

Effects of (non)-magnetic disorder in quasi-1D singlet superconductors

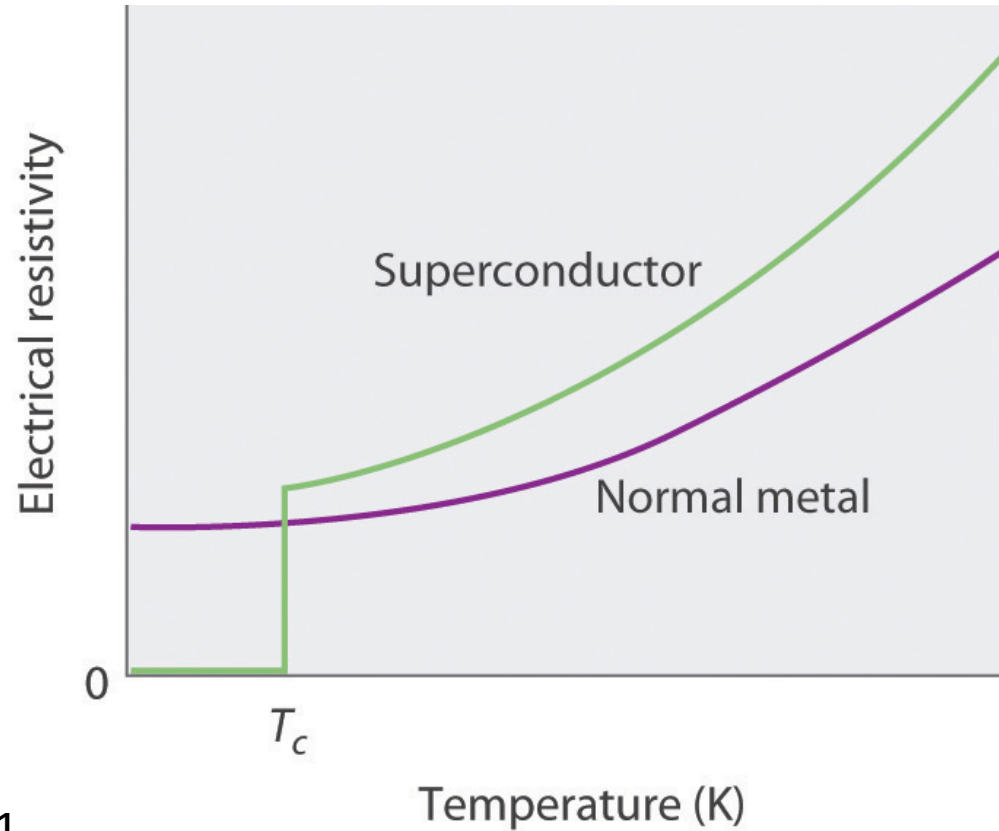
Giacomo Morpurgo

Young researcher's day, 16/09/2022

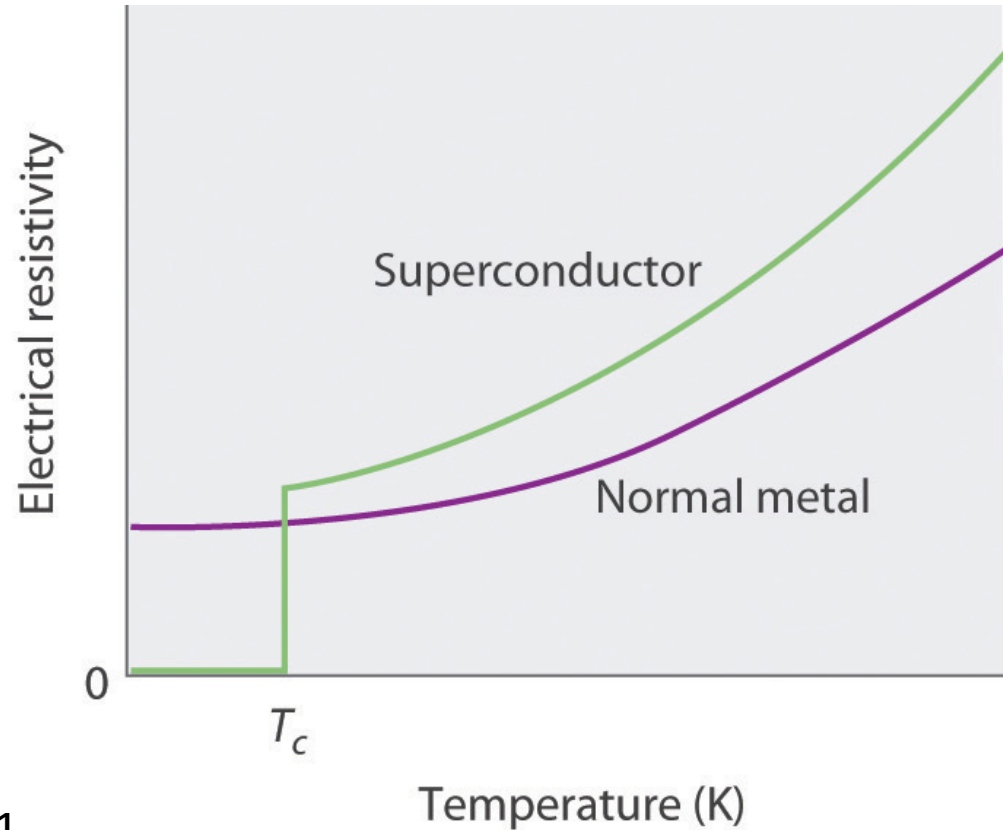


*Thierry
Giamarchi*

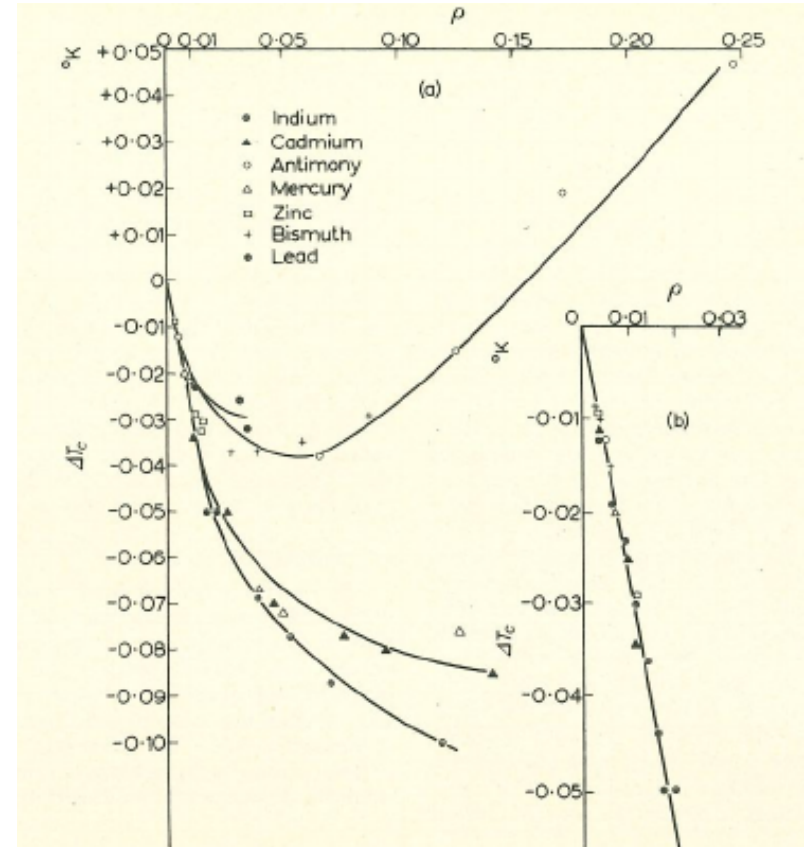
Superconductivity



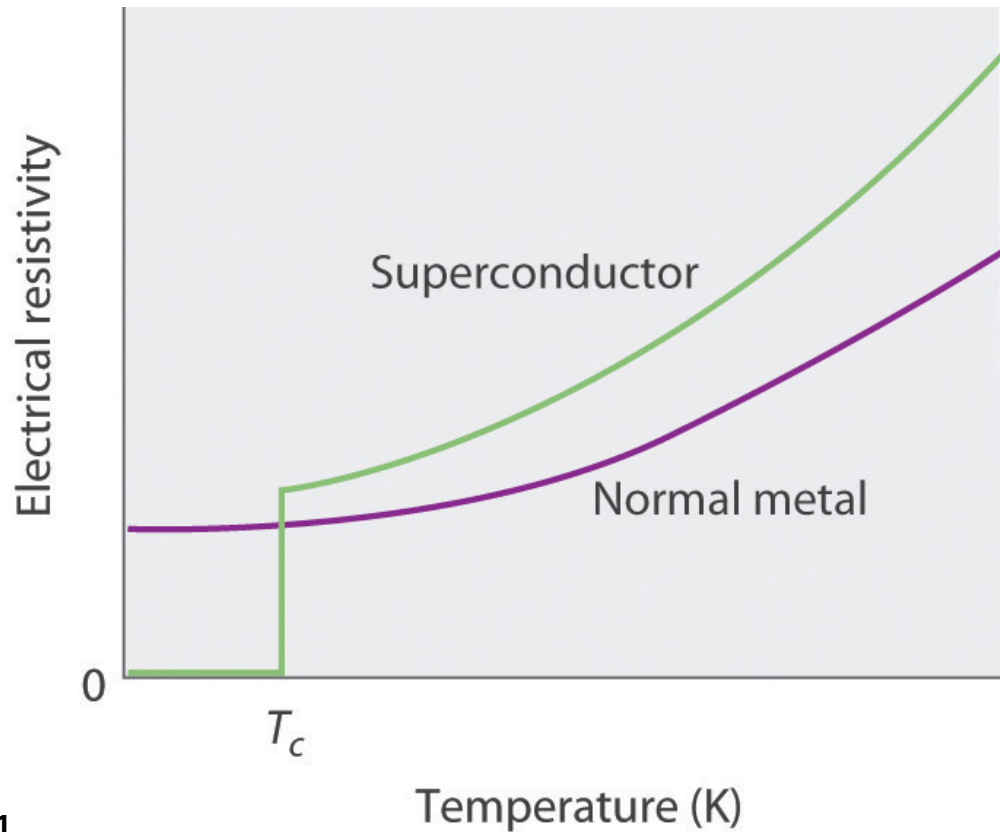
Superconductivity



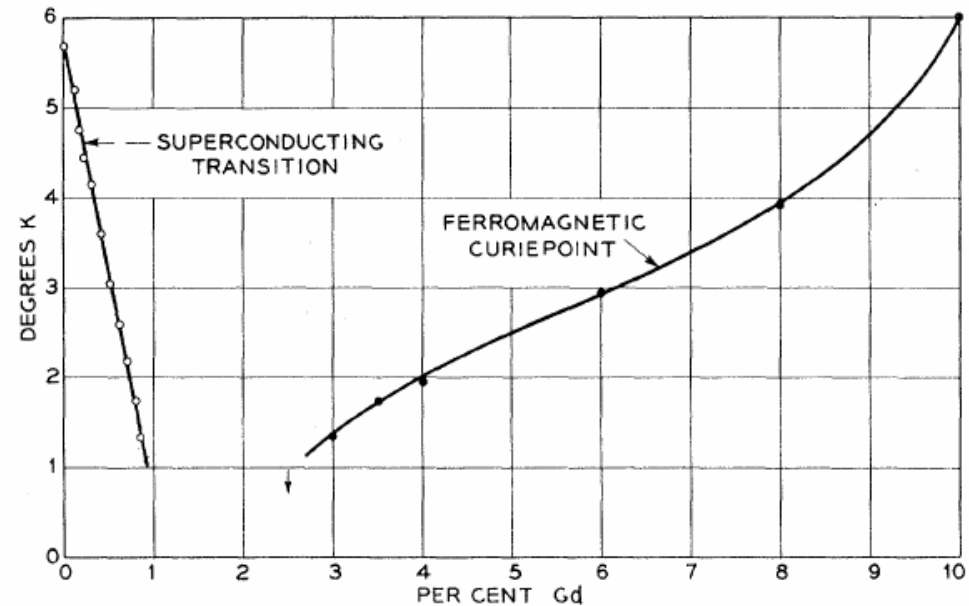
Non-magnetic disorder



Superconductivity



Magnetic disorder



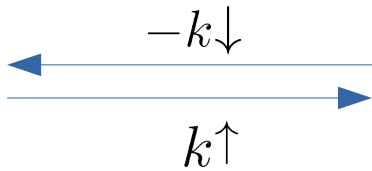
Matthias, Suhl, Corenzwit, PRL 1958

Disorder against superconductivity

P. W. Anderson, J. Phys. Chem. Solids (1959).

No disorder

Formation of
Cooper pairs

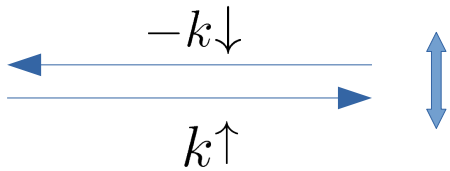


Disorder against superconductivity

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No disorder

Formation of
Cooper pairs



Time Reversal (TR) partners

Disorder against superconductivity

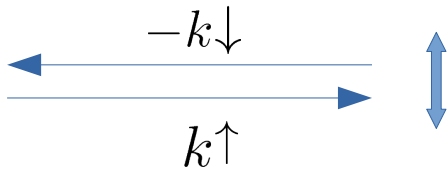
P. W. Anderson, J. Phys. Chem. Solids (1959).

No disorder

Non-Magnetic disorder

Formation of
Cooper pairs

TR symmetry



Time Reversal (TR) partners

Disorder against superconductivity

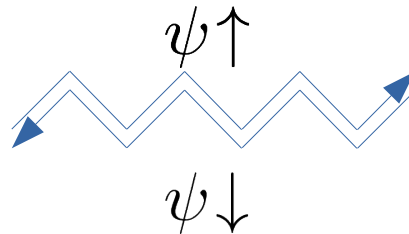
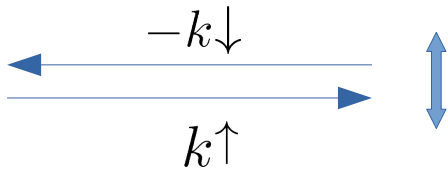
P. W. Anderson, J. Phys. Chem. Solids (1959).

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Non-Magnetic disorder

Formation of
Cooper pairs

TR symmetry



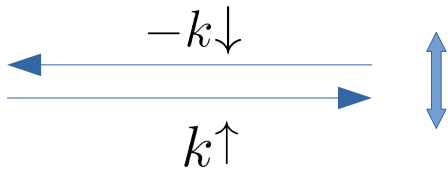
Time Reversal (TR) partners

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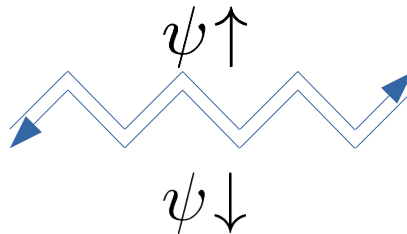
Formation of
Cooper pairs



Time Reversal (TR) partners

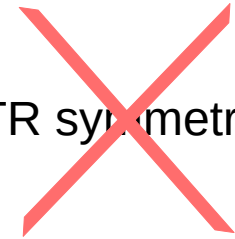
Non-Magnetic disorder

TR symmetry



Magnetic disorder

TR symmetry

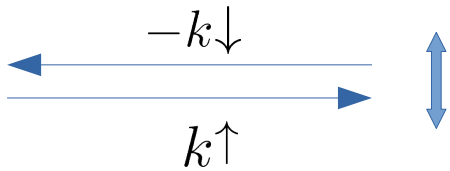


Disorder against superconductivity

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No disorder

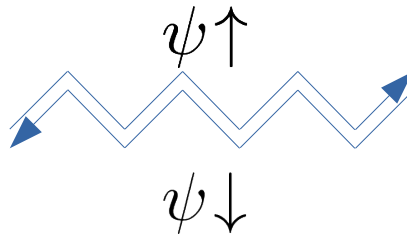
Formation of
Cooper pairs



Time Reversal (TR) partners

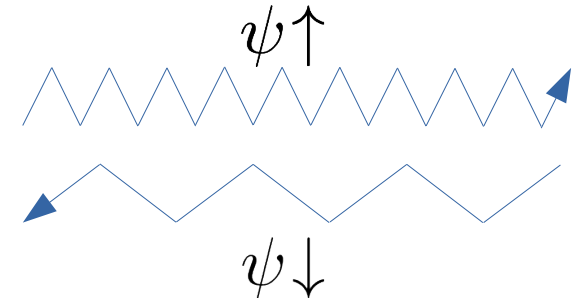
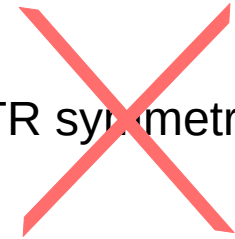
Non-Magnetic disorder

TR symmetry



Magnetic disorder

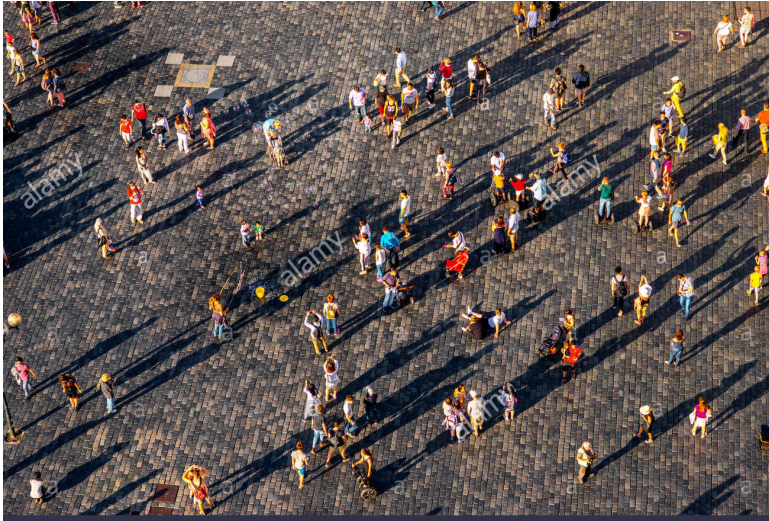
TR symmetry



1D systems peculiarities

Excitations

$2D$



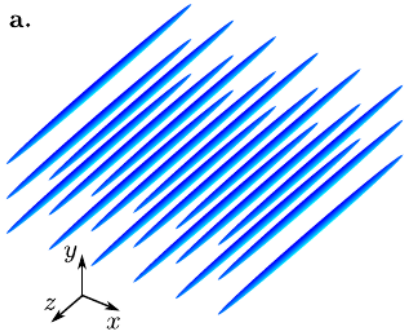
$1D$



All together

Quasi 1D system

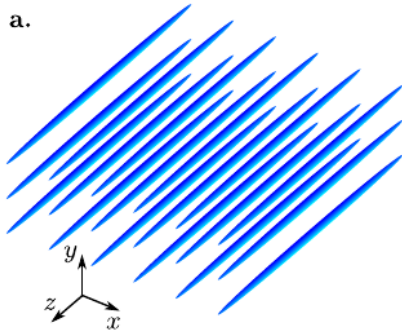
a.



All together

Quasi 1D system

a.



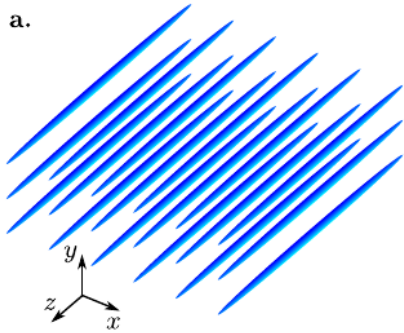
Our goal :

Find $T_c(D)$
Understand effect of disorder

All together

Quasi 1D system

a.



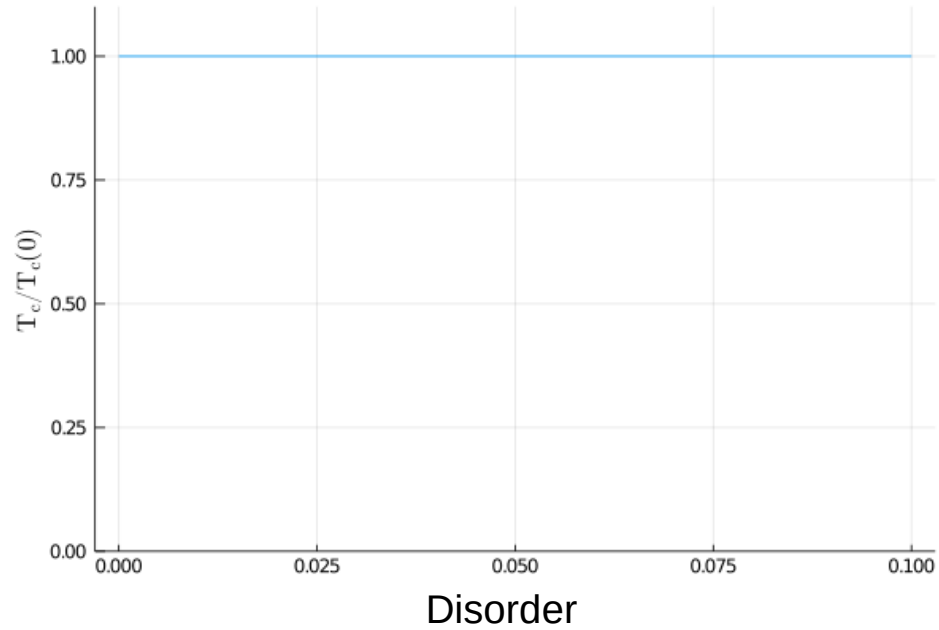
Our goal :

Find $T_c(D)$
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Thanks for your attention !

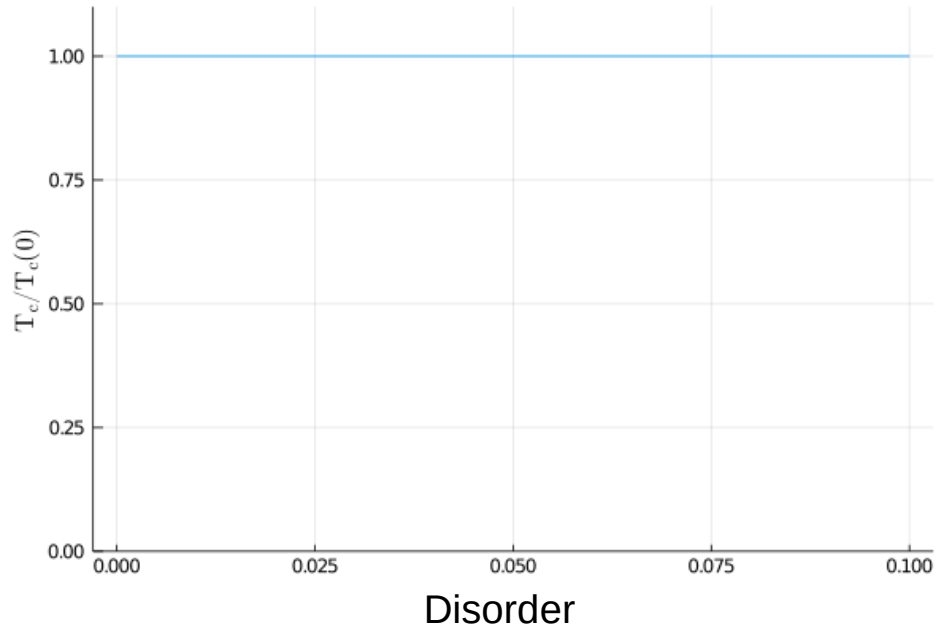
Results

Non-magnetic disorder

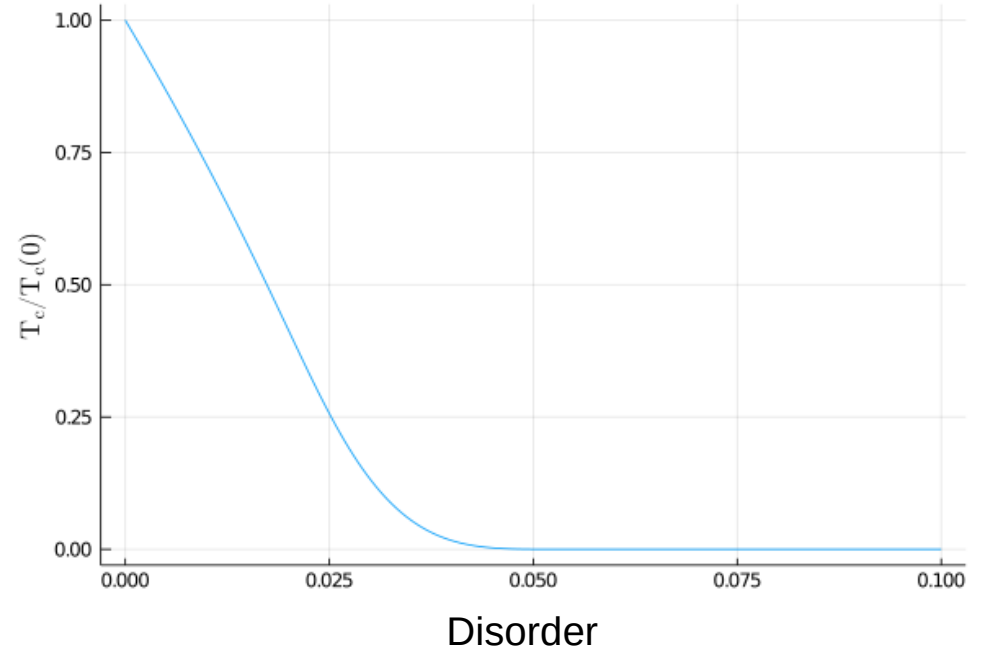


Results

Non-magnetic disorder

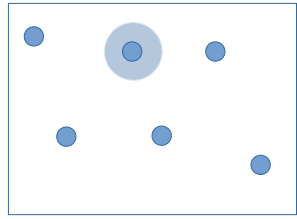


Magnetic disorder

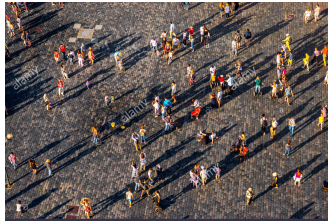


Why look at quasi-1D systems?

Excitations



$2D$



$1D$



No long range order
-fluctuations don't allow order

Disorder effects :
-Anderson localization

