

DR. GEOFFREY O. OKENG'O, Ph.D.

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CAREER OBJECTIVE

To establish a stellar lifelong career as a polished and distinguished physicist, astrophysicist, thinker and educator, able to elegantly combine research, teaching and consultancy in order to train, mold, inspire and nurture holistic graduates appropriately equipped with skills to meet the 21st century technology, innovation, economic and scientific needs.

RESEARCH STATEMENT

Over the years, my enthusiasm for knowledge and understanding has seen me carry out research in various topics ranging from *radio astronomy* (Calibration of a 22-GHz radio receiver on a Telescope - NASSP Honor thesis, 2008); *stellar astrophysics* (Theoretical Study of Stellar Pulsations in Young Brown Dwarfs - M.Sc. thesis, 2011); *cosmology* (Modeling structure formation in the Universe with Interacting Fluids - PhD thesis, 2015) ; *Planetary and Solar System Physics* (supervised 2 undergraduate students in solar system modeling and dangerous asteroid impact analysis), amongst others. The result has been that I have, not only evolved to be more thorough scientist, but also have acquired a broad range of skills that are up to date with the demands of the 21st century world of academia and industry.

Additionally, current shifting trends in research and industry powered by emergence of new technological developments and challenges, have seen my research interests broaden recently to include applications of data science and Machine Learning. I'm interested in developing big data analytics and scientific computing techniques applicable in a wide range of disciplines including astrophysics, computer science, physics, mathematical sciences and technology. I'm the founder and coordinator of The Scientific Computing Academy, founded in 2016. My vision is summed by the statement: "inspiring, nurturing and educating tomorrow's technology-versed learners able to contribute to solving the world's most challenging problems of our time".

WORK EXPERIENCE

DEC. 2015 – TO DATE

LECTURER, DEPARTMENT OF PHYSICS, UNIVERSITY OF NAIROBI

Lecturing physics and astrophysics courses to undergraduate and beginning graduate students. Research and students research projects supervision. Consultancy - mathematical modeling,

curriculum development, physics and astrophysics. The courses taught include: *Mathematical Physics, Electrodynamics, Quantum Mechanics, Relativity, Stellar Astrophysics, Cosmology and Galaxies*.

FEB. 2015 – MAY 2015

VISITING POSTDOCTORAL FELLOWSHIP, INTER-UNIVERSITY CENTRE FOR ASTRONOMY AND ASTROPHYSICS, PUNE, INDIA

- I worked with Professor Kandaswamy Subramanian and Associate Professor Sanjit Mitra on the following areas of their research:
 - Cosmic Magnetism
 - Gravitational Waves detection using LIGO-India
 - CMB temperature fluctuations and polarization
- I gave a public seminar on my PhD thesis work titled “*Modeling Structure formation with interacting fluids*”. I also worked with the head of Science Outreach Mr Samir Dhurde in conducting schools’ public outreach and science awareness.

MAY 2016 – TO DATE

FOUNDER & COORDINATOR, THE SCIENTIFIC COMPUTING ACADEMY, DEPARTMENT OF PHYSICS, UNIVERSITY OF NAIROBI

Designing, coordinating and administering short courses and lectures on scientific computing, targeted at graduate students, junior researchers and researchers from government, industry and the private sector. The Scientific Computing Academy (SCA) aims at providing unique, hands-on, practical problem-oriented training in order to alleviate an existing skills gap at the interface of computer science and applied sciences.

DEC. 2018 – TO DATE

SECRETARY/CEO, THE CHIROMO CAMPUS CLUB, UNIVERSITY OF NAIROBI

Currently serving as the club Chief Executive Officer.

DEC. 2015 – TO DATE

MEMBER & THEMATIC HEAD (ASTROPHYSICS), CURRICULUM REVIEW COMMITTEE, DEPARTMENT OF PHYSICS, UNIVERSITY OF NAIROBI

Conducted an overhaul of the Bsc (Astrophysics) undergraduate programme first introduced in 2009, introducing new modern and relevant courses that allow students to major in radio astronomy, astrodynamics, space technology and aerodynamics, remote sensing and space systems design and programming.

DEC. 2015 – TO DATE

MEMBER, NATIONAL SQUARE KILOMETRE ARRAY STEERING COMMITTEE, NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION, MINISTRY OF HIGHER EDUCATION, KENYA

Active member of the national technical steering committee tasked with developing a framework for building the first ever radio astronomy observatory at Mt. Longonot Kenya, that will be part of the African Very Long Baseline Interferometry (AVLBI) and the Square Kilometer Array (SKA) phase II.

FEB. 2012 – NOV. 2015

TUTORIAL FELLOW, DEPARTMENT OF PHYSICS, UNIVERSITY OF NAIROBI

Lecturing Physics and Astronomy undergraduate courses, undergraduate student projects supervision and consultancy.

OCT. 2010 – JAN. 2012

GRADUATE ASSISTANT, DEPARTMENT OF PHYSICS, UNIVERSITY OF NAIROBI

Lecturing Physics and Astronomy undergraduate courses, undergraduate student projects supervision and consultancy.

JAN. 2009 – DEC. 2009

TUTOR, ELECTRODYNAMICS AND ASTROPHYSICS, DEPARTMENT OF MATHS & APPLIED MATHEMATICS, UNIVERSITY OF CAPE TOWN, SOUTH AFRICA

Tutor for electrodynamics and astrophysics honors courses at the National Astrophysics and Space Science Programme (NASSP), University of Cape Town, South Africa.

JUN. 2008 – JULY 2009

TUTOR, SENIOR A-LEVEL PHYSICS & MATHEMATICS, INTERNATIONAL SCHOOLS OF CAPE TOWN AND HOUT BAY, CAPE TOWN, SOUTH AFRICA

Appointed Senior A-Level Mathematics and Physics tutor, prepared students for the Cambridge Senior A-Level examination.

JAN. 2002 – JUL. 2007

HIGH SCHOOL TEACHER, PHYSICS, MATHEMATICS AND CHEMISTRY, VARIOUS SECONDARY SCHOOLS, KISII & NAIROBI, KENYA

Teacher in High School Physics, Mathematics and Chemistry before joining university and during all university vacations and breaks.

EDUCATION

SEPTEMBER 2015:

DOCTOR OF PHILOSOPHY IN PHYSICS (ASTROPHYSICS), UNIVERSITY OF THE WESTERN CAPE, CAPE TOWN, SOUTH AFRICA

My thesis was in the area of Theoretical Cosmology supervised by Professor Roy Maartens – an A-rated Professor of Cosmology and the National Research Foundation (NRF) Square Kilometre Array (SKA) Research Chair in Cosmology at University of the Western Cape. My work was funded by a SKA doctoral bursary.

MARCH 2011:

MASTER OF SCIENCE IN PHYSICS (ASTROPHYSICS), UNIVERSITY OF THE WESTERN CAPE (THESIS) AND UNIVERSITY OF CAPE TOWN (COURSEWORK)

Msc awarded *Cum Laude*. I did and passed the following courses:

- Plasma Physics
- Astrophysical Fluid Mechanics
- Galaxies and Cosmology
- Extragalactic Astronomy
- Advanced General Relativity
- Hot Topics in Cosmology.

Msc Thesis Topic: “*Modelling Stellar Pulsations in Young Brown Dwarfs*”

DECEMBER 2008:

HONORS IN ASTROPHYSICS AND SPACE SCIENCE, UNIVERSITY OF CAPE TOWN, SOUTH AFRICA

Degree awarded with *Honors*. I did and passed the following courses offered under the National Astrophysics and Space Science Programme (NASSP) at UCT:

- General Astrophysics I (Stellar Astrophysics)
- General Astrophysics II (Extragalactic Astrophysics)
- Introduction to General Relativity
- Observational Techniques I (Optical & Infrared astronomy)
- Observational Techniques II (Radio Astronomy)
- Computational Methods in Astronomy

- Computational Physics
- Classical Electrodynamics
- Astrophysical Fluid Mechanics
- Spectroscopy

Honors Thesis Topic: *“Calibration of the 22 GHz Receiver at the 26 m Hartebeesthoek Radio Telescope”*

MARCH, 2011:

BACHELOR OF SCIENCE IN PHYSICS, UNIVERSITY OF NAIROBI, KENYA

Bsc degree awarded with *Honors*. I did and passed a total of 44 courses which include:

- Basic and advanced calculus
- Basic and advanced geometry
- Linear algebra
- Probability and statistics
- Real analysis
- Basic and advanced mathematical physics
- Mechanics I & II
- Statistical physics
- Nuclear physics
- Atomic physics
- Basic and advanced electrodynamics
- Elementary particle physics
- Computational physics
- Introductory & Digital electronics
- Quantum mechanics
- Classical mechanics
- Astrophysics

Honors Thesis Topic: *“Dark Matter in the Universe”*

SKILLS & ATTRIBUTES

- Excellent oral presentation and writing skills
- Excellent computational skills on both windows and linux platforms
- High organization skills and ability to meet deadlines
- Teamwork, loyalty and positivity skills

- High creativity and adaptability skills

HONORS AND AWARDS

- SKA Grant to attend the Annual Square Kilometre Array (SKA) Annual Bursary Conference, Cape Town, South Africa 27 November to 1 December 2017.
- SKA Grant to attend the Annual Square Kilometre Array (SKA) Annual Bursary Conference, Cape Town, South Africa 28 November to 2 December 2016.
- IAU Grant to attend the IAU 29th General Assembly August 3-14, 2015, Honolulu, Hawaii USA.
- IAU Grant to attend the IAU 29th General Assembly August 3-14, 2015, Honolulu, Hawaii USA.
- IAU (OAD)- IUCAA Visiting Fellowship, February- May, 2015.
- African School of Fundamental Physics and its Applications (ASP 2014)- Certificate.
- SKA South Africa Doctoral Fellowship, 2012.
- SKA South Africa Masters Fellowship, 2009-2010.
- Brightest Young Minds (BYM) South Africa, 2009.
- Best Postgraduate Presentation Award, UCT 2009.
- Certificate in Communicating Astronomy with the public, SAAO 2009 - Certificate.

POST-GRADUATE STUDENTS SUPERVISION

1. **Mr Mutunga Samson** - Msc, thesis title: "*Testing the Copernican Cosmological Principle with Astronomical Observations*" - **Completed - Graduated, Sept. 2017.**
2. **Mr Peter Jairous Banda** - Msc - I56/89604/2016, thesis title: "*A Study of Hydroxyl (OH) Maser Variability in NGC 6334 F*" - **Completed, December 2018.**
3. **Mr Amos Kipkosgei Chepkwony** - Msc - S56/73613/2014, thesis title: "*Environmental Radiation Dose Rate Assessment in the Gold Mining Region of Lolgorian, Narok County, Kenya*" - **Completed, Graduated September 2018.**
4. **Mr Jephther Ongige Ondieki** - Msc - S56/78901/2015, thesis title: "*Mapping Radioactive Minerals Using Remote Sensing: A Case Study of Mrima Hills, Kitui County, Kenya*" - Completed, January 2019.
5. **Mr Mwanja Jonathan Muthenya** - Msc - S56/60181/2013, thesis title: "*Assessment of Radioactive Management Systems in Kenya*" -Ongoing.
6. **Ms. Lynda Wamwere** - Msc -S56/5961/2017, *Environmental Impact Assessment of Heavy Metals from Kilimapesa Hill Gold Mines in Lolgorien, Narok County*- Submitting February 2019.
7. **Ms. Rita Mwende** – Msc – I56/20130/2019, *Solar PV energy systems prediction, forecasting and Modelling*, **proposal stage.**
8. **Mr. Yoves Munala** – Msc – I56/11395/2018, *A Study and Modelling of PV systems underwater energy generation*, **proposal stage.**

9. **Mr. Moses Langa** – PhD - *Probing a Cosmic “Dark-Sector” Interaction with Astronomical Observations*, **Proposal stage**.
10. **Mr. Carringtone Kinyanjui** – PhD - *The Effect of Quantum Gravitational Perturbations on the Gravitational Wave Signatures of Inspiral Binary Black-Holes*, **proposal stage**.

TEACHING EXPERIENCE

I have more than 8 years university teaching experience three of which I have taught at postgraduate level. In my teaching, I have continually aimed at adopting better teaching methods and technologies for more enhanced students learning experience.

The courses I have taught are as follows:

A. Postgraduate

- SPH 639: Relativity
- SPH 603 - Quantum Mechanics I
- SPH 632 - Advanced Laboratory Techniques
- SPH 635 - Computational Physics
- SPH 601 – Classical Mechanics

- SPH 636 - Quantum Mechanics II

B. Undergraduate

(i) Astronomy & Astrophysics

- SPA 101 - Introduction to Astronomy
- SPA 203 - Light and Astronomical Optics
- SPA 301 - The Distant Stars
- SPA 302 - Evolution of Stars
- SPA 303 - Galaxies and the Universe
- SPA 401 - Properties and Physics of Stars
- SPA 405 - Introduction to General Relativity and Cosmology
- SPA 406 - Astronomy Projects

(ii) Physics

- SPH 309 - Quantum Mechanics I
- SPH 405 - Electrodynamics II
- SPH 409 - Quantum Mechanics II
- SPH 420 - Physics Projects

DEPARTMENTAL RESPONSIBILITIES

- 2015 - To date: College Representative, Environmental Committee.
- 2016 - To date: Thematic Head, Astronomy & Astrophysics
- 2018 - To date: Departmental Seminar Coordinator

- 2016 – To date: Patron, University of Nairobi Astronomy, Astrophysics & Space Science Students Association (UNASSA)

REFEREED JOURNAL PUBLICATIONS

1. **G.O. Okeng'o**, J.O. Malo, J.B. Awuor, R.O. Genga, *Testing structure formation in the universe via coupled matter fluids*, Rwanda Journal - Vol 1, No 1 (2016) pp. 57-68. ISSN: 2305-2678.
2. **Okeng'o G. O.** and Awuor J. B., *On the Complexification of Minkowskian Spacetime*, Africa Journal of Physical Sciences 2 (2015) 73-76. ISSN 2313-3317.
3. **Okeng'o G. O.** and Malo J. O., *A Simplified Formalism for Computing Growth Rates for Perturbations in Standard Cosmology*, African Review of Physics,10:0028. 2015;10 (2015) (ISSN 2223-6589):205-207.
4. S. M. Mutunga, **G. O. Okeng'o** and C. O. Mito, *On testing the copernican principle- Modelling the CMB temperature angular power spectrum*, KJS Series A Vol. 17 No. 1 (2019).
5. **Okeng'o G. O.**, *Imprints of a late-time interaction in vacuum dark energy models*, Africa Journal of Physical Sciences Vol 3 (2019). ISSN: 2313-3317
6. **Okeng'o G. O.** and Gikuiyu T. N., *An Assessment of Dangers to Life on Earth from Potentially Dangerous Asteroids (PDAs) And Need for Adequate Technological Preparedness*, Kenya Journal of Science (2018) (under review).
7. **Okeng'o G. O.**, *Interacting Vacuum Dark Energy*, Kenya Journal of Science (2018) (under review)
8. Baki, P., Obure, C. O. and **Okeng'o, G. O.**, *Techniques for Merging Cultural Aspects of Astronomy with Scientific Observations* (2012) African Skies, Vol. 16, p.13.

CONFERENCE PAPERS & OTHER PUBLICATIONS

1. **Okeng'o G. O.** "*Indigenous Knowledge and Science- Complementary Systems*", Oral Paper Kenya National Academy of Science (KNAS), Scientific Day of Africa Celebrations 2015, Proceedings of the KNAS, 2015
2. **Okeng'o G. O.**, and Gikuiyu T. N. "*An Evaluation of the Potentially Dangerous Asteroids and Need for Adequate Technological Preparedness*", Conference Oral Paper presented at the 4th Kenya Annual Science and Innovation Week, University of Nairobi, 11th – 15th May, 2015.

3. **Okeng'o G. O.**, "*Structure formation with two interacting matter fluids*", Conference Oral Paper presented at the 4th East African Astronomy Workshop, University of Rwanda, Kigali, Rwanda, June 30th-July 4th, 2014.
4. **Okeng'o G. O.**, *Modelling the growth of large-scale structure with interacting fluids*, PhD Thesis, University of the Western Cape, South Africa- Supervised by Prof Roy Maartens Square Kilometer Array Research Chair in Cosmology, Department of Science and Technology, South Africa.
5. **Okeng'o G. O.**, "*A Theoretical Study of Stellar Pulsations in Young Brown Dwarfs*", M.Sc. Cum Laude Thesis, University of the Western Cape 2011, published online at <http://etd.uwc.ac.za/usrfiles/modules/etd/docs/>
6. **Okeng'o G. O.**, "Calibration of a 22 GHz Radio Receiver on the 26 m Hartebeesthoek Radio Telescope", NASSP Honors Thesis (2008), University of Cape Town.
7. **Okeng'o G. O.**, "*Testing Dark Energy with HI Surveys*", Annual SKA Postgraduate Conference poster paper, 2012.

RECENT CONFERENCES & MEETINGS ATTENDED

1. The "*Innovation Summit 2019*", 13-14 June 2019, Chandaria Auditorium, University of Nairobi Towers.
2. The "*DARA Dish Conversion Workshop*", 21-25 January 2018, Accra, Ghana.
3. The "*Grant Proposal Writing Training Workshop*", 17 - 18 Jan. 2018, Chiromo Conference Centre, CBPS.
4. The "*12th Annual Square Kilometre Array Bursary Conference*" 27th November - 1st December 2017, The Strand Tower Hotel, Cape Town, South Africa.
5. The "*11th Annual Square Kilometre Array Bursary Conference*" 28th November - 2nd December 2016, Fire and Ice Protea Hotel, Cape Town, South Africa.
6. The "*10th Annual Square Kilometre Array Bursary Conference*" 30th November - 3rd December 2015, The Stellenbosch Institute for Advanced Studies (STIAS), Stellenbosch, South Africa.
7. The *Kenya National Science, Technology and Innovation Week* 11th -15th May 2015 hosted by the Ministry of Science and Technology, Kenya.
8. *Training Programme in Astronomy for African Scientists*, April 20 - May 01, 2015, The Inter-University Center for Astronomy and Astrophysics (IUCAA), Pune, India.
9. The *9th Annual Square Kilometer Array Bursary Conference*, 04-08 December 2014, Stellenbosch Institute for Advanced Studies, Stellenbosch University, Cape Town, South Africa.
10. *African School of Fundamental Physics and its Applications*, Cheikh Anta Diop, Dakar University, Senegal, August 3rd to 23rd, 2014.
11. The *Fourth East African Astronomy workshop*, University of Rwanda, June 30th to July 04, 2014, Kigali, Rwanda.

INTERNATIONAL GUESTS INVITED TO GIVE SEMINARS AT THE DEPARTMENT

Over the last two years, I have invited the following international guests and organized for them to give seminars at the Department of Physics, University of Nairobi:

1. **Dr. Nooraji Jiwaji**, Open University of Tanzania
2. **Dr David Buckley**, South African Astronomical Observatory
3. **Dr Vanessa McBride**, Office of Astronomy for Development & SAAO
4. **Dr. Jessamyn Fairfield (PhD)** - Researcher in Nano-materials & Neuromorphic Devices, National University of Ireland, Galway.
5. **Dr. Claudia Fracchiolla (PhD)** - Research Associate in Physics Education, National University of Ireland, Galway
6. **Dr. Rose Mutiso (PhD)** - Energy Researcher & CEO, MVawazo Institute, Nairobi- Kenya.
7. **Mr Willis Obonyo** - PhD student in Astrophysics, University of Leeds, UK.
8. **Mr Eric Kamau and Mr James Chege** - Msc students in Astrophysics at RATT, Rhodes University, South Africa.
9. **Prof. Gernot Groemer** - Astronaut, Astronomer & President of the Austrian Space Society.
10. **Dr. Riturpano Goswami** - Senior Lecturer, Gravity Research Group, University of Kwazulu Natal, South Africa.
11. **Dr. Anne Marie Nzioki** - Lecturer, Gravity Research Group, University of Kwazulu Natal, South Africa.
12. **Dr. Althea Wilkinson** - Astronomer, University of Manchester, UK.
13. **Dr. Pheneas Nkundabakura** - Lecturer, University of Rwanda, Kigali, Rwanda.
14. **Prof. Catherine M. Cress** - Principal Scientist at the Centre for High Performance Computing (CHPC) & Extra-Ordinary Professor of Physics, University of the Western Cape, South Africa.
15. **Dr. Sean February** - Research Scientist, Centre for High Performance Computing (CHPC), Cape Town, South Africa.

OUTREACH ACTIVITIES & INITIATIVES

Over the last two years, I have organized and facilitated the following outreach activities at the Department of Physics:

- Invited pupils, teachers and parents from The Oaks Academy, Nairobi for a Public Lecture and Public Sky Viewing at the Department of Physics, University of Nairobi.
- Together with some students from the department, I visited and gave general physics and astronomy talks at the following schools:
 - Mukumu girls High School, Kakamega.
 - The Visa Oshwal Academy -

- The Visa Oshwal Primary School -
- Pangani Girls High School
- State House Girls High School
- The Nairobi School

SCHOLARSHIPS FOR STUDENTS

I have used my international links in South Africa to secure Scholarships for the following students:

1. Eric Kamau - Msc student in RATT, Rhodes University, South Africa - Jan. 2017
2. James Chege - Msc student in RATT, Rhodes University, South Africa - Jan. 2017
3. Lexy Andati - Msc student in RATT, Rhodes University, South Africa - Jan. 2018
4. Mr. Carrington Kinyanjui- Msc student, University of Manchester, UK – Oct. 2019

STUDENTS PRACTICALS EQUIPMENT

I have solicited and secured donation of 2 Yagi Antenna for Radio Astronomy Practicals from Prof. Peter Wilkinson from the University of Manchester, who paid all costs including shipping costs.

PROFESSIONAL ORGANISATIONS MEMBERSHIP

- Member, The East African Astronomical Society (EAAS)
- Member, The African Astronomical Society (AfAS)
- Member, The East Africa Association for Radiation Protection (EAARP)

OTHER ACTIVITIES

- **2018 - to date:** Board Member, Matutu Adventist Mixed High School
- **2017 - to date:** Treasurer, Matutu Adventist Schools Alumni Association (AAMAS).
- **2016 - to date:** Patron, University of Nairobi Astronomy and Space Science Students Association (UNASSA)
- **2014 - to date:** Scientific writer and blogger: <http://kenyan-astrophysicist.blogspot.com/>

HOBBIES

Soccer, Yoga, safari, music and non-technical writing.

REFERENCES

1. Prof Riewa O. Genga, Professor of Physics, Department of Physics, University of Nairobi Kenya. Email: rgenga@uonbi.ac.ke
2. Prof Joseph Otieno Malo, Professor of Theoretical Physics, Department of Physics, University of Nairobi. Email: jomalo@uonbi.ac.ke
3. Dr Silas Mureramanzi, Senior Lecturer in Physics, Department of Physics, University of Nairobi. Email: mureramanzi@uonbi.ac.ke