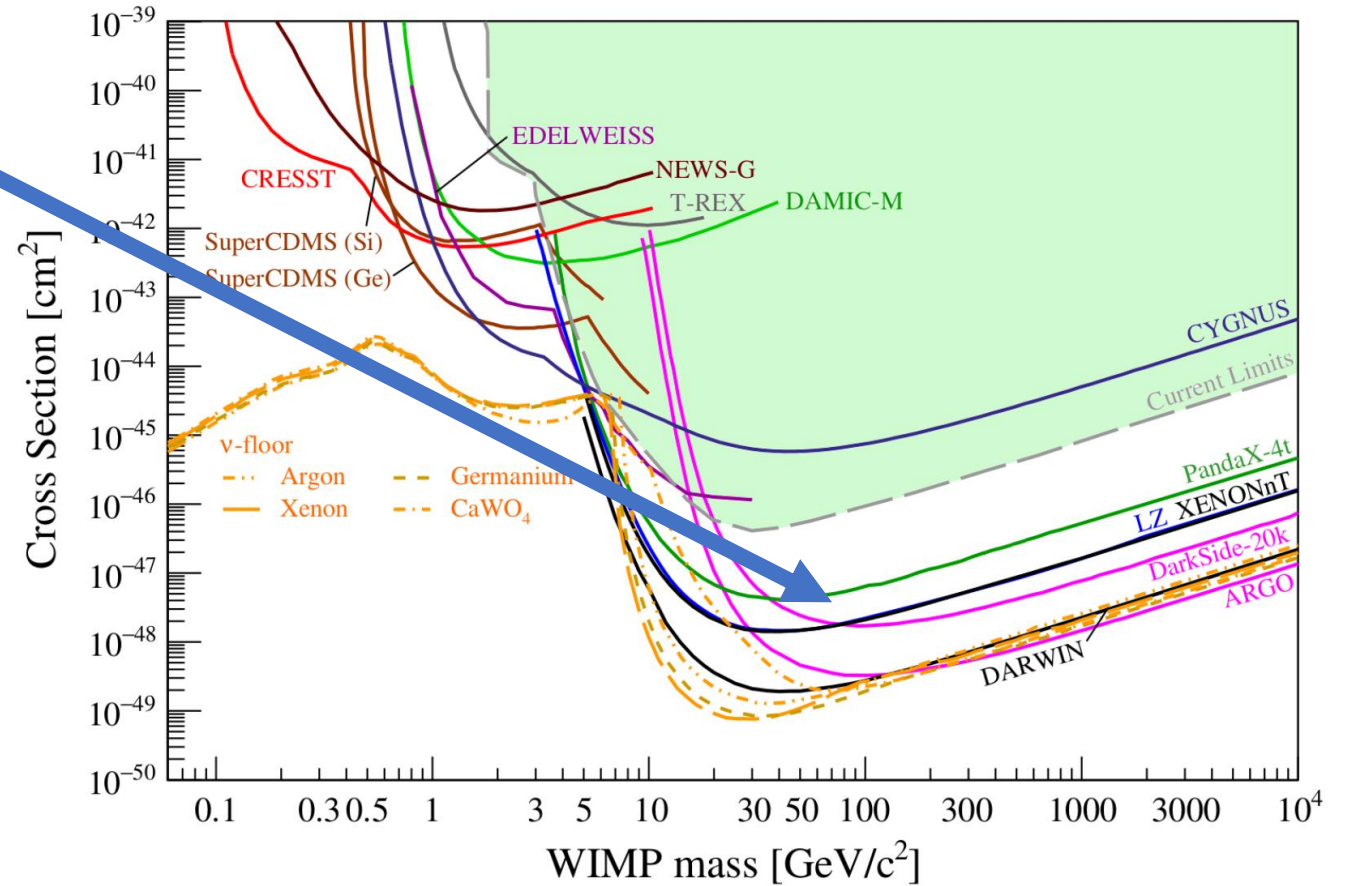


figure: XENONnT



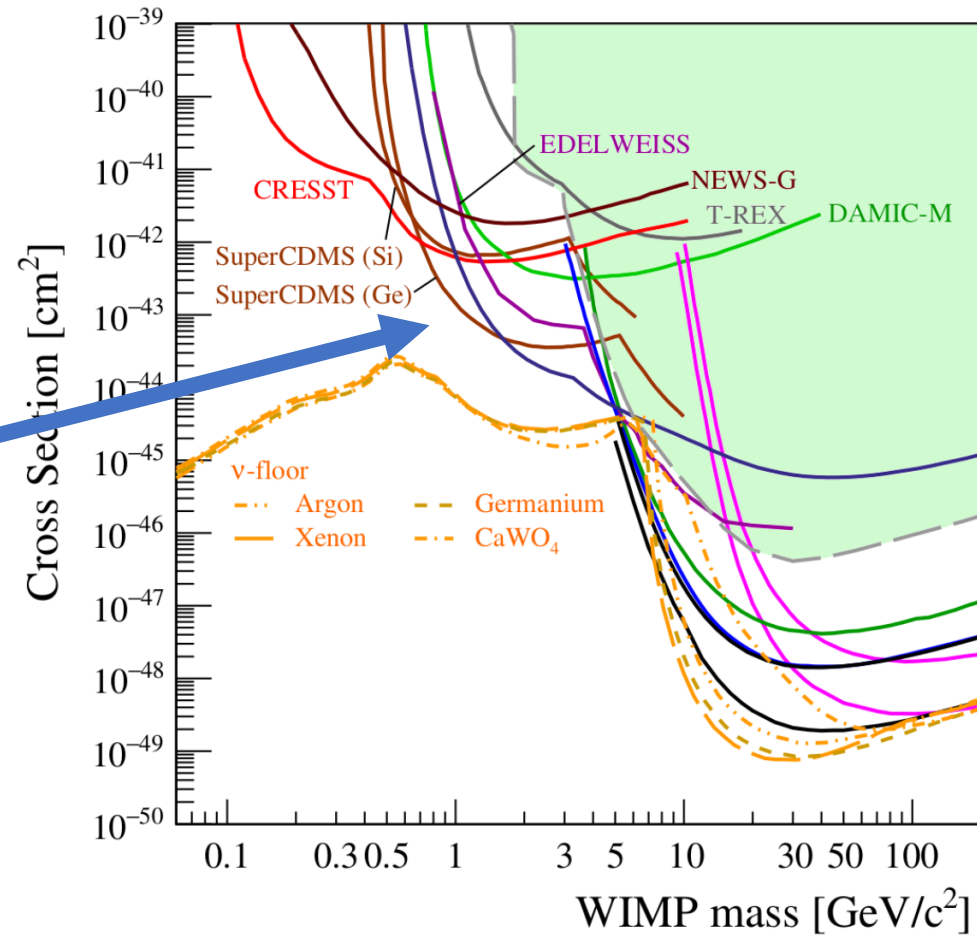
The future (low mass)

Significant progress expected in the next ~5 years

Cryogenic bolometers (phonons)
CRESST-III, COSINUS (+ scintillation)
EDELWEISS, SuperCDMS (+ ionisation)

Ionisation detectors
SENSEI, DAMIC-M (skipper CCD)
NEWS-G (SPC)

Ar/Xe TPCs
Migdal effect
Dedicated *DarkSide-LM*



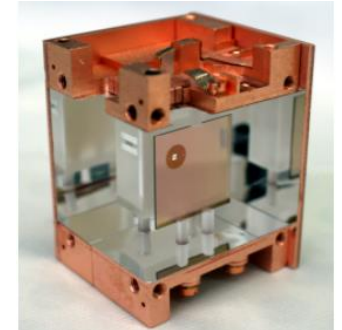
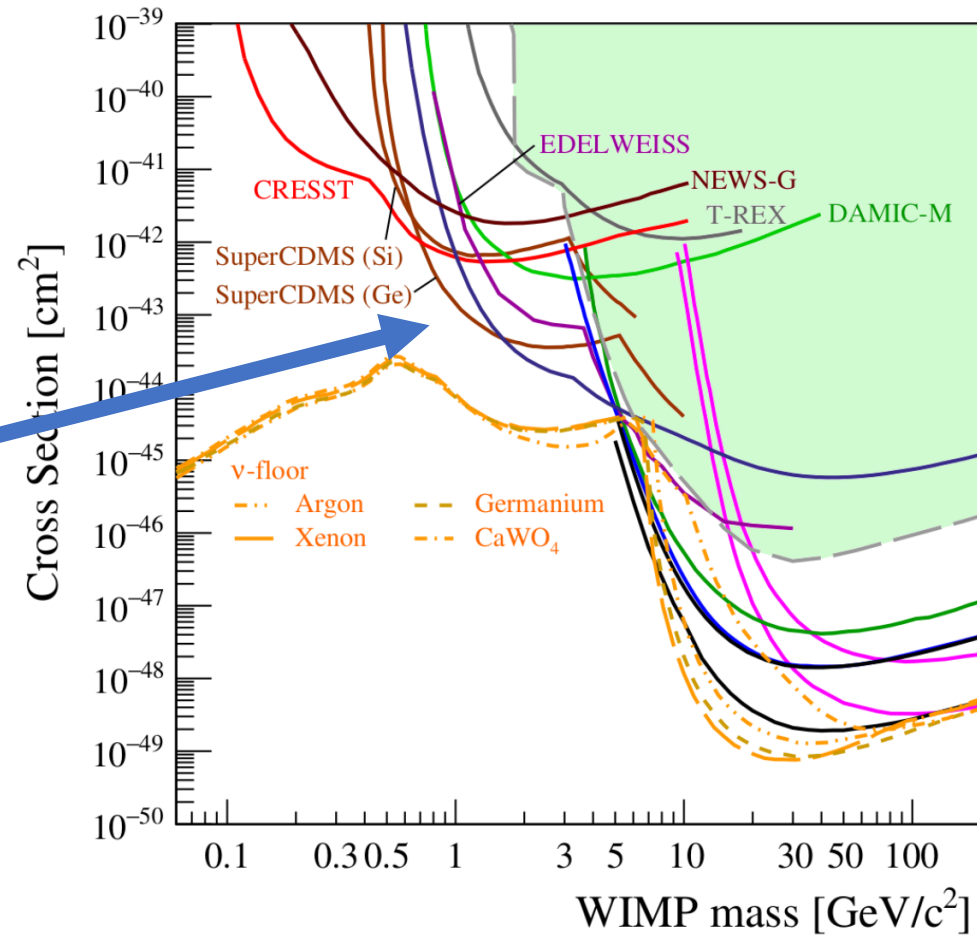
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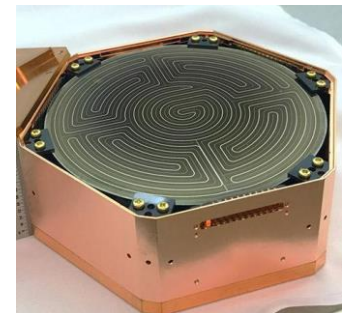
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CRESST-III (CaWO₄)



SuperCDMS iZIP (Si/Ge)

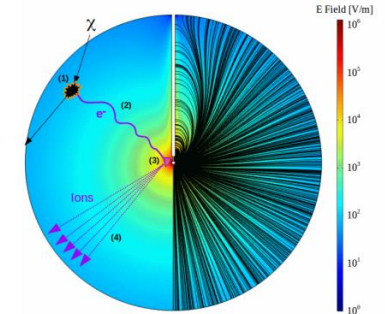
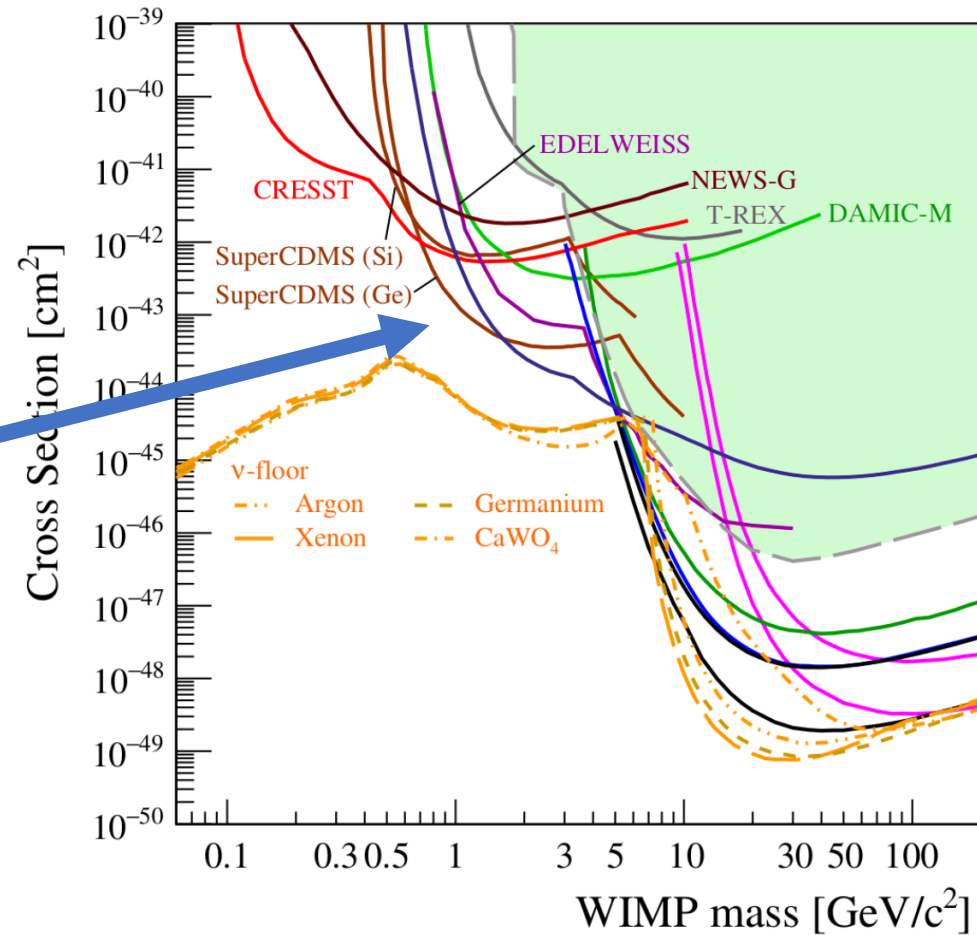
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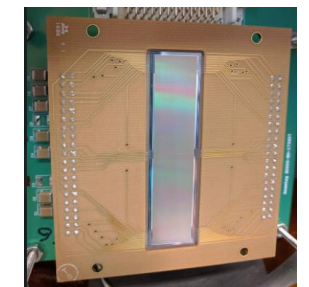
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NEWS-G (Ne/CH4)



SENSEI (Si)

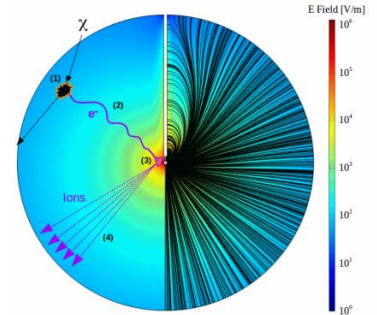
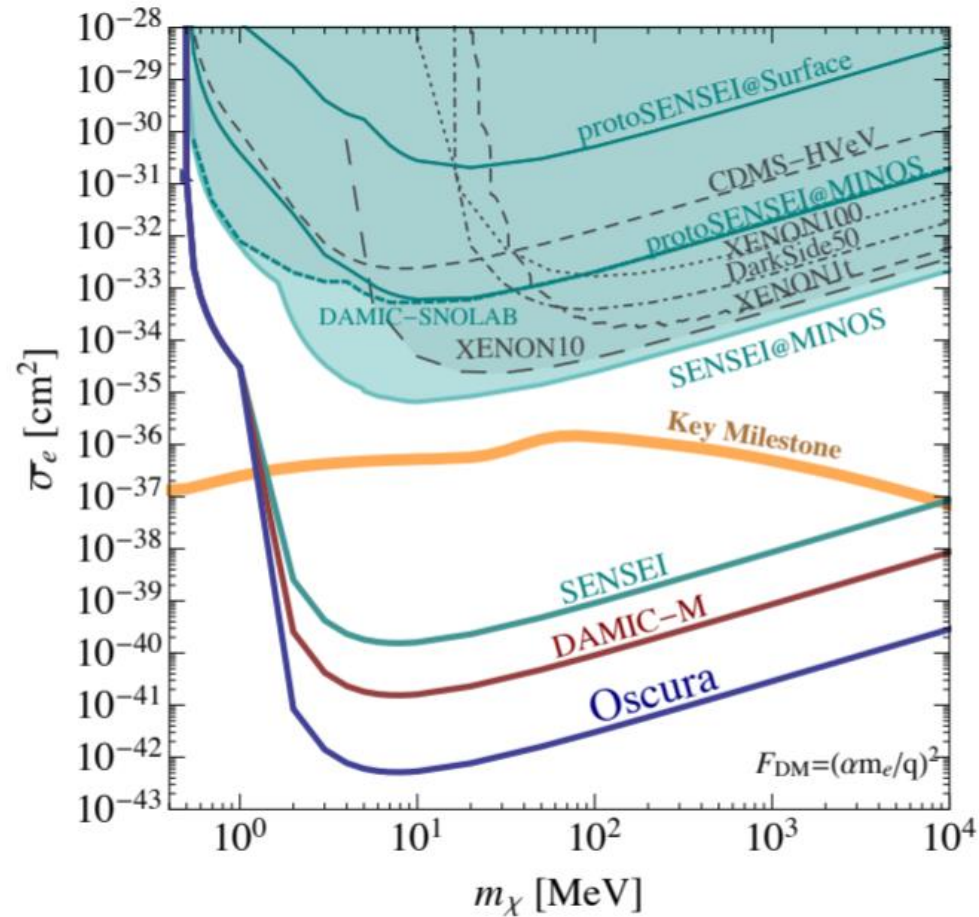
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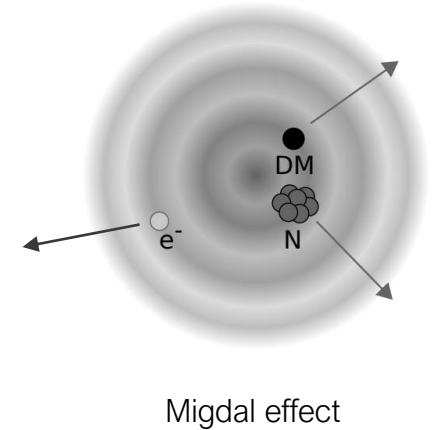
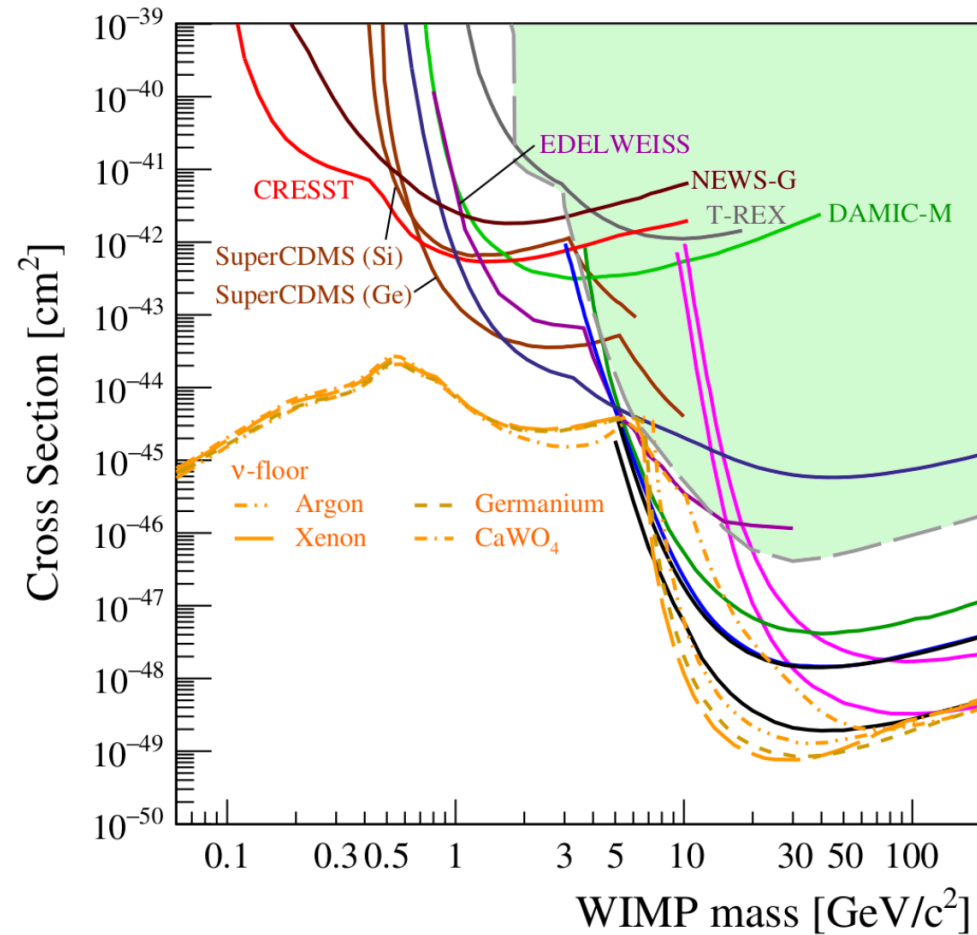
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The next frontier: $m_{DM} < 100$ MeV

(see Wednesday's session)

Many ideas/proposals in this space...

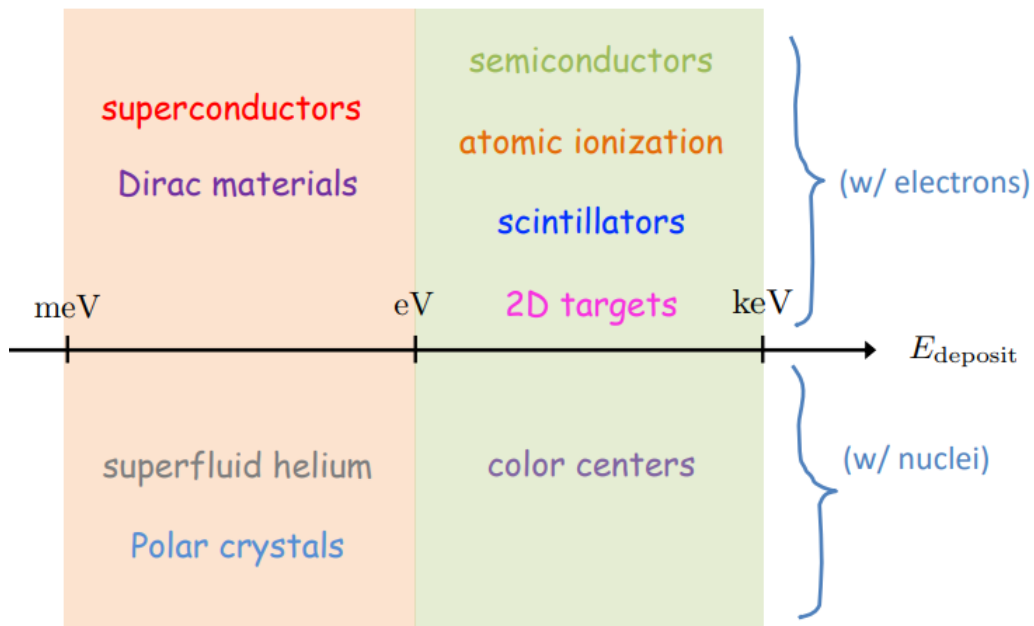
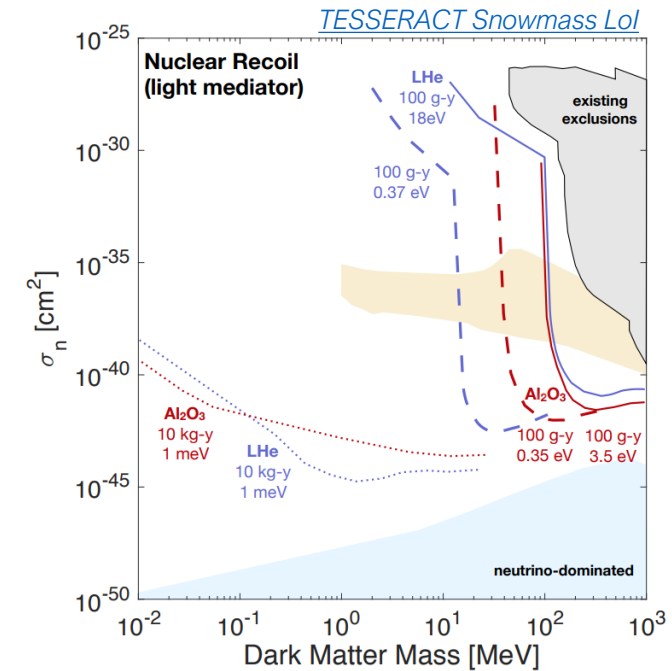
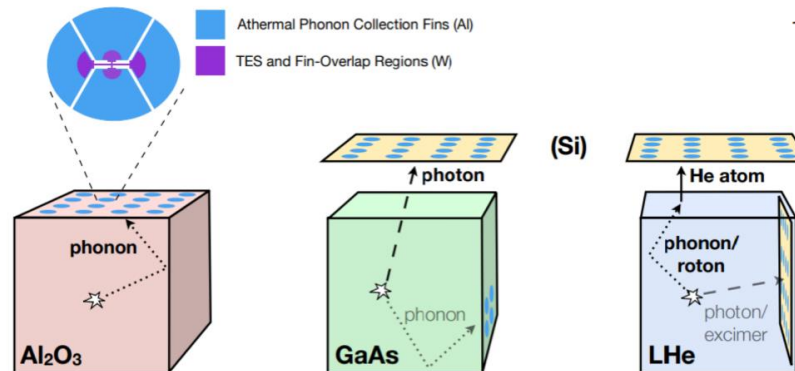


figure: Y. Hochberg

e.g. *TESSERACT* (*HeRALD*/*SPICE*)

R&D, targeting experiment in ~2027



Discussion/Questions?

