

Curriculum Vitae (as at March 2024)

Prof. Giovanni Hearne (ORCID ID: 0000-0002-1662-7831)

Department of Physics, University of Johannesburg (UJ)

Professor of Physics

Group leader of the Mössbauer and High Pressure Research Laboratory

Place and Date of birth: Gqeberha-SA, 15 March 1961

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Scientific Career

- 2012-present:** **Professor of Physics**, Department of Physics, University of Johannesburg, Johannesburg, SA
2009-2012: **Associate Professor**, Department of Physics, University of Johannesburg, Johannesburg, SA
2007-2009: **Reader and Associate Professor**, School of Physics, University of the Witwatersrand, Johannesburg, SA.
1995-2006: **Lecturer and subsequently Senior Lecturer**, School of Physics, University of the Witwatersrand, Johannesburg, SA.
1992-1994: **Post-Doctoral Associate**, School of Physics and Astronomy, High Pressure Research Group, Tel-Aviv University, Tel-Aviv, Israel.
1993: **PhD (Physics)**, University of the Witwatersrand, Johannesburg, SA. "The Lattice Dynamics of Sn-base A15 Superconductors by using ^{119}Sn Mössbauer Spectroscopy".

Scholarship and scientific output

NRF evaluation and rating: B2 (as of January 2023)

Research interests

Experimental Condensed Matter Physics. ^{57}Fe Mössbauer-effect spectroscopy at variable cryogenic temperatures (down to 1.5 K) and high pressures (up to one megabar). High pressure physics (diamond- and gem- anvil cells, DACs and GACs). Laser spectroscopy, XRD, electrical-transport and synchrotron-based techniques (XAS), at high pressures. CO_2 laser heating in DACs. Lattice-dynamics, superconductivity, magnetism, magnetic-electronic (insulator-metal and spin-state) transitions (in strongly correlated electron systems SCES), materials science. Instrumentation physics (electronics). Participation in numerous research projects pertaining to applied, industrial and bio-molecular physics. ^{197}Au (gold) Mössbauer-effect spectroscopy.

Publications

80 articles in peer-reviewed international journals, h-index is 22, ~1800 citation (**Scopus**).

Several invited presentations at international conferences.

Google scholar: <https://scholar.google.com/citations?hl=en&user=m75pWRAAAAAAJ>

Students and post-docs

6 PhD theses and 7 MSc dissertations supervised.

External examiner for several PhD and MSc theses, nationally and internationally.

Hosted several post-doctoral researchers, 1997 up to date (British, Chinese, Senegalese, Italian, French, Indian).

Membership

Member of the South African Institute of Physics.

Member of the International Association for the Advancement of High Pressure Science and Technology (AIRAPT), <http://www.airapt.org/>

Consultant to the IUCr Commission on High Pressure, <http://highpressure.iucr.org/>

External reviewer

On a regular basis: Journal of Physics: Condensed Matter, Physical Review B, Physical Review Materials, Physical Review Letters, Journal of Magnetism & Magnetic Materials (JMMM), Journal of Applied Physics. *On an occasional basis:* Science, Physica-B, Europhysics Letters, Intermetallics, Applied Physics Letters.

Selected peer reviewed research output over the last decade
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1. “Pressure-induced quantum phase transition in $\text{Fe}_{1-x}\text{Co}_x\text{Si}$ ($x = 0.1, 0.2$) ”
M. K. Forthaus, G. R. Hearne, N. Manyala, O. Heyer, R. A. Brand, D. I. Khomskii, T. Lorenz, and M. M. Abd-Elmeguid
Phys. Rev. B **83**, (2011) 085101 (1-10). **Highlighted as Editors’ Suggestion.**
2. “High P-T phase transformations and metastability in the $\text{Zr}_{0.5}\text{Hf}_{0.5}\text{O}_2$ solid solution ceramic”
Neil R. Jackson, Rudolph M. Erasmus, David G. Billing and Giovanni R. Hearne
Journal of the European Ceramic Society **32**, (2012) 697–704
3. “Pressure response of vacancy ordered maghemite ($\gamma\text{-Fe}_2\text{O}_3$) and high pressure transformed hematite ($\alpha\text{-Fe}_2\text{O}_3$) ”
Giovanni Hearne and Vittoria Pischedda
Journal of Solid State Chemistry **187** (2012) 134–142
4. “Pressure-induced suppression of charge order and nanosecond valence dynamics in Fe_2OBO_3 ”
G.R. Hearne, W.N. Sibanda, E. Carleschi, V. Pischedda and J.P. Attfield
Phys. Rev. B **86**, (2012) 195134 (1–5)
5. “Wigner-Mott insulator-to-insulator transition at pressure in charge-ordered Fe_2OBO_3 ”
G. Diguët, G. R. Hearne, W. N. Sibanda, E. Carleschi, P. Musyimi, V. Pischedda, and J. P. Attfield
Phys. Rev. B **89**, (2014) 035132 (1-8)
6. “(Phenoxyimidazolyl-salicylaldimine) iron complexes: synthesis, properties and iron catalysed ethylene reactions”
M. Yankey, C. Obuah, I. A. Guzei, E. Osei-Twum, G. Hearne and J. Darkwa
Dalton Trans. **43**, (2014), 13913–13923
7. “K-edge x-ray dichroism investigation of $\text{Fe}_{1-x}\text{Co}_x\text{Si}$: Experimental evidence for spin polarization crossover”
G.R. Hearne, G. Diguët, F. Baudalet, J.-P. Itié, N. Manyala
Journal of Magnetism and Magnetic Materials **379**, (2015) 274–279
8. “Coexistence of site- and bond-centered electron localization in the high-pressure phase of LuFe_2O_4 ”
G. R. Hearne, E. Carleschi, W. N. Sibanda, P. Musyimi, G. Diguët, Yu. B. Kudasov, D. A. Maslov, and A. S. Korshunov
Phys. Rev. B **93**, (2016) 105101 (1-7)
9. “ CuFeO_2 at a megabar: Stabilization of a mixed-valence low-spin magnetic semiconducting ground state”
W. M. Xu, G. R. Hearne, and M. P. Pasternak
Phys. Rev. B **94**, (2016) 035155 (1-6)
10. “ FeCr_2O_4 spinel to near megabar pressures: Orbital moment collapse and site-inversion facilitated spin crossover”
W. M. Xu, G. R. Hearne, S. Layek, D. Levy, J.-P. Itié, M. P. Pasternak, G. Kh Rozenberg, and E. Greenberg
Phys. Rev. B **95**, (2017) 045110 (1-9)
11. “Site-specific spin crossover in Fe_2TiO_4 post-spinel under high pressure up to nearly a megabar”
W. M. Xu, G. R. Hearne, S. Layek, D. Levy, J.-P. Itié, M. P. Pasternak, G. Kh Rozenberg, and E. Greenberg
Phys. Rev. B **96**, (2017) 045108 (1-11)
12. “Interplay between structural and magnetic-electronic responses of FeAl_2O_4 to a megabar: Site inversion and spin crossover”
W. M. Xu, G. R. Hearne, S. Layek, D. Levy, M. P. Pasternak, G. Kh Rozenberg, and E. Greenberg
Phys. Rev. B **97**, (2018) 085120 (1-9)

13. “Electron-density distributions in selected ferrocenyl-pyrazolyl late transition metal complexes”
M.A. Peck, G. R. Hearne, C. Obuah and J. Darkwa
Phys. Chem. Chem. Phys. **20**, (2018) 11682-11691

14. “Pressure-induced disruption of the local environment of Fe-Fe dimers in FeGa₃ accompanied by metallization”
G. R. Hearne, S. Bhattacharjee, B. P. Doyle, M. A. M. Ahmed, P. Musyimi, E. Carleschi and B. Joseph.
Phys. Rev. B **98**, (2018) 020101(R) (1-5)
Also featured in Eletttra Highlights 2018-2019
(see <https://www.eletttra.eu/images/Documents/SCIENCE/Eletttra%20HL%202019.pdf>)

15. “Unusual pressure-induced metallic state in the correlated narrow band-gap semiconductor FeSi”
G. R. Hearne, P. Musyimi, S. Bhattacharjee, M.K. Forthaus and M.M. Abd-Elmeguid.
Phys. Rev. B **100**, (2019) 155118 (1-9). **Highlighted as Editors’ Suggestion**

16. “Charge fluctuations across the pressure-induced quantum phase transition in EuCu₂(Ge_{1-x}Si_x)₂”
Mahmoud A. Ahmida, Martin K. Forthaus, Christoph Geibel, Zakir Hossain, Giovanni R. Hearne, Jirka Kaštil, Jiri Prchal, Vladimir Sechovský, and Mohsen M. Abd-Elmeguid
Phys. Rev. B **101**, (2020) 205127 (1-10)

17. “Interplay between valence fluctuations and lattice instabilities across the quantum phase transition in EuCu₂(Ge_{1-x}Si_x)₂”
Mahmoud A. Ahmida, Dirk Johrendt, Giovanni R. Hearne, Christoph Geibel, Zakir Hossain, and Mohsen M. Abd-Elmeguid
Phys. Rev. B **102**, (2020) 155110 (1-13)

18. “Pressure-Induced Spin Crossover at Room Temperature in a Nanoporous Host-Guest Framework Structure”
Banele Vatsha, Rowan Goliath, and Giovanni Hearne
ChemPlusChem **86**, (2021), 82–86
Also selected as a Cover Feature (CHEMPLUSCHEM 1/21)
(see <https://0-doi-org.ujlink.uj.ac.za/10.1002/cplu.202000705>)

19. “Effects of light-ion low-fluence implantation on the pressure response of double-walled carbon nanotubes”
G. R. Hearne, L. Kapesi, R. M. Erasmus, S. R. Naidoo, and R. Warmbier
Phys. Rev. Materials **5**, (2021), 033607 (1-11)

20. “Interplay between H-bonding proton dynamics and Fe valence fluctuations in Fe₃(PO₄)₂(OH)₂ at high pressure” G. Hearne, V. Ranieri, P. Hermet, J. Haines, O. Cambon, J.L. Bantignies, P. Fertey, T. Stuerzer, M. Poienar, J. Rouquette *Phys. Rev. B* **107**, (2023) L060302 (1-8)

Selected conference presentations over the last decade

“Pressure response of charge order in mixed valence warwickite Fe_2OBO_3 ”

G. Diguët, P. Musyimi, W. N. Sibanda, **G. R. Hearne**, E. Carleschi, V. Pischedda, and J. P. Attfield

Oral presentation: European High Pressure Research Group International Meeting (EHPRG 51) 1-6 September 2013, Queen Mary - University of London, London, UK

“On The Nature Of Electron Localization In The High Pressure Phase of LuFe_2O_4 ”

G.R. Hearne, E. Carleschi, W.N. Sibanda, P. Musyimi, G. Diguët

Poster Presentation: CORPES15 International workshop on strong correlations and angle-resolved photoemission spectroscopy, 5-10 July 2015, Couvent des Cordeliers, Paris-France.

“Coexistence of site- and bond-centered electron localization in the high pressure phase of the LuFe_2O_4 multiferroic”

G R Hearne, E Carleschi, W Sibanda , P Musyimi, G Diguët, Y Kudasov, D Maslov and A Korshunov

Poster Presentation: The 54th European High Pressure Research Group (EHPRG) International Meeting on High Pressure Science and Technology 4 – 9 September 2016 • Bayreuth/Germany.

“Intriguing electrical-transport behavior in the high pressure phase of the hybridization gapped semiconductor FeGa_3 ”

G R Hearne, M A M Ahmed, P Musyimi, E Carleschi and B P Doyle

Oral Presentation: The 54th European High Pressure Research Group (EHPRG) International Meeting on High Pressure Science and Technology 4 – 9 September 2016 • Bayreuth/Germany.

“Spin crossover and charge gap resilience in ferrous spinels up to a megabar”.

G. R. Hearne, W. M. Xu, S. Layek, D. Levy, J-P. Itié, M. P. Pasternak, G. Kh. Rozenberg and E. Greenberg

Oral Presentation: The 55th European High Pressure Research Group (EHPRG) International Meeting on High Pressure Science and Technology 3 – 8 September 2017 • Poznan/Poland.

“Pressure induced disruption of charge order in mixed-valence barbosalite $\text{Fe}_3(\text{PO}_4)_2(\text{OH})_2$ ”

T.N. Nelufule, **G.R. Hearne**, J. Rouquette

Oral Presentation: The 27th AIRAPT International Conference on Science and Technology 4 – 9 August 2019 • Rio-de-Janeiro/Brazil.

“Promoting carbon nanotube interlinking using ion implantation and high pressures in a diamond anvil cell”

L. Kapesi, **G.R. Hearne**, R. Erasmus and S. Naidoo

Poster Presentation: The 27th AIRAPT International Conference on Science and Technology 4 – 9 August 2019 • Rio-de-Janeiro/Brazil.

“Magnetic-electronic studies at a megabar: the new frontier”

G.R. Hearne, W. M. Xu, S. Layek, D. Levy, J-P. Itié, M. P. Pasternak, G. Kh. Rozenberg and E. Greenberg

Invited Keynote Presentation: Synchrotron Techniques under High Pressure (PRESSYNC), satellite workshop to the 27th AIRAPT International Conference on Science and Technology 31 July – 2 August 2019 • Campinas/Brazil.

“Facilitating irreversible nanotube interlinking using combined ion-implantation pre-processing, high pressures and high temperatures”.

G. R. Hearne, L. Kapesi, R. M. Erasmus, S. R. Naidoo, and R. Warmbier. Invited oral presentation at the Mini-Colloquium “Physics of nanosystems at extreme conditions” of the “Journées de la Matière Condensée”

(JMC) organized by the [Condensed Matter Physics Division](#) of the [French Physical Society](#) (SFP). The largest national congress of Condensed Matter Physics in France (600-700 participants). 22-26 August 2022.