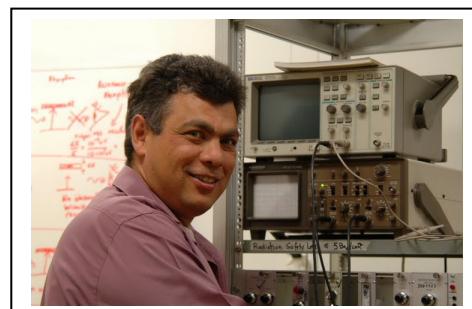


CURRICULUM VITAE*

PERSONAL DETAILS

Name : **GIOVANNI HEARNE**
Present Employment: **PROFESSOR OF PHYSICS**
DEPARTMENT OF PHYSICS
(staff # 720008674),
UNIVERSITY OF JOHANNESBURG
P O BOX 524
AUCKLAND PARK
2006
Ph office : +27-011-559-3849
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Fax : +27-011-559-2339
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e-mail : GRHEARNE@UJ.AC.ZA



ACADEMIC QUALIFICATIONS

1978 –
1985 : BSc (Physics and ComputerScience), BSc Hons (Physics), MSc (Physics)
University of the Witwatersrand.

1993 : PhD (Physics)
University of the Witwatersrand.
"The Lattice Dynamics of Sn-base A15 Superconductors by using ^{119}Sn
Mössbauer Spectroscopy " ;

ACADEMIC AND PROFESSIONAL EXPERIENCE

1992 : **Post-Doctoral Associate** (1992-1994)
School of Physics and Astronomy
Tel-Aviv University , Tel-Aviv , Israel .

1995 : **Lecturer**
Department of Physics
Witwatersrand University , Johannesburg , South Africa .

1999 : **Senior Lecturer**
School of Physics
Witwatersrand University , Johannesburg , South Africa

2007 to
June-2009 : **Reader and Associate Professor**
School of Physics
Witwatersrand University , Johannesburg , South Africa

* as of July-2019

July-2009

**Dec-2012 : Associate Professor
Department of Physics
University of Johannesburg , Johannesburg, South Africa**

Jan-2013

**to date : Professor
Department of Physics
University of Johannesburg , Johannesburg, South Africa**

MEMBERSHIP OF PROFESSIONAL ASSOCIATIONS

- ✓ South African Institute of Physics (SAIP) ;
- ✓ International Association for the Research and Advancement of High Pressure Science and Technology (AIRAPT) .

ACADEMIC DISTINCTIONS /AWARDS

- 1996 : **Foundation for Research and Development (FRD National Funding Agency) -- President's Award.**
- 1996 : **University Vice-Chancellor's Research Award (University of the Witwatersrand)**
- 2004 : **University Council Fellowship -- R150000 (~Euro19000) awarded to only one individual in the University in any given year (University of the Witwatersrand).**
- 2005 : **2004 NSTF Science and Technology (NSTF/NRF) Award to most outstanding senior black researcher of the last 5-10 years.**

SUPERVISION OF HIGHER DEGREES AND MENTORSHIP OF UNDERGRADUATES

Supervision or co-supervision completed and higher degrees awarded

- Mentorships -- three NRF Assistantships BSc (Physics) ;
- Nine MSc students ;
- Six PhD students ;

Supervision in Progress (2019)

- Two MSc students , one PhD student ;

POST-DOCTORAL ASSOCIATES

| | | |
|--------------------|---|--|
| 1997 | : | Dr Pamela Murphy (UK) [Raman spectroscopy] ; |
| 2000 – 2001 | : | Dr Jing Zhao (PR China) [DACs , Raman spectroscopy, Crystallography] ; |
| 2004 (Sept-Nov) | : | Dr Sossé Ndiaye (Senegal) [Raman Spectroscopy] ; |
| 2004 – 2006 | : | Dr Vittoria Pishedda (Italy) [DACs , Crystallography] ; |
| 2010 | : | Dr Charles Kasl (SA) [DACs , Conductivity] ; |
| 2013 | : | Dr Gildas Diguët (France) [DACs, Magnetics] ; |
| 2017 – 2018 | : | Dr Shuvrajyoti Bhattacharjee (India) [Structural elucidation, Dielectric measurements] ; |

LECTURING/TEACHING EXPERIENCE

- **FIRST YEAR AUXILIARY PHYSICS**

Building Science students and Physics non-majors.
Lectured all topics. Course Co-ordinator.
(“Physics” : Giancolli)

- **PHYSICS-I PRACTICALS**

First Year Physics Majors and Engineering students.
Practicals sessions coordinator.

- **PHYSICS- II & III PRACTICALS**

University of South Africa (UNISA Correspondence course)
Physics practicals : second- and third- year levels.
Practicals sessions coordinator.

- **MATERIALS SCIENCE II**

Second Year Physics and Chemistry Majors
Electrical, Magnetic, Optical and Thermal Properties of Materials
(“Materials Science and Engineering : An Introduction” , W.D Callister 7th ed.)

- **THIRD YEAR STATISTICAL PHYSICS and SOLID STATE PHYSICS**

Third year Physics Majors
(“Statistical Physics” by Mandl , “Solid State Physics” by Hooke and Hall)

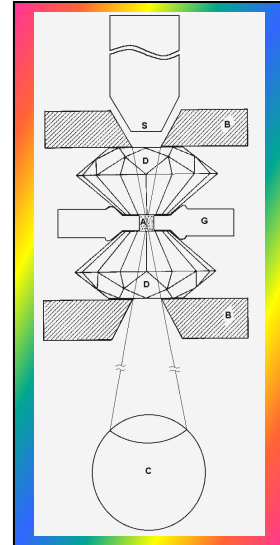
- **PHYSICS HONOURS** (Fourth year)

Solid State Physics (“Introduction to Solid State Physics” , Kittel and Meyer)
Applications of Statistical Mechanics (“Statistical Mechanics” , Pathria)

RESEARCH

1985 - to date : **Experimental Condensed Matter Physics --**

^{57}Fe and ^{119}Sn 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 and Conductivity 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). Synchrotron techniques (XRD, XAS, Nuclear Resonance Spectroscopy) applications at high pressure. Participation in numerous research projects pertaining to applied, industrial and bio-molecular physics. ^{197}Au (gold) Mössbauer-effect spectroscopy ;



- Current research-leader of both the “Mössbauer” and “High-Pressure Research” Laboratories in the Department of Physics at the University of Johannesburg ;
- Member of the DST-NRF Centre of Excellence in Strong Materials (CoE-SM) , New Ultra Hard Materials (NUHM) focus area ;
- Five invited talks at International Conferences (high pressure research) ;
- Reviewer for the journals: Science, Physical Review Letters, Physical Review B, Physical Review Materials, EuroPhysics Letters, Journal of Physics - Condensed Matter , Physica-B, Intermetallics, Journal of Applied Physics, Applied Physics Letters, Materials Chemistry Frontiers.

RESEARCH FACILITIES

- Diamond anvil cell (DAC) facilities, including several miniature Merrill-Bassett type DACs, miniature piston-cylinder DACs for very high pressure studies and a membrane DAC. Home built spark-erosion drilling apparatus and ruby-fluorescence facility for pressure measurements. Premier compound and stereo microscopes for preparation and loading of the DAC.
- Two Mössbauer spectrometers. Variable temperature capabilities to 4 K in liquid helium cryostats. A furnace is available for high temperature studies.

- One Mössbauer spectrometer may be equipped with a precision x-y stage and where necessary $^{57}\text{Co}(\text{Rh})$ “point” source for Fe Mössbauer pressure studies.
- CO_2 laser-heating facility for attaining high temperatures (up to 3000 K) in the DAC.
- Temperature dependent (300 – 3 K) DAC resistivity pressure studies.
- Both Raman spectroscopy and lab-based XRD pressure studies are possible using the facilities at the University of the Witwatersrand (both Schools of Physics and Chemistry). Raman spectroscopy in the DAC is also performed on a WITEC spectrometer in the Department of Geology at UJ.
- Turn-buckle magnetic DAC (TM-DAC from CSEC , Univ of Edinburgh) for magnetization measurements in the MPMS:SQUID to 100 – 120 kbar.

INTERNATIONAL AND NATIONAL STANDING

NRF EVALUATION AND RATING: B3 (since April 2017)

H-INDEX: 21 ; Times Cited (without self-citations) : ~1390
(SCOPUS, July 2019)

SHORT-TERM RESEARCH VISITS (1 - 5 months)

1998 : School of Physics and Astronomy, Tel-Aviv University , ISRAEL ;

2003 : II-Physikalisches Institut , Universität zu Köln, GERMANY ;

2005 : Department of Physics , Sultan Qaboos University, OMAN ;

2006 : II-Physikalisches Institut , Universität zu Köln, GERMANY ;

2008-

2012 : II-Physikalisches Institut , Universität zu Köln, GERMANY
(annual 2-3 week research visits) ;

SERVICE TO THE UNIVERSITY/PROFESSION/DISCIPLINE/COMMUNITY

1997 – 2016

- Served on numerous NRF Physics Advisory and Assessment Panels ;
- Served on numerous NRF and NLC (National Laser Centre) bursaries assessment panels ;
- NLC (National Laser Centre) : Head of task team to audit laser research activities and equipment on the African Continent (2002) ;
- Inception committee of the African Laser Centre (ALC) (2001 to 2003) : the first networked Centre of Excellence for science under NEPAD, launched Sept. 2003 ;
- Technikon (University of Technology) National Advisory Panel : Nano-materials (TWR) 2004 & 2005 ;
- External Examiner for a number of MSc dissertations to date (Sultan Qaboos University - Oman; Univ of Johannesburg ; WITS University) ;
- External Examiner for a number of PhD theses to date (Univ of Stellenbosch; WITS University) ;
- 2006 to 2010 : Associated with the DST instituted South African Synchrotron Initiative (SASI) . Currently part of the Synchrotron Research Road Map Implementation Committee (SRRIC)
See <http://psi.phys.wits.ac.za/wiki/Synchrotron/Synchrotron>.

**REPRESENTATIVE FULL JOURNAL PUBLICATIONS
IN HIGH PRESSURE RESEARCH AND SPECTROSCOPY**

Selected earlier works in high pressure research

“⁵⁷Fe Mössbauer Spectroscopy in a Diamond-Anvil Cell at Variable High Pressures and Cryogenic Temperatures”

G.R. Hearne, M.P. Pasternak and R.D. Taylor

Review of Scientific Instruments **65** , (1994) 3787-92 .

“Pressure-induced Metallization of ZnSe”

G. Itkin , G.R. Hearne, E. Sterer , M.P. Pasternak, W. Potzel

Physical Review B **51** , (1995) 3195-97 .

“Electronic Structure and Magnetic Properties of LaFeO₃ at High Pressure”

G.R. Hearne, M.P. Pasternak , R.D. Taylor and P. Lacorre

Physical Review B **51** , (1995) 11495-500 .

“Mössbauer Studies of Pressure-Induced Amorphization in the Molecular Crystal SnBr₄”

G.R. Hearne , M.P. Pasternak and R.D. Taylor

Physical Review B **52** , (1995) 9209-213.

“The Nature of the Verwey Transition in Magnetite (Fe₃O₄) to Pressures of 16 GPa”

G.Kh. Rozenberg , G.R. Hearne, M.P. Pasternak , P. Metcalf and J.M. Honig

Physical Review B **53** , (1996) 6482-6487.

“Experimental confirmation of a *p-p* intra-band gap in Sr₂FeO₄”

G. Kh. Rozenberg, A.P. Milner, M. P. Pasternak , G.R. Hearne, R.D. Taylor

Physical Review B **58** , (1998) 10283-10287.

“Electrical-transport, Magnetism and Spin-state Configurations of High-pressure Phases of FeS”

S. Takele and G.R. Hearne,

Physical Review B **60** , (1999) , 4401-4403

“Surface Brillouin Scattering at High Pressure – Application to a Thin Supported Gold Film”

J.C. Crowhurst, G.R. Hearne, J.D. Comins, A.G. Every, and P.R. Stoddart,

Phys. Rev. B **60** , (1999), R14990-R14993

“CO₂ laser-heated diamond-anvil cell methodology revisited”

G.R. Hearne, A. Bibik, and J. Zhao

J. Phys : Condens. Matter **14**, (2002) , 11531-11535

Selected more recent works in high pressure research

“Pressure induced Fe²⁺ + Ti⁴⁺ intervalence charge transfer and the Fe³⁺/Fe²⁺ ratio in natural ilmenite (FeTiO₃) minerals”

S. Takele and G.R. Hearne

J. Phys : Condens. Matter **16**, (2004), 2707-2718

“Effect of grain size on the structural transitions in anatase TiO₂: A Raman spectroscopy study at high pressure”

G.R. Hearne, J. Zhao, A.M. Dawe, V. Pischedda, M. Maaza, M. K. Nieuwoudt, P. Kibasomba, O. Nemraoui and J. D. Comins

Phys. Rev. B **70**, (2004), 134102 (10pgs)

“Sub-nanoscale, single molecule, magnetic-electronic switches from externally perturbed spin states in Iron(III)-based complexes”

G.R. Hearne , O. Munro, N. Pearson and M. Shongwe

Invited presentation at the second International Symposium on Nuclear Probes at High Pressure (HPNP'04), July 2004, Cologne (Kardinal Schulte Haus), Germany.

J.Phys:Condens.Matter **17**, (2005), S727-S742

“Ultra-stability and enhanced stiffness of ~6nm TiO₂ nano-anatase and eventual pressure-induced disorder on the nanometer scale”

V. Pischedda, G. R. Hearne, A. M. Dawe, and J. E. Lowther

Phys. Rev. Lett. **96**, (2006) 035509(1-4) . Also e-publication in *Virtual Journal of Nanoscale Science & Technology* **13**, Issue 6 (2006), see <http://www.vjnano.org> .

“Pressure-induced amorphization and a possible polyamorphism transition in nanosized TiO₂. An X-ray Absorption Spectroscopy study ”

A.-M. Flank, P. Lagarde, J.-P. Itié, A. Polian , G.R. Hearne

Phys. Rev. B **77**, (2008), 224112 (9pgs)

“Nanomaterials at high pressure : spectroscopy and diffraction techniques”

G.R. Hearne (*invited lecturer*) , 41st Course of the International School of Crystallography, held in Erice-Italy from June 4 - 14, 2009.

Chapter in , **High-Pressure Crystallography : From Fundamental Phenomena to Technological Applications**

Series : NATO Science for Peace and Security Series : B – Physics and Biophysics, eds. E. Boldyreva and P Dera, (Netherlands : Springer), (2010), 503 - 512

ISBN 978-90-481-9260-1 (PB)

“Simplified manual fabrication of cubic-zirconia gem anvils for extended energy-range spectroscopic studies to routine high pressures of 100–150 kbar (10–15 GPa)”

N. R. Jackson, R. M. Erasmus, and G. R. Hearne

Review of Scientific Instruments **81**, (2010), 073903 (1-6)

“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.

“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

“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

“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)

“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)

“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)

“ 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)

“ 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)

“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)

“Interplay between structural and magnetic-electronic responses of FeAl₂O₄ 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)**

“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)**

**REPRESENTATIVE FULL JOURNAL PUBLICATIONS
IN OTHER RESEARCH FIELDS**

“DRIFTS studies of the interaction of nitric oxide and carbon monoxide on Au-TiO₂”

M.A. Debeila, N.J. Coville, M.S. Scurrall, **G.R. Hearne**,
Catalysis Today **72 (1-2)**, (2002) 79-87

“The fate of haem iron in the malaria parasite *Plasmodium falciparum*”

J.M. Combrinck, J. Egan, T.J. Egan, **G.R. Hearne**, H.M. Marques, S. Ntenti,
B.T. Sewell P.J. Smith, D. Taylor, D. A. van Schalkwyk , J. C. Walden
Biochemical Journal **365**, (2002) 343-347
ALSO TOP NEWS JUNE 2002

“A one-step ambient temperature ferrite process for treatment of acid mine drainage waters”

O. Lahav, B. E. Morgan, **G.R. Hearne** and R. E. Loewenthal
J. Environ. Eng. (American Society of Civil Engineers) **129**, (2003) 155–161

“Reductive routes to stabilized nanogold and relation to catalysis by supported gold”

D. Boyd, S. Golunski, **G.R. Hearne**, T. Magadzu, K. Mallick, M.C. Raphulu,
A. Venugopal, M.S. Scurrall
Applied Catalysis A: General **292**, (2005) 76–81

“Thermally Induced Two-Step, Two-Site Incomplete ${}^6A_1 \leftrightarrow {}^2T_2$ Crossover in a Mononuclear Iron(III) Phenolate-Pyridyl Schiff-Base Complex: A Rare Crystallographic Observation of the Coexistence of Pure S= 5/2 and 1/2 Metal Centers in the Asymmetric Unit ”

Musa S. Shongwe, Badria A. Al-Rashdi, Harry Adams, Michael J. Morris, Masahiro Mikuriya, and **Giovanni R. Hearne**
Inorg. Chem. **46**, (2007) 9558-9568

“On the physico-chemical and physiological requirements of hemozoin formation promoted by perimicrovillar membranes in *Rhodnius prolixus* midgut ”

Renata Stiebler, Bruno L. Timm, Pedro L. Oliveira, **Giovanni R. Hearne**,
Timothy J. Egan, Marcus F. Oliveira
Insect Biochemistry and Molecular Biology **40**, (2010) 284–292

“(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

“K-edge x-ray dichroism investigation of Fe_{1-x}Co_xSi: Experimental evidence for spin polarization crossover”

G.R. Hearne, G.Diguet, F.Baudelet , J.-P.Itié , N.Manyala
Journal of Magnetism and Magnetic Materials **379**, (2015) 274–279

“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