

# Update from Theory Community



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**University of York, University of Jyväskylä, University of Warsaw**  
**Nuclear Physics UK Community Meeting 2017**  
**5th - 6th January**  
**Warwick**

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# Outline

1. Staffing
2. Nuclear.Theory.Vision@UK
  - a) TALENT courses
  - b) Meetings
  - c) Visitors
3. Grand-challenge project
4. Theory support for experiment
5. Research plans
6. Priorities



# Permanent academic staff + core staff: January 2017



Jacek Dobaczewski



**Permanent academic staff + core staff  
+ emeriti + PDRAs : January 2017**

Towns & Villages Network  
british-towns.net



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# Nuclear Theory Vision @ UK

STFC funding for the **benefit of the entire UK** nuclear theory

## ➔ 3 international **TALENT courses**

Summer 2016: Nuclear DFT @ York, 3 weeks. Lectures by **Dobaczewski, Idini, Pastore & Schunck**, 27 MSc and PhD students

## ➔ Regular (twice a year) **1-day theory meetings**

November 2015 @ Manchester : 16 participants

May 2016 @ York : 14 participants

November 2016 @ Surrey : 24 participants

**Experimentalists welcome!**

## ➔ Visitor programme (High-profile and/or task-oriented):

April 2016 : Jeremy Holt, Texas A&M University

October 2016 : Tetsuo Hatsuda, RIKEN

January 2017 : Isaac Vidaña, University of Coimbra

February 2017 : Olga Rubtsova, Moscow State University

**Suggestions welcome!**

[http://personal.ph.surrey.ac.uk/%7Ecb0023/uktheory/Nuclear\\_Theory\\_Vision\\_%40\\_UK/Nuclear\\_Theory\\_Vision\\_%40\\_UK.html](http://personal.ph.surrey.ac.uk/%7Ecb0023/uktheory/Nuclear_Theory_Vision_%40_UK/Nuclear_Theory_Vision_%40_UK.html)

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# Grand-challenge project

Very preliminary discussions on the **neutrino-nucleus** scattering

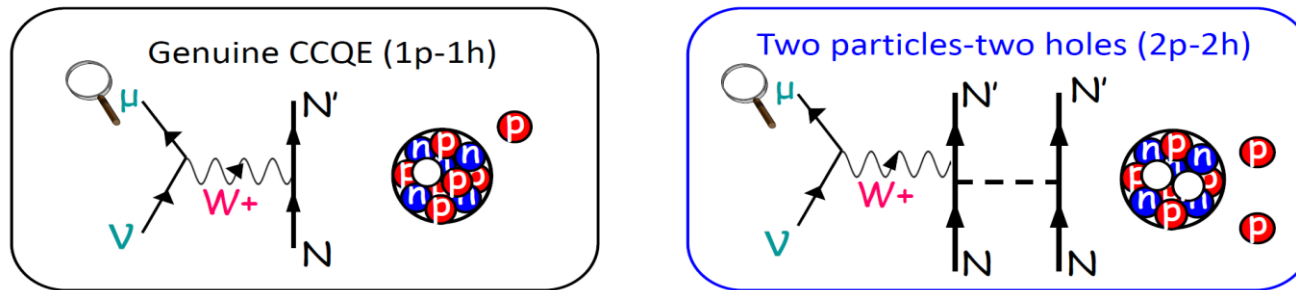
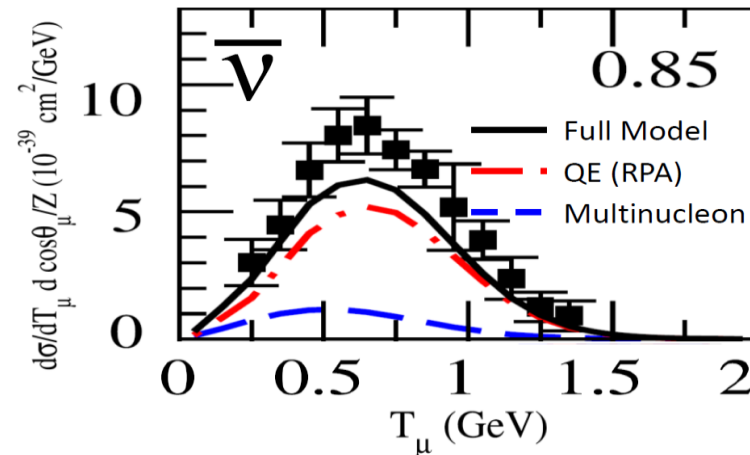
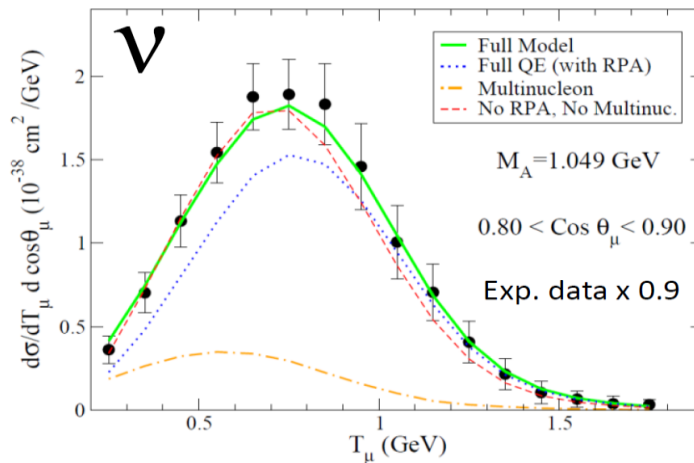


Figure 14. Schematic and pictorial representation of the 1p-1h and 2p-2h excitations.



Tepei Katori and Marco Martini, arxiv:1611.07770

**IPPP/NuSTEC topical meeting on neutrino-nucleus scattering**, will be held in Durham on 18-20 April 2017, organized by **Peter Ballett, Jacek Dobaczewski, Keith Ellis, Tepei Katori, Ken Long, Jorge Morfin, and Silvia Pascoli**

# Theory support for experiment

New cross-community effort suggested by STFC for the **benefit of the entire UK** nuclear experiment

- To be decided upon by the Nuclear Physics Grant Panel within the forthcoming Consolidated Grant Review
- Requested by Liverpool/Daresbury to study:
  - **K-isomers**
  - **Evolution of single-particle states**
  - **Octupole shapes**
  - **Triaxial high-spin states**
- Open to future collaborations and requests for support
- Under the supervision of the Cross Community Committee
- Moderate Initial request of one PDRA at York with a view to growth over the longer term if it is successful

**Maintained** support channels in reaction theory (**Surrey**) and Compton scattering (**Manchester**)



# Research plans

- York:**
- Better **precision and accuracy** in describing nuclei across the table of isotopes achieved by:
    - 1° building **novel energy density functionals** and
    - 2° **deriving functionals directly from *ab initio*** calculations for light nuclei

- Surrey:**
- Low-energy nuclear reaction processes (**fusion, transfer, and breakup**), reaction dynamics of few-body halo nuclei in the **wave-packet method**, developments in **(d,p) and (p,d)** reaction theory. overlap functions for **transfer and knockout reactions**
  - *Ab initio* theory within the **SCGF and CHH techniques**, and towards the **isospin frontier**, *ab initio* tools for the nuclear and **hyperon-nucleon interaction**, input for **electroweak-nucleus reactions**

- Manchester:**
- Chiral EFT for **Compton scattering** on light nuclei and **virtual Compton scattering** contribution to two-photon exchange in atoms and in lepton-nucleus scattering





# Priorities

- I. Maintain a sustained **growth of the UK nuclear theory** workforce, which should follow the recent rebound from its critical state.
- II. Maintain the research directions where the UK nuclear theory has **worldwide recognised achievement** record, leadership, and accumulated expertise.
- III. Rebuild the **PDRA support** to generally acceptable typical levels that are available within the present state of funding resources.
- IV. Work on stronger patterns of **theory-experiment links**, collaborations, and synergetic connections.
- V. Open new research directions with links to the UK **particle physics** community.



# Thank you

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