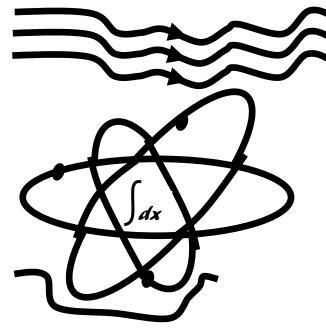




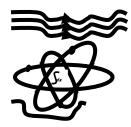
# SPECIAL EDITION IN HONOUR OF Professor John O.A. IDIODI TRANSACTIONS OF THE

**NIGERIAN ASSOCIATION OF MATHEMATICAL PHYSICS** 



Published by

Nigerian Association of Mathematical Physics



#### THE NIGERIAN ASSOCIATION OF MATHEMATICAL PHYSICS

(NAMP)

## **Editorial Board for NAMP Transactions**

Professor G. Babaji: Department of Physics, Bayero University, Kano. Professor L. Taura: Department of Physics, Bayero University, Kano. Professor J.O. Fiase: Department of Physics, Benue State University, Makurdi Professor F. Matthew Ojelabi: Department of Physics, Ekiti State University, Ado-Ekiti. Professor S.T. Oni: Department of Mathematics, Federal University of Technology, Akure. Professor A.N. Njah: Department of Physics, University of Lagos, Lagos. Professor J.O.A. Idiodi: Department of Physics, University of Benin, Benin City. Professor J.A. Gbadeyan: Department of Mathematics, University of Ilorin, Nigeria. Professor J.O. Omolehin: Department of Mathematics, University of Ilorin, Ilorin. Professor K.A. Gbolagade: Department of Computer and Information Science, Kwara State University. Professor M.N.O. Ikhile: Department of Mathematics, University of Benin, Benin City. Professor J.O. Adeniran: National Mathematical Centre, Abuja. Professor M.O. Oyesanya: Department of Mathematics, University of Nigeria, Nsukka Professor G.C.E. Mbah: Department of Mathematics, University of Nigeria, Nsukka Professor S.M. Ogbonmwan: Department of Mathematics, University of Benin, Benin City. Professor E.O. Ayoola Department of Mathematics, University of Ibadan, Ibadan. Professor G.E. Akpojotor Department of Physics, Delta State University, Abraka.

#### **Council of NAMP**

Professor G. Babaji/Bayero University Kano/Nigeria/Nigeria/President Professor Vincent Asor/Michael Okpara University of Agriculture, Umudike/Nigeria/Vice-President Professor E.O. Oghre/University of Benin, Benin City/Nigeria/Secretary Dr. Mrs. K-K.A. Abdullah/Olabisi Onabanjo University/Nigeria/Asst. Secretary Professor A.O. Popoola/Osun State University, Osogbo/Nigeria/Treasurer Professor John O.A. Idiodi/University of Benin, Benin City/Nigeria/Editor-in-Chief

#### Correspondence

All correspondence relating to NAMP Publications and the submission of articles for publication Should be addressed to the **Editor-in-Chief**, whose address is:

Professor John O.A. Idiodi, Department of Physics, University of Benin, Benin City, Nigeria. Email: jidiodi@hotmail.com; Tel. +2348037994106 For further information, check our website: www.nampjournals.org.

The Nigerian Association of Mathematical Physics, October – December, 2020

Transactions of the nigerian association of mathematical physics

TRANSACTIONS

# OF THE

### NIGERIAN ASSOCIATION OF MATHEMATICAL PHYSICS

# Volume 13

## October - December, 2020

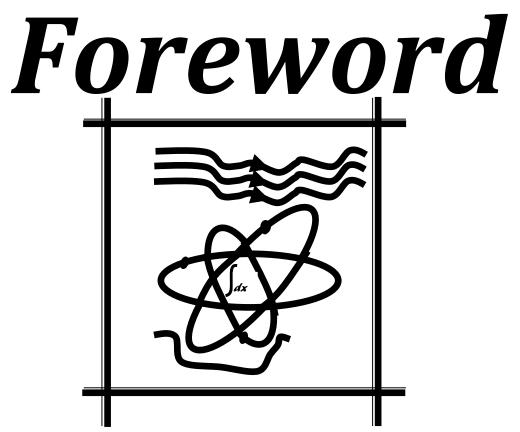
Published by

# Nigerian Association of Mathematical Physics

Printed and bound in Nigeria by:

AMBIK Press td., 4, Olike-Odibi Avenue, Isiohor, Benin City, Nigeria. Phone: +2348037113845

**JNAMP Typesetter: Dr. Ben. Iyorzor, e-mail: beniyorzor@yahoo.com, Tel.: +2347035400919** *Transactions of the Nigerian Association of Mathematical Physics Volume 13, October - December, 2020* 



In the foreword to the Journal of NAMP, whose maiden issue came out in 1992, it has been noted that there were only very few scientists in Nigeria who could strictly speaking be called Mathematical Physicists. For this reason, it was decided that the term Mathematical Physics should be broadened to mean: any Scientist who applies fairly rigorous mathematics to Physics, Chemistry, Engineering, or other sciences and also any Mathematician whose results have direct applicability in Physics, Chemistry, Engineering and so forth. In a great country like Nigeria, the process of growth which led to the formation of NAMP in 1979 has produced, as at today, quite a number of scientists whose works bear signatures of the true meaning of the term Mathematical Physicist. To capture such works is the burden of this second Journal of NAMP, called **Transactions** of the Nigerian Association of Mathematical Physics.

It is my sincere hope that several scientists will try to have their works published in the Transactions of NAMP.

#### Prof. G. Babaji

October – December, 2020.

Transactions of the Nigerian Association of Mathematical Physics Volume 13, (October – December) 2020

#### PREFACE

This special volume consists of peer reviewed papers presented on the occasion of the 70<sup>th</sup> birthday and the formal retirement of Professor John O.A. Idiodi, from the service of the University of Benin. He served the University and the National and International Scientific Communities meritoriously for a period of about 45 years spanning October 1975 to January 2<sup>nd</sup> 2020. During this period he has produced several M.Sc and Ph.D students.

Since 1997 Professor John O.A. Idiodi has been the Editor-in-Chief of the Journal of the Nigerian Association of Mathematical Physics. He is also the Editor-in-Chief of the Transactions of the Nigerian Association of Mathematical Physics since 2015.

As you go through this special volume, I trust that you would find the papers interesting and sufficiently diverse.

Professor Godfery E. Akpojotor Chairman Organizing Committee