

THE AMANO SOCIETY OF PURE AND APPLIED PHYSICS

**THE RESEARCH CORRESPONDENCE AND
COORDINATION ACTION GROUP WORKING GUIDE**

2017

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NOVEMBER, 2017

Contents

INTRODUCTION	5
PURPOSE OF THE RCCAG	5
DUTIES OF THE RCCAG	6
OPERATION MODEL OF THE RCCAG	6
RESEARCH DIRECTORATES	8
PERSONNEL AND DUTIES	15
WORKING PROCEDURE	17
RESEARCH COORDINATOR- RESEARCHER WORKING GUIDELINE.....	Error! Bookmark not defined.
RESEARCH ELIGIBILITY	18

INTRODUCTION

The RESEARCH CORRESPONDENCE AND COORDINATION ACTION GROUP (RCCAG) is a working sub division of the Amano Society of Pure and Applied Physics (ASPAP) responsible for coordinating, maintaining and promoting research and correspondence among society members. This document outlines the nature in which this action group shall exist and operate.

PURPOSE OF THE RCCAG

The RCCAG is an action group of the Amano Society of Pure and Applied Physics that exists to carry out ASPAP's purpose as a physics research, correspondence and peer review society. ASPAP exists to foster pioneering research and scientific and technological breakthroughs in pure and applied physics among its Zambian members. In order to do this, many other activities need to take place to facilitate the proper carrying out of research and correspondence. To achieve this, ASPAP divides its various activities aimed at the same ultimate goal into action groups.

Action groups are permanent sub divisions within ASPAP that are dedicated to carrying out one of ASPAP's key mission activities. We see better where the RCCAG fits in when we take a look at the purpose of ASPAP as outlined in article two of the ASPAP constitution:

- 1.1. UNITE LIKE-MINDED ZAMBIANS INTERESTED IN PHYSICS AND PHYSICS RELATED RESEARCH AT AN ACADEMIC LEVEL.
- 1.2. PROMOTE THE ACHIEVEMENT OF SCIENTIFIC BREAKTHROUGHS AMONG ZAMBIAN SCIENTISTS.
- 1.3. PROMOTE PHYSICS IN THE ZAMBIAN SOCIETY AND THE WORLD AT LARGE THROUGH SCIENTIFIC PUBLICATIONS OVER VARIOUS PLATFORMS.
- 1.4. PROMOTE PHYSICS IN THE ZAMBIAN SOCIETY THROUGH HOLDING VARIOUS ACTIVITIES WITH THE PUBLIC.
- 1.5. CREATE A COMMUNICATION NETWORK BETWEEN RESEARCHERS AND INDUSTRY.

1.6. ENGAGE IN PHYSICS EDUCATION ACTIVITIES TARGETING YOUNG PEOPLE ESPECIALLY.

From these we see that ASPAP's key purpose revolves around research. Research is what makes ASPAP relevant and it is the main reason why it was created, to "PROMOTE THE ACHIEVEMENT OF SCIENTIFIC BREAKTHROUGHS AMONG ZAMBIAN SCIENTISTS." The RCCAG is thus at the heart of ASPAP.

DUTIES OF THE RCCAG

Below is summarised the main duties of the RCCAG:

1.0. PROMOTE A CULTURE OF RESEARCH AND CURIOSITY AMONG SOCIETY MEMBERS.

- 2.0. Coordinate all research activities within the society.
- 3.0. Give research guidance and assistance to every researcher within the society.
- 4.0. Be actively involved in every member's research activities by providing guidance, critique, audience and fostering peer review.
- 5.0. Inspire society members to work towards breakthroughs and original work.
- 6.0. Establish and maintain the culture of correspondence among society members.
- 7.0. Promote and lead group discussions on social media platforms about physics and physics related topics among society members and the general public.
- 8.0. Receive papers from society members and circulate them among them.
- 9.0. Lead the review of papers among society members.
- 10.0. Circulate interesting physics news among society members.

OPERATION MODEL OF THE RCCAG

Refer to figure 1.0. below.

The RCCAG shall be headed by an RCCAG director who shall be this action group's representative in the ASPAP executive. There shall be a list of research fields and each of these fields shall have a research coordinator. The purpose of each coordinator is to spearhead and promote research. There shall be a number of researchers under each research coordinator depending on the fields of research. Each researching member shall

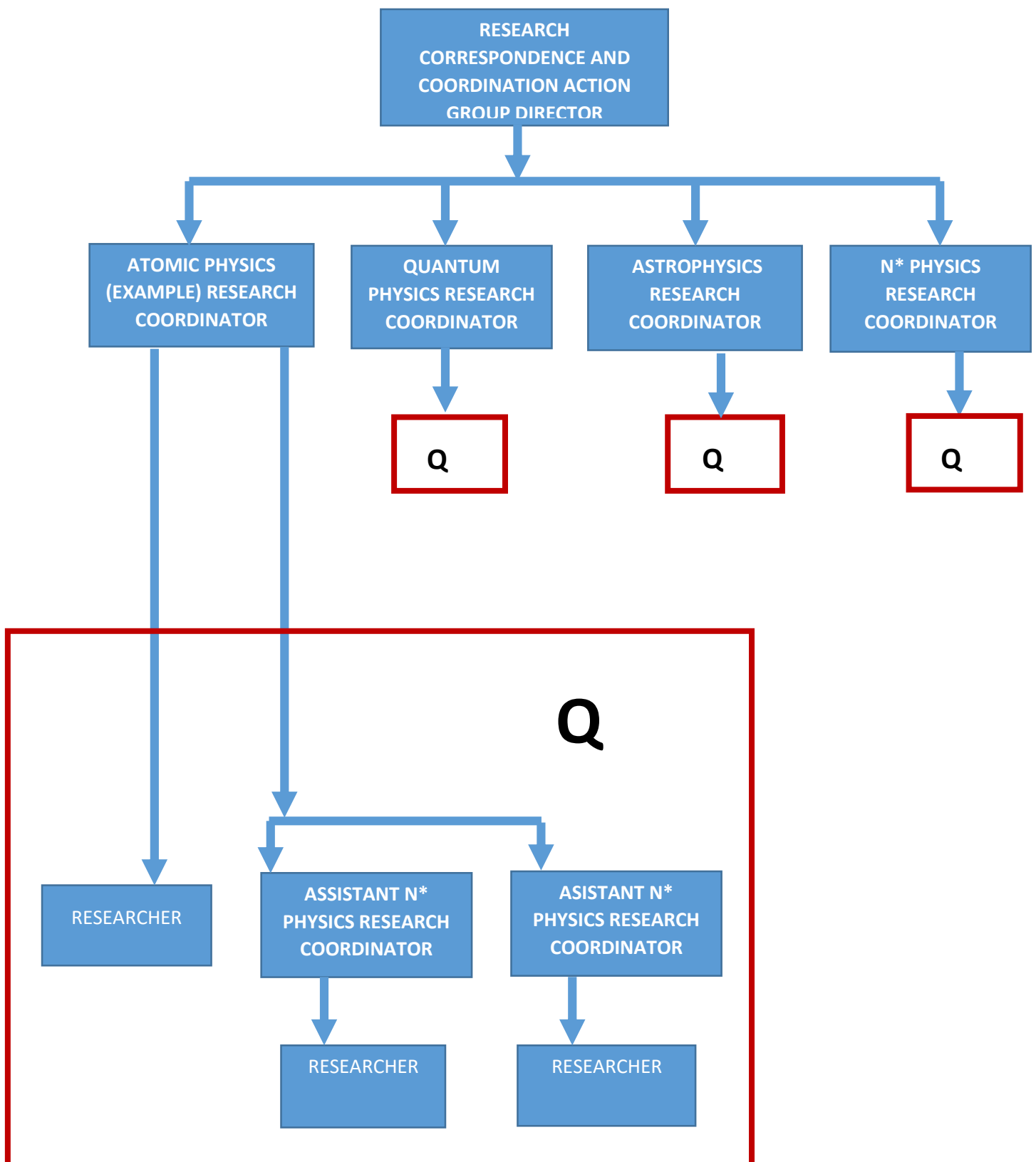


Figure 1.0. RCCAG structure

report to a particular coordinator or assistant coordinator, and every coordinator has the duty to check on the level of research progress per member assigned to them and offer guidance and support.

RESEARCH DIRECTORATES

The scope of pure and applied physics is very broad. To be able to sufficiently undertake research in almost every cardinal branch of pure and applied physics, the RCCAG shall be divided into research directorates. These directorates shall be headed by their respective research coordinators. Their division shall range from the physics of the small to the physics of the large.

The aim of the research directorates is to produce quality research work in the specified fields of physics using a “narrow-deep” rather than “broad-shallow” approach. This is very important for research as it provides the researcher the proper atmosphere to professionally become an expert and practitioner in a particular field of physics and henceforth, be at the very frontiers of discovery, fully acquainted with world class cutting edge scientific progresses in that particular field.

ASPAP shall provide the platform for consultations and/or collaborations among researchers from every directorate for researchers to share ideas and acquire help from each other, especially in situations where a research topic demands the expertise of researchers from various fields.

The number of research directorates is not fixed and shall grow depending upon the surfacing of personnel with newer physics research interests.

Given in the table below are the current research directorates with descriptions and examples of areas of research.

RESEARCH DIRECTORATE		DESCRIPTION	RESEARCH AREA EXAMPLE
1.	ATOMIC, MOLECULAR AND OPTICAL PHYSICS	This directorate focuses on the study of atoms, ions, molecules, light and light-matter interactions. It is a well established field in modern physics with very good prospects and applications in quantum computers, quantum information and quantum metrology among many others. This field has direct application of quantum mechanics.	<ul style="list-style-type: none"> • Ultra cold atoms • Atoms in an ultra intense laser field • Optical clocks • Atomic clocks • Effects of blackbody radiation on the atomic levels • Rydberg states in ions • non linear optics

2.	ASTRONOMY: COSMOLOGY AND ASTROPHYSICS	<p>This directorate focuses on one of the most ancient fields of physics – Astronomy. This ancient field in modern research has been subdivided into two fields: Cosmology – which studies the Universe as a whole, from its origins to the fate, while astrophysics focuses on the heavenly bodies; their physical properties, formation, structures and death.</p> <p>Astronomy is a very fascinating field and often demands the expertise of researchers from other fields too; from nuclear and particle physics, to quantum mechanics, optics, atomic physics, plasma physics and many others. Astronomy hopes to answer man’s fundamental questions through scientific tools and methods:-</p> <p>Who are we? Where do we come from? Why are we here? What’s our place in the Universe? Why and how does the Universe even exist?</p>	<ul style="list-style-type: none"> • Cosmological models of the Universe • General Relativity • String theory • Dark matter • Dark energy • Black holes • Cosmic rays • Neutron stars • Quantum gravity • Spiral galaxies • Supernovae • Nebula
3.	NUCLEAR PHYSICS AND TECHNOLOGIES	<p>This directorate focuses on nuclear physics and its applications. From nuclear processes of atomic nuclei, particles, their properties to their applications at nuclear reactors for energy, medical applications in the diagnosis and treatment of cancer and more. Researchers in this field are expected to tackle such kind of problems having a solid foundation in nuclear physics. This field coincides in certain area with particle physics.</p>	<ul style="list-style-type: none"> • Processes in nuclear reactors • Radio isotopes • Radiometric dating • Cancer treatments • Medical diagnosis • others

4.	ELEMENTARY PARTICLES AND FUNDAMENTAL INTERACTIONS	<p>This directorate focuses on elementary particle physics and fundamental interactions. It has been separated from its parent field, nuclear physics, due to the fact that in modern physics, this has become an individual area of research on its own. This directorate's aim is to tackle the very fundamental questions of physics at the infinitely small scale. Experiments in particle physics are very expensive and hard to achieve as these interactions and particles are usually observed at very high energies (Teravolts) and thus, can only be done in particle accelerators and colliders. The most famous of all the Large Hadron Collider (LHC) has already produced fascinating results, discovering the Higgs Boson, a particle which was predicted by theoretical particle physicists decades earlier. Researchers in this directorate are expected to have solid knowledge in theoretical particle physics, quantum field theory and fundamental interactions. Sometimes this field is called high energy physics.</p>	<ul style="list-style-type: none"> • Symmetries • Fields • Particles • The standard model • Unification theories
5.	QUANTUM PHYSICS	<p>This directorate focuses on research in quantum physics. Since the time quantum mechanics was first formulated by its pioneers and fathers, it still continues to puzzle us. Nonetheless, there has been progress in this field and today, quantum physics has many applications in electronics, astronomy and now recently, quantum computing, which is</p>	<ul style="list-style-type: none"> • Quantum entanglement • Teleportation • Tunnelling • Quantum gravity • Quantum computing • Quantum metrology • Quantum information

		<p>still in its infancy. The aim of this directorate is to produce pioneering work in quantum physics at a pure and fundamental level and also produce information that might be relevant to researchers in other fields relating to quantum physics.</p>	
6.	PLASMA PHYSICS	<p>This directorate focuses on research in plasma physics. This is an interesting area of physics which concentrates on the physics of plasmas. Besides solid, liquid and gas, matter can exist in another state called plasma. Plasma, consists of ions, and not simply neutral atoms or molecules like liquids or gases. This brings about fascinating physical phenomena which requires special attention on its own as an independent field. This science has good application in astronomy.</p>	<ul style="list-style-type: none"> • Astrophysical and laboratory plasmas
7.	SOLID-STATE AND CONDENSED MATTER PHYSICS	<p>This directorate focuses on research in solid-state and condensed matter physics. This is one of the most applicable areas of physics today, and has given birth to fields such as semiconductor physics, nano/micro physics and has practically revolutionized our knowledge of materials. Due to the broadness of this field, researchers in this directorate shall focus only on the pure and fundamental problems in the field of solid state and condensed matter physics. Those who have strong desire and interest in the applied aspect of this field should</p>	<ul style="list-style-type: none"> • Nano structures • Superconductors • Symmetries

		perhaps apply to the directorate of nano/micro physics and technologies or to the directorate of semiconductor physics. Solid-state and condensed matter physics is concerned with questions about the structures and properties of solids and matter in the condensed state. This field does coincide in certain aspects with theoretical particle physics when it comes to symmetries and groups (from group theory).	
8.	NANO/MICRO PHYSICS: MATERIALS AND TECHNOLOGIES	This research directorate focuses on research in nano/micro physics and the technologies from such materials.	<ul style="list-style-type: none"> • Nano materials and structures • Graphite • Nanotechnology
9.	SEMICONDUCTOR PHYSICS AND DEVICES	This research directorate focuses on research in semiconductor physics and devices. Researchers in this field, unlike those in the solid-state and condensed matter physics directorate, are required to have solid understanding of the manufacture and operation of semiconductor devices. They are also required to have strong understanding of solid-state and condensed matter physics. This directorate hopes is to produce pioneering work that will provide enough scientific knowledge to local entrepreneurs to start up a whole industry in Zambia in this field of semiconductor physics.	<ul style="list-style-type: none"> • Semiconductor devices(operation, manufacture)
10.	RADIO PHYSICS: TELECOMMUNICATION AND DEVICES	This research directorate focuses on research in radio physics. Researchers in this	<ul style="list-style-type: none"> • Antennas • Satellites

		<p>directorates are expected to have understanding of antennas, signal processing, propagation of radio waves and also some core concepts in electronics. The aim of this directorate is to produce pioneering work in radio physics and provide some valuable solutions to the communication industry in Zambia, given our current state where this industry is dominated by foreign investors who are providing communication services at a very high price.</p>	<ul style="list-style-type: none"> • Networking • Radio astronomy • Internet
11.	ENVIRONMENTAL AND PLANETARY PHYSICS	<p>This research directorate focuses on research in environmental and planetary physics. Researchers in this field are expected to have expertise knowledge in ecology, climate change, and all aspects of physics relating to our environment and our planet as a whole. This directorate aims to produce significant contributions to the science of climate change, global warming and other environmental problems affecting the planet.</p>	<ul style="list-style-type: none"> • Climate change • Space weather • Green house gases in the atmosphere
12.	CLEAN AND RENEWABLE ENERGY AND TECHNOLOGIES	<p>This research directorate focuses on research in clean and renewable energy and technologies. This field is an applied interdisciplinary field as it requires expertise in both physics and some aspects of engineering. The aim of this directorate is to produce pioneering work and technologies that will revolutionize the energy industry in Zambia; utilize our</p>	<ul style="list-style-type: none"> • Solar cells(manufacture, operation, improvements) • Wind technologies(manufacture, operation, improvements) • Hydro (improve efficiency) • others

		<p>natural resources, maintain a low rate of pollution (which due to mines and other industries is not getting any lower), put an end to the problems of load shedding, especially on the domestic scale, by providing alternative technologies for energy. This directorate, due to its applied nature, will often require researchers to collaborate and/or consult with researchers from other fields.</p>	
13.	MATHEMATICAL AND COMPUTATIONAL PHYSICS	<p>This research directorate focuses on research in mathematical and computational physics. Researchers in this field are expected to be experts in mathematics and possess strong computing and programming skills. These researchers are required to have solid knowledge in statistics and probability, be able to model physical processes using computer software facilities, and be able to present and interpret data. The aim of this research directorate is to provide physicists (fellow researchers in other directorates) the necessary assistance and expertise in mathematics, computing and modelling. This directorate shall work hand in hand with other directorates, collaborate frequently with researchers from other directorates where their expertise are required and also produce their own pioneering work tackling challenging</p>	<ul style="list-style-type: none"> • Mathematical modelling of physical processes • Algorithms • Computing • Statistics, probability and data presentation and interpretation

		mathematical problems in physics.	
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PERSONNEL AND DUTIES

A) RESEARCH CORRESPONDENCE AND COORDINATION ACTION GROUP DIRECTOR

Definition:

This is the official who is in charge of the research correspondence and coordination action group. He represents it in the Society executive.

Duties

- i. Keep update of all research activities within the society among society members.
- ii. Lead the research correspondence and coordination action group and represent it in the society executive.
- iii. Collect research related information among society members and spread it within the society such as research papers, ideas, for the sake of discussion.
- iv. Promote a culture of research, discovery and curiosity and the aiming for scientific breakthroughs among society members.
- v. Admin for discussion-made social media group fora.

The RCCAG director can also be a field research coordinator (see C below).

B) DEPUTY RESEARCH CORRESPONDENCE AND COORDINATION ACTION GROUP DIRECTOR.

Definition:

Deputy to the research correspondence and coordination action group director with own specified duties.

Duties:

- i. Collect physics news from outside the society and disseminate it within the society.
- ii. Assist the research and RCCAG director in duties delegated to the deputy's office.

The RCCAG director can also be a field research coordinator (see C below).

C) FIELD RESEARCH COORDINATORS

Definition:

These are academic heads of research directorates and shall be responsible for coordinating research among members in their respective research directorates.

Duties:

- i. Keep record of all research going on in their respective research directorate.
- ii. Offer individual supervision to researchers assigned to them.
- iii. Offer assistance to every researcher assigned to them.
- iv. Give status reports to the research and correspondence action group director.

D) ASSISTANT FIELD RESEARCH COORDINATORS

Definition:

These are academic personnel who assist the field research coordinators in their research coordination duties:

Duties:

- i. Keep record of all research activities among the researchers assigned to them.
- ii. Offer individual supervision to researchers assigned to them.
- iii. Offer assistance to every researcher assigned to them.
- iv. Give status reports to the field research coordinator.

WORKING PROCEDURE

- 1.0. A member with an idea he wishes to research upon with the society's assistance and knowledge shall submit his research proposal by writing to the RCCAG director or in his/her absence, to their vice.
- 2.0. The RCCAG director and/or his vice shall consult with the necessary directorate coordinator over the proposed research and the researcher, checking if it meets the requirements for eligibility to be a research subject to be undertaken within the society. See [here](#) to see the requirements for research eligibility.
- 3.0. If the proposed research topic is eligible to be carried out within ASPAP, the RCCAG director shall communicate in writing to the research candidate of the RCCAG's approval and support for the proposed research to be carried out within ASPAP and a research coordinator shall be assigned to such a member.
- 4.0. The new researcher shall report to his assigned research coordinator and shall with his/her help and guidance begin their research.
- 5.0. A member with no original research idea can consult from the RCCAG director for a research topic and one shall be assigned to them together with a specific research coordinator.

RESEARCH ELIGIBILITY

This section shows which researches can be carried out within ASPAP and which ones cannot. The Criteria for a topic's research eligibility are:

- i. The topic must fall under the disciplines of pure and/or applied physics.
- ii. The topic must be original and NOT be an exact duplicate of a previous topic.
- iii. The research topic must fall under the expertise and interests of the researcher.
- iv. The topic must be **very clear** and **very specific**, having a reasonable and clearly defined scientific basis and objective. [Vague and unclear topics will not be acceptable!]
- v. The topic must have the appropriate scientific terminologies.