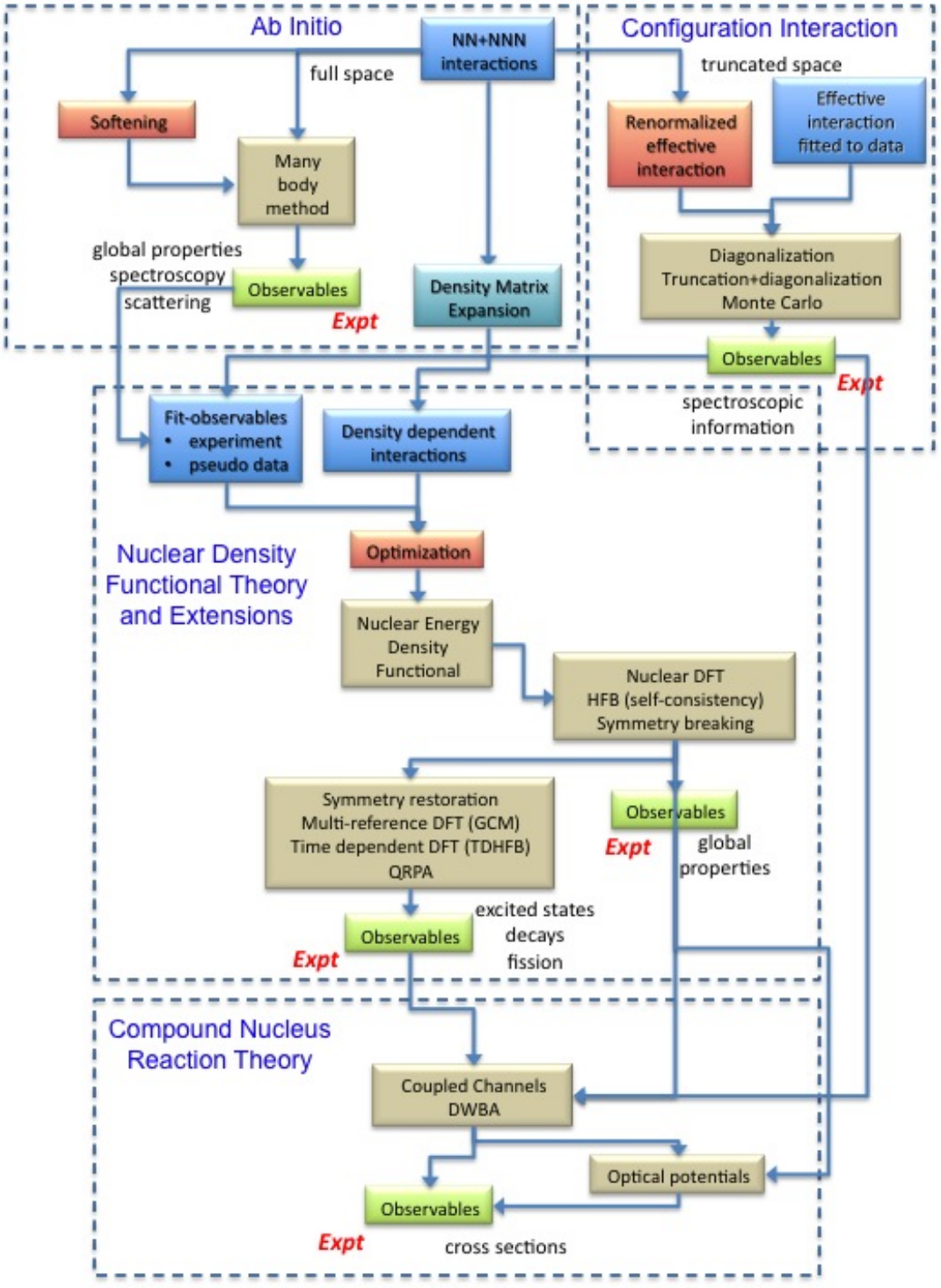
Ab Initio
NN+NNN interactions
full space
Softening
Many body method
global properties
spectroscopy
scattering
Observables
Expt
Density Matrix Expansion
Configuration Interaction
truncated space
Renormalized effective interaction
Effective interaction fitted to data
Diagonalization
Truncation+diagonalization
Monte Carlo
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spectroscopic information
Fit-observables
• experiment
• pseudo data
Density dependent interactions
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Nuclear Density Functional Theory and Extensions
Nuclear Energy Density Functional
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HFB (self-consistency)
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global properties
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excited states
decays
fission
Expt
Compound Nucleus Reaction Theory
Coupled Channels
DWBA
Optical potentials
Observables
Expt
cross sections

Role and Goals of the Ab Initio Functionals Group

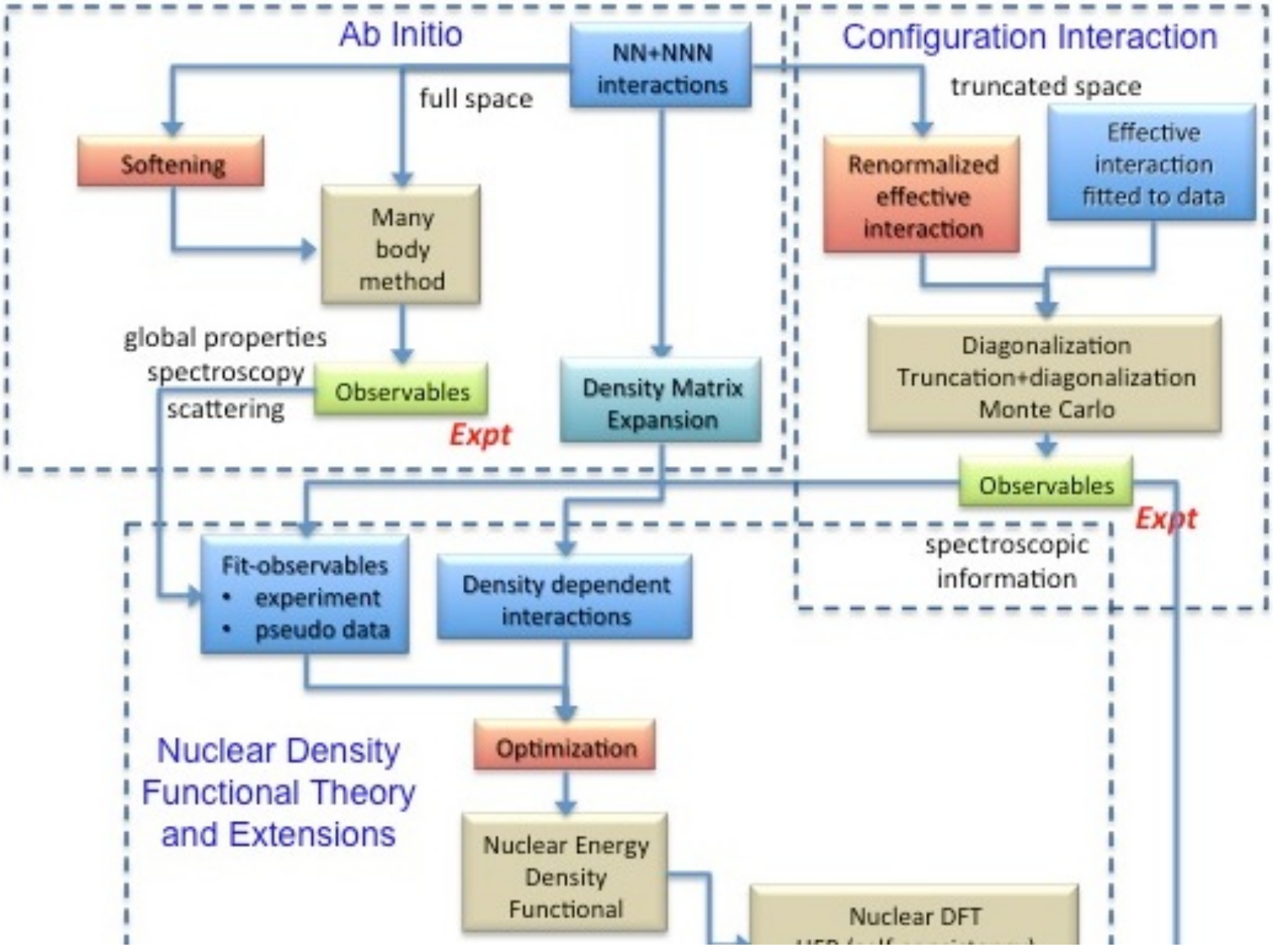
From last year's CPR: (previous talks) (today's talks)

- Develop low-momentum NN and NNN interactions and operators as input to ab initio wave function methods and nuclear matter (Jurgenson, Anderson)
- Develop nuclear matter calculations with controlled theoretical errors as input to microscopic functionals (Hebeler, Hergert)
- Construct ab initio functionals in the form of a generalized Skyrme interaction, with theoretical error bars, and understand conceptual issues (Drut, Bogner)
- Validate the functionals against ab initio wave function methods (Maris)
- Provide guidance to DFT Applications on novel density dependencies for EDF's based on microscopic input (Stoitsov, Kortelainen)

UNEDF junior personnel scorecard

Ab Initio Functional division (and collaborators)

- Recent transitions
  - Biruk Gebremariam: MSU $\longrightarrow$ SAS (5/2010)
  - Eric Jurgenson: OSU $\longrightarrow$ LLNL (10/2009)
  - Lucas Platter: OSU $\longrightarrow$ INT (10/2009)
- Upcoming transitions
  - Joaquín Drut: OSU $\longrightarrow$ LANL (10/2010)
  - Kai Hebeler: TRIUMF $\longrightarrow$ OSU (9/2010)
- Metastable
  - Eric Anderson: OSU
  - Heiko Hergert: MSU
  - Markus Kortelainen: ORNL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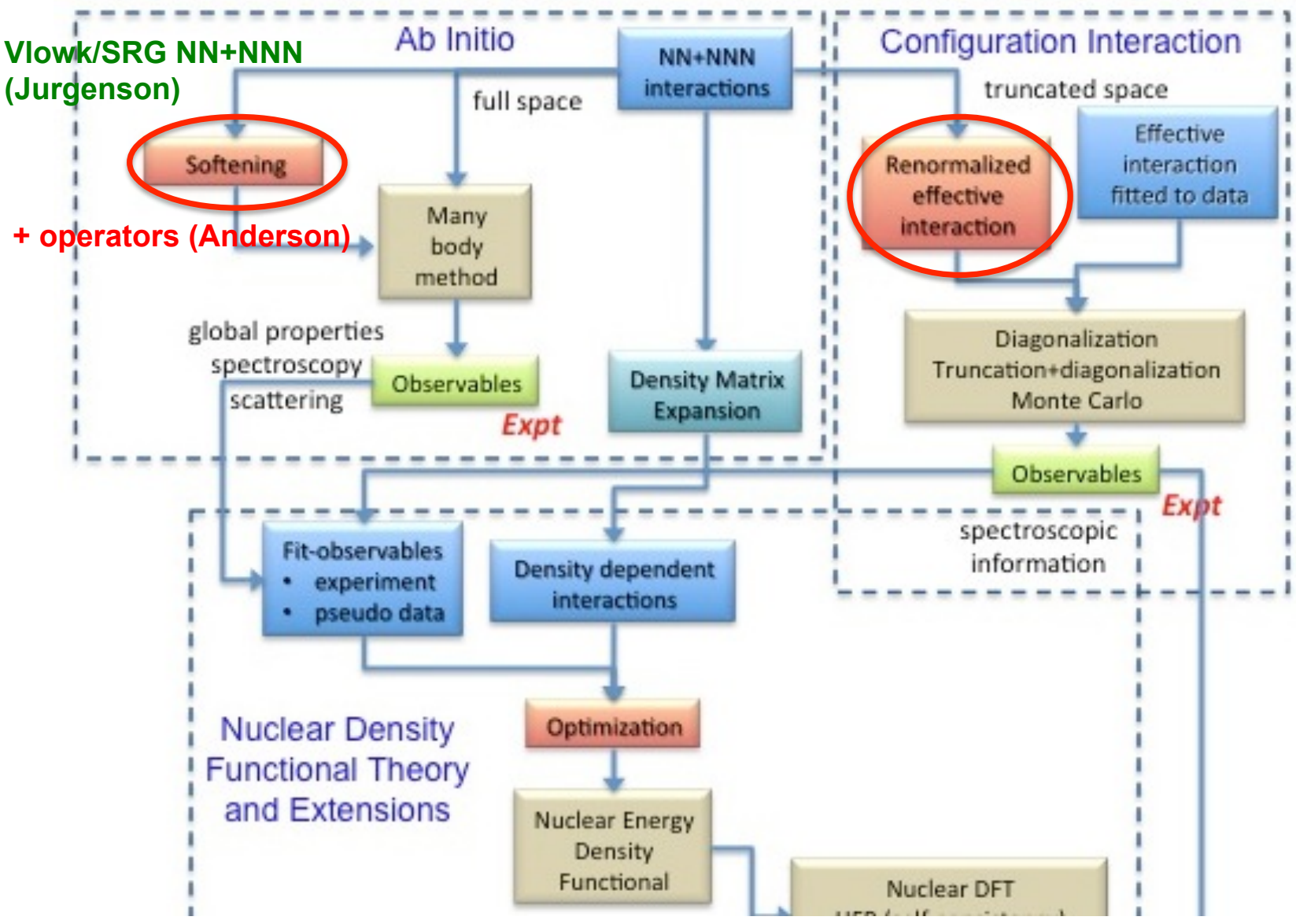
Vlowk/SRG NN+NNN
(Jurgenson)
+ operators (Anderson)
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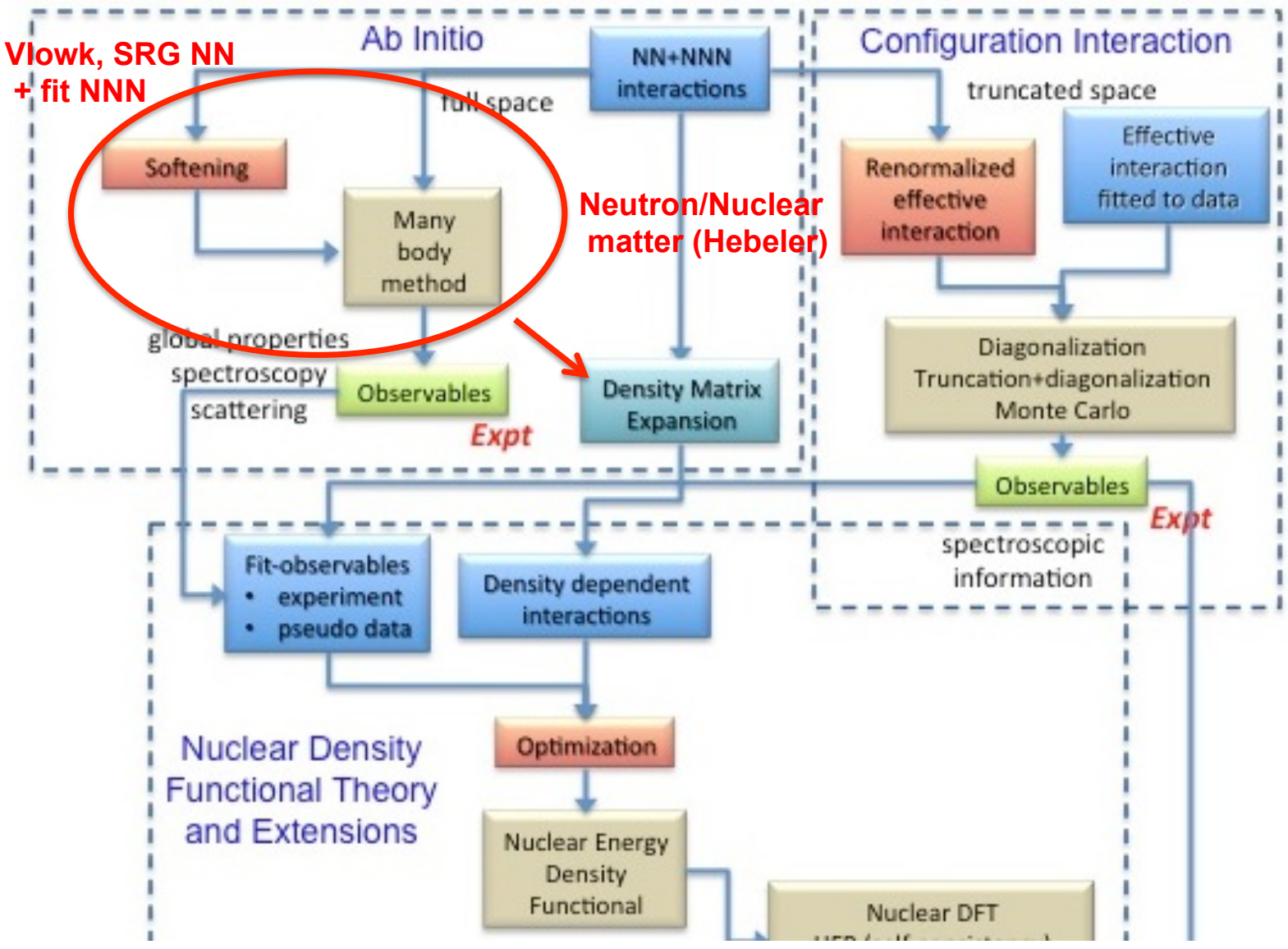
Vlowk, SRG NN
+ fit NNN
Ab Initio
NN+NNN
interactions
full space
Softening
Many
body
method
Neutron/Nuclear
matter (Hebeler)
global properties
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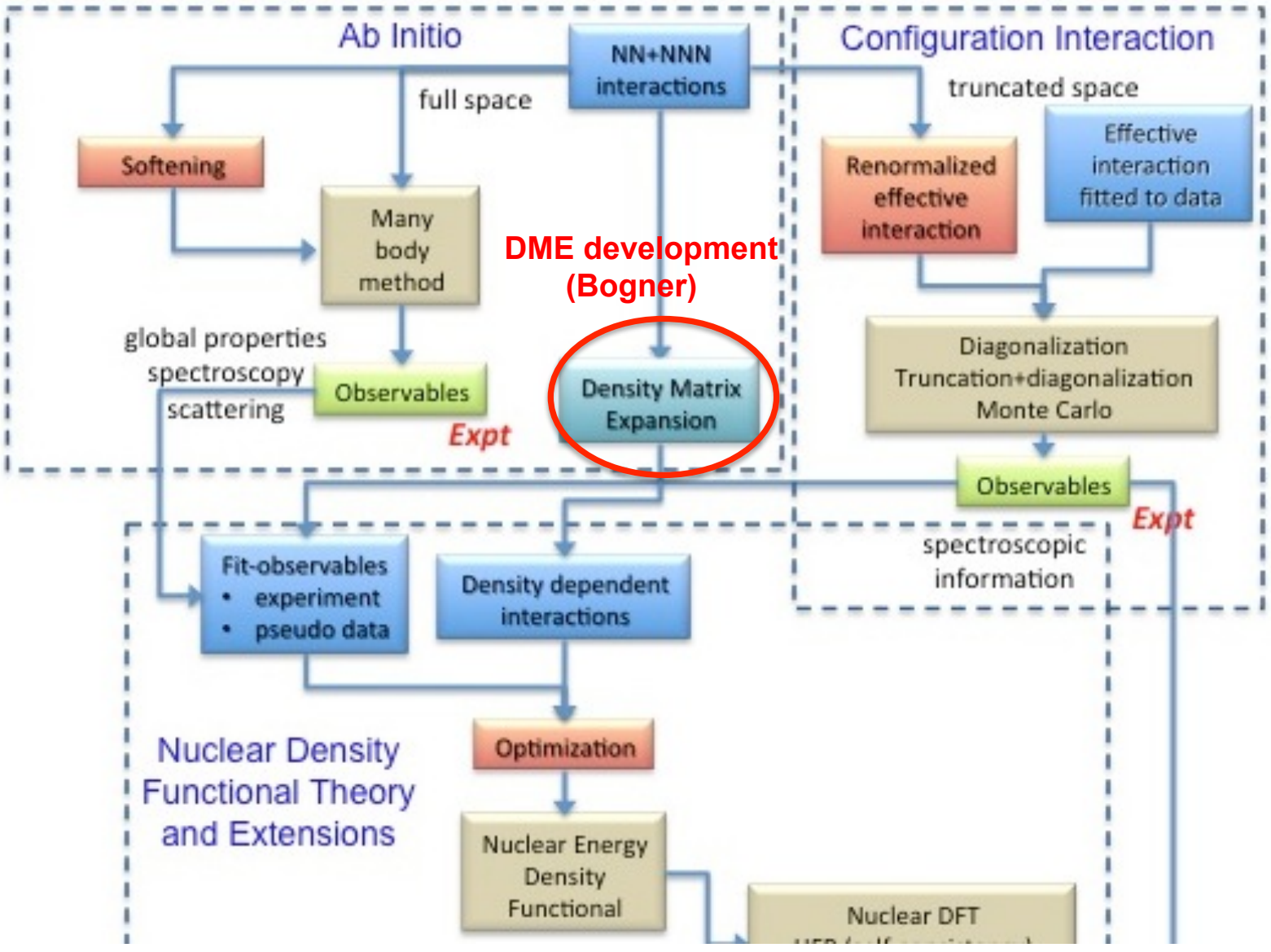
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Expt
DME development (Bogner)
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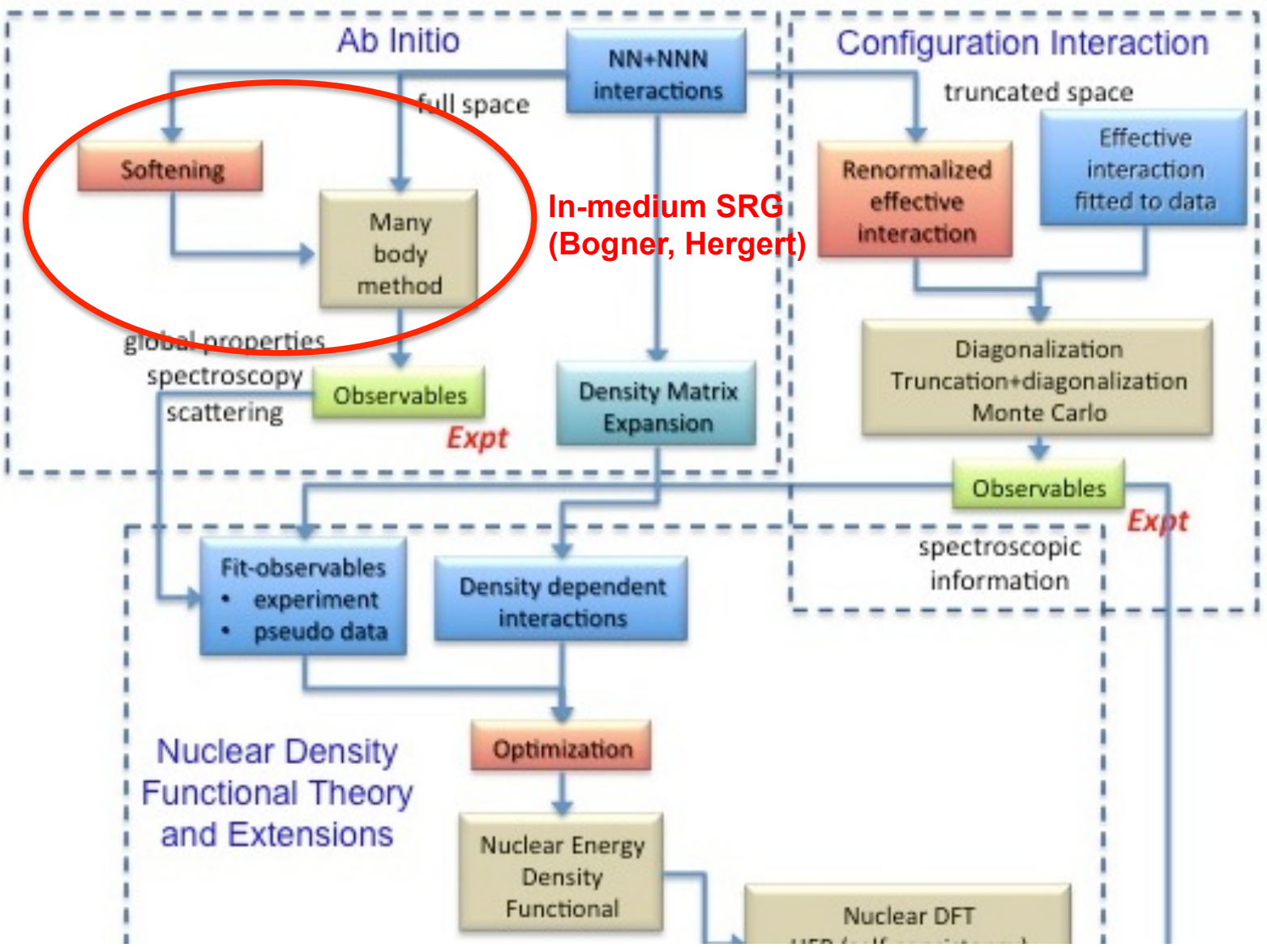
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NN+NNN interactions
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Softening
Many body method
In-medium SRG
(Bogner, Hergert)
global properties
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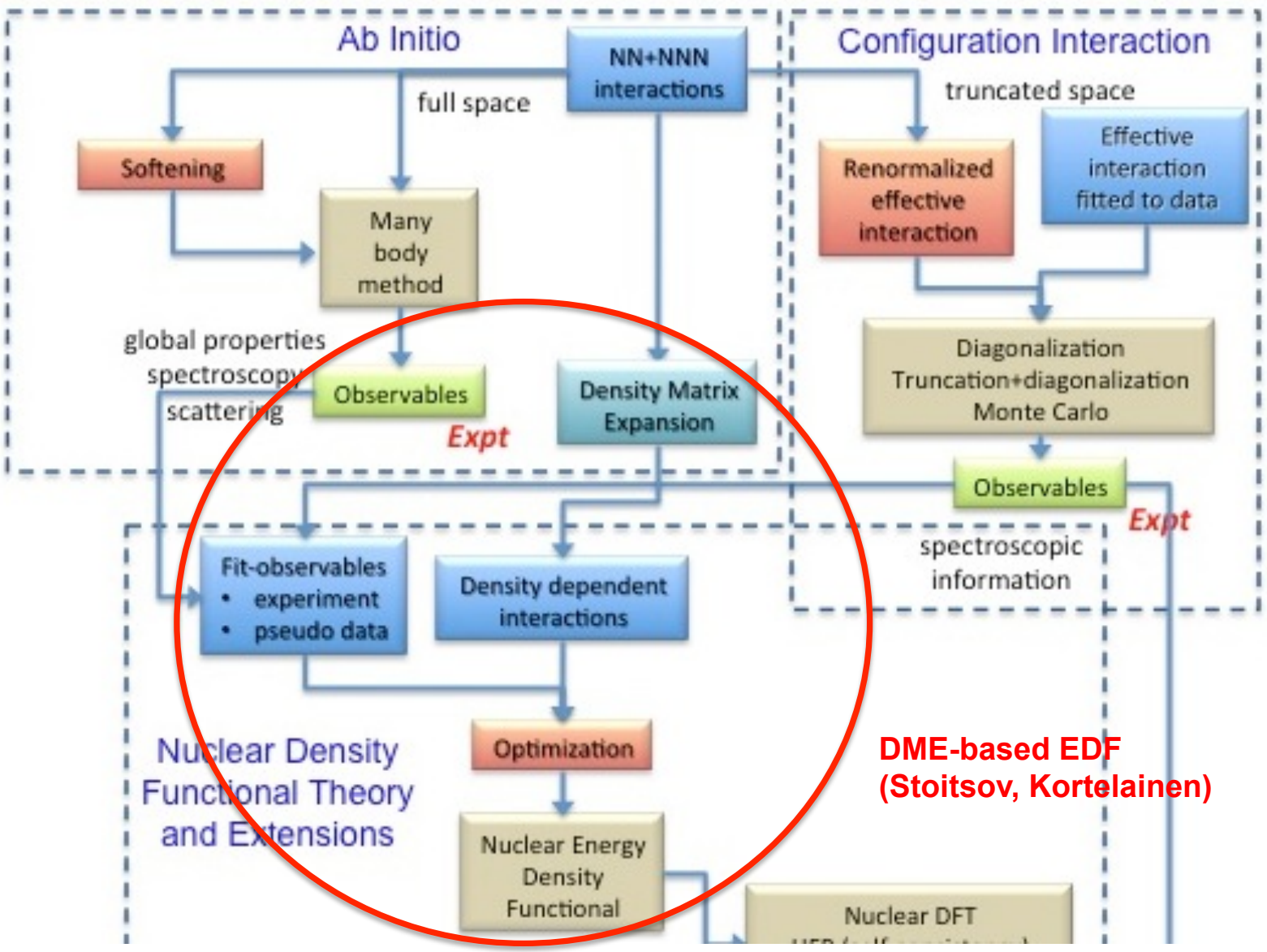
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DME-based EDF
(Stoitsov, Kortelainen)

Ab Initio Nuclear DFT Deliverables

Plan for Year-4 from Continuation Progress Report

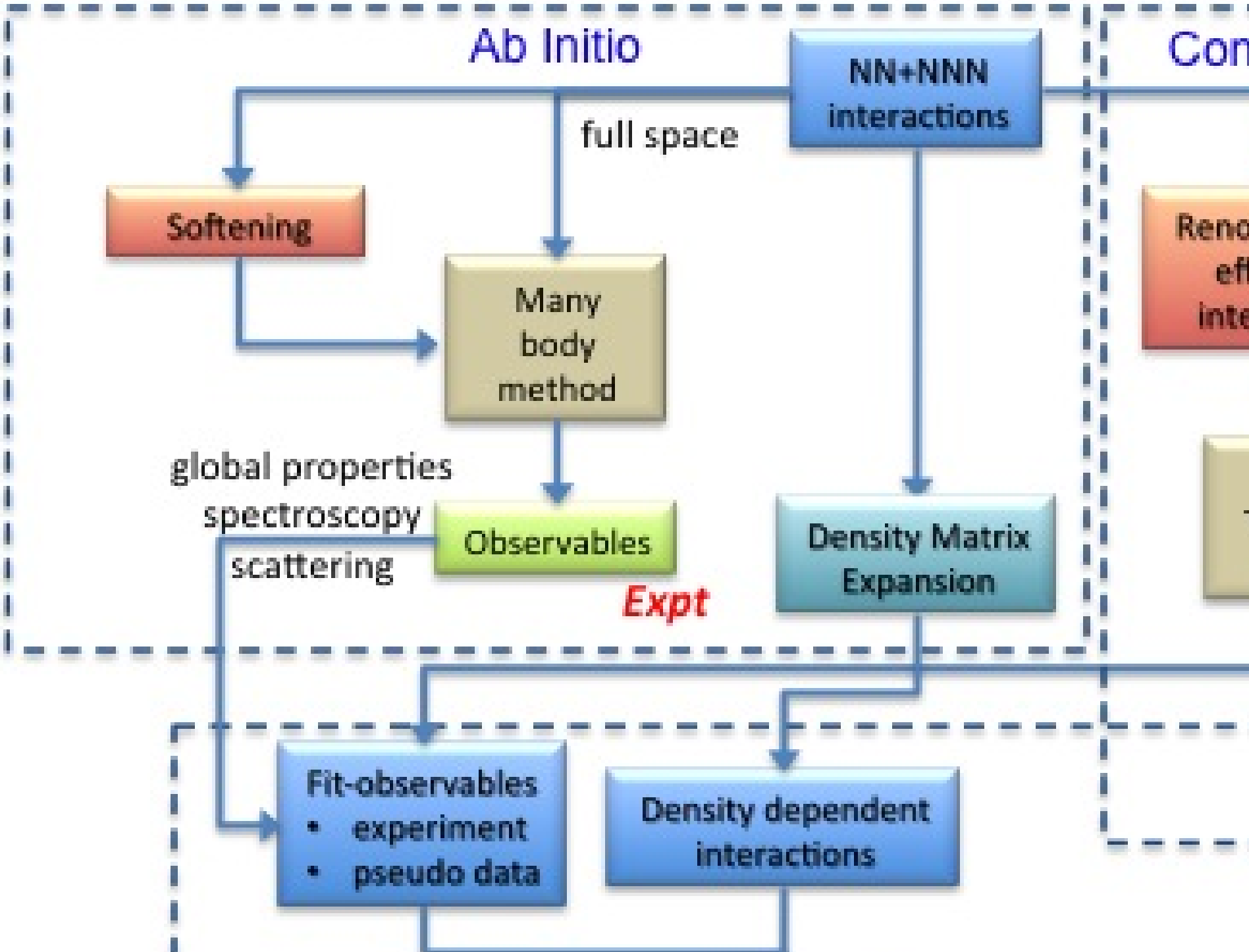
- Extend DME and validate against ab initio calculations. Initial work toward ^{40}Ca DME comparisons
- Further development of π–DME functionals; include pairing
- Continue development and testing of orbital-based DFT

Other deliverables from CPR

- Low-k interactions: evolve, test, export evolved 3D 3NF and evolve operators
- Improve and test nuclear matter on which DME relies
- Upgrade and validate the DME implementation
- Compare DME to CC and NCFC with the same (variable) Hamiltonian, including with external fields.
- In-medium SRG: Further closed-shell nuclei and ph channels in nuclear matter
- Develop and test a refit Skyrme functional including universal long-range DME parts

Talks in this session

- Eric Anderson, SRG-evolved operators
- Kai Hebeler, Neutron/nuclear matter with 3NF
- Scott Bogner, DME expansions and in-medium SRG
- Heiko Hergert, In-medium SRG for infinite matter
- Mario Stoitsov, DFT calculations with DME-based EDF
- Markus Kortelainen, Fortran module for density dependent parts of EDF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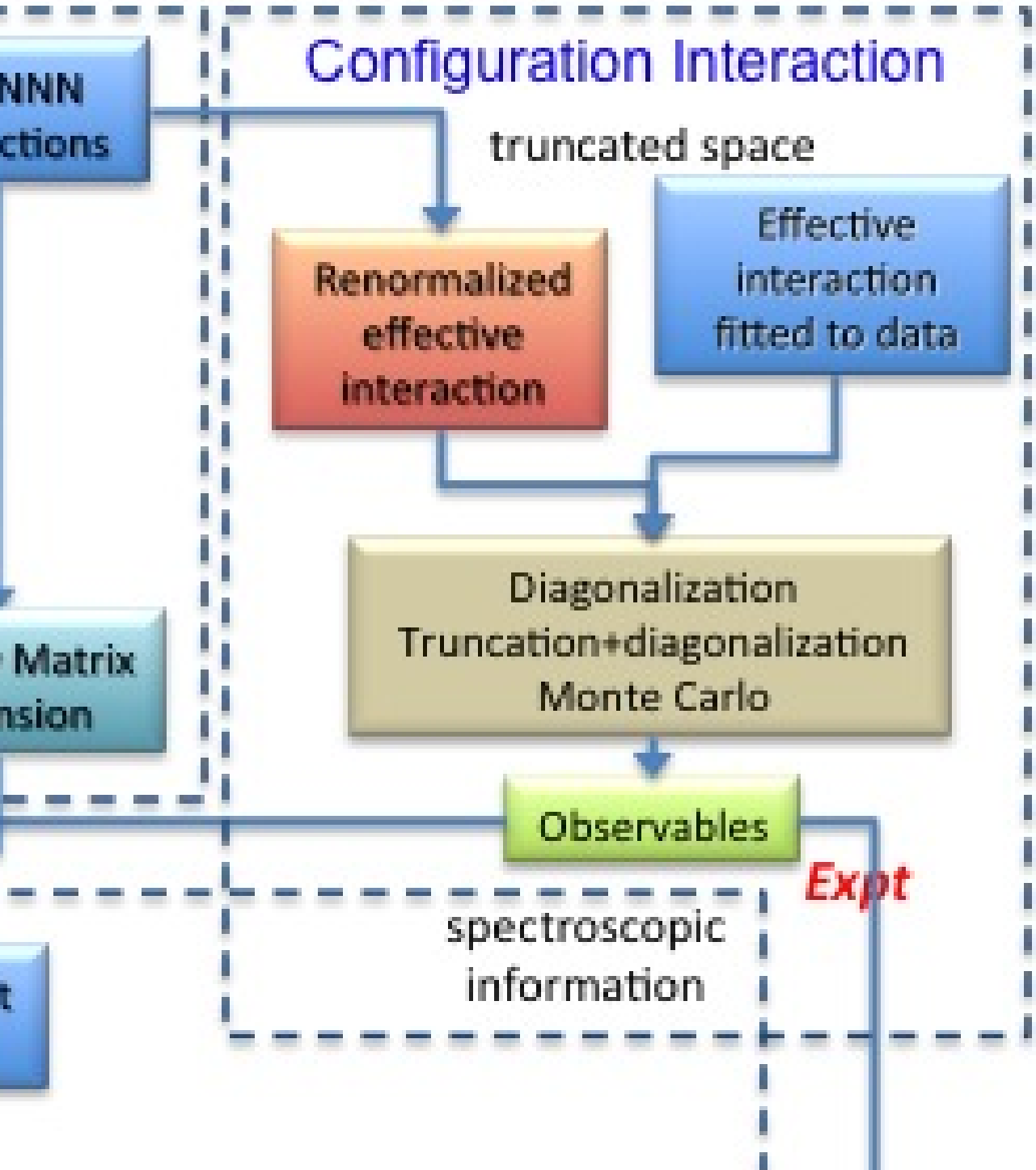
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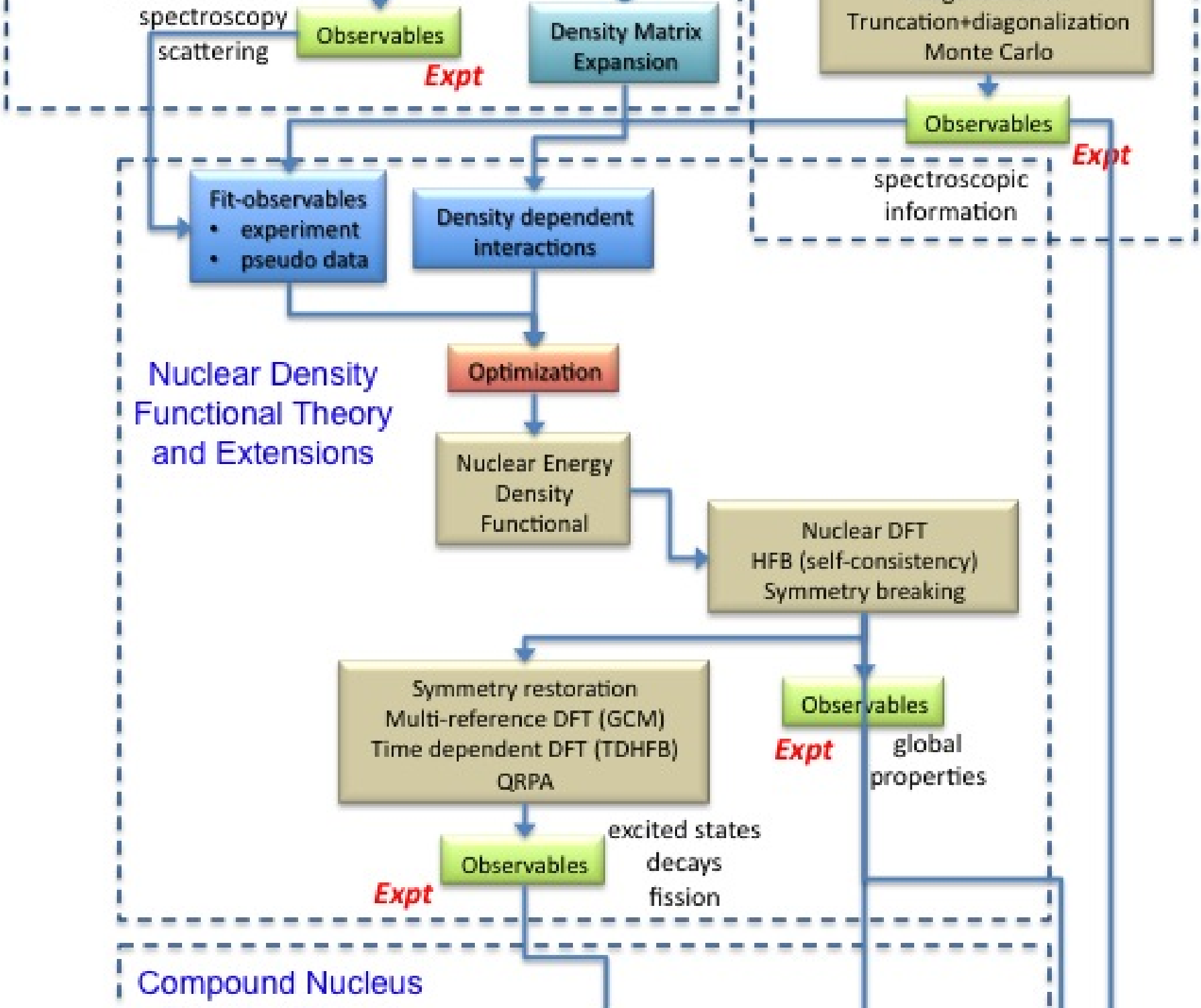
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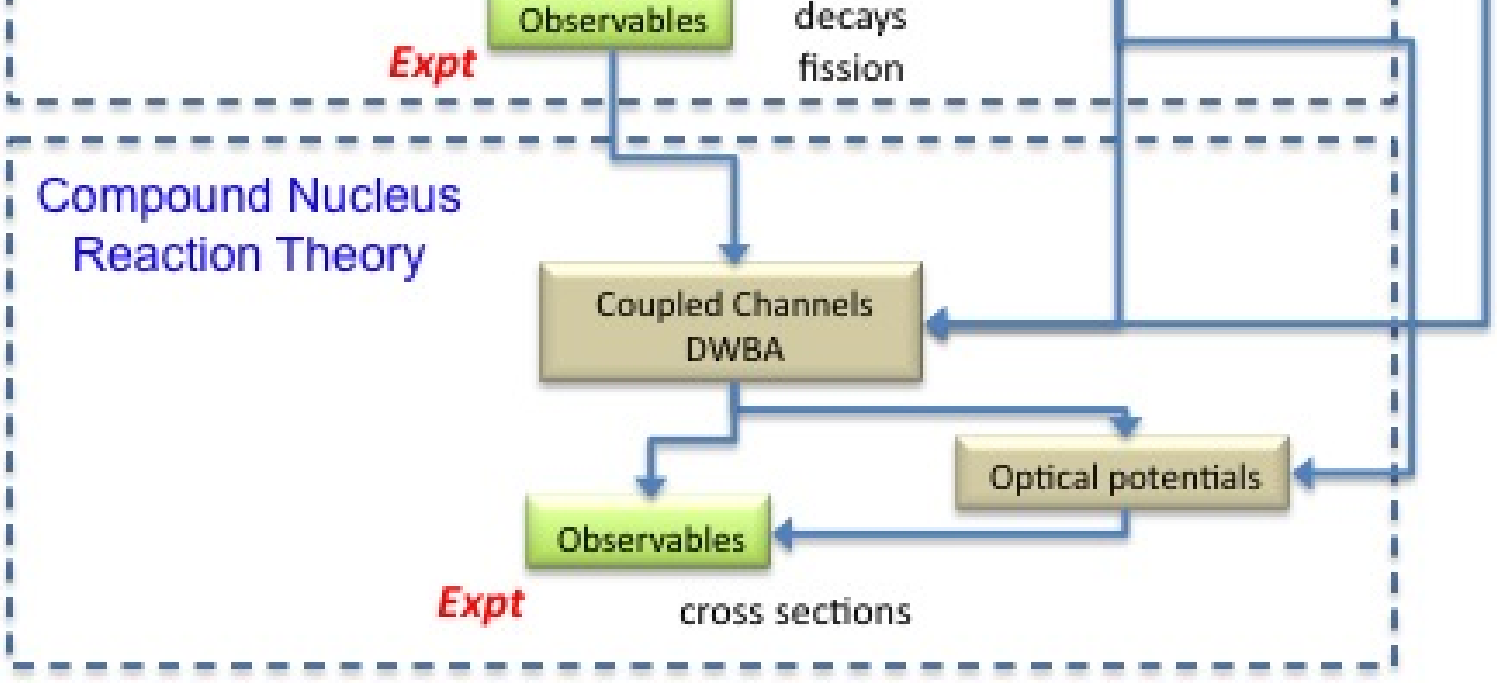
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