

- Radioactive Materials – Best Practice, London, United Kingdom”. Retrieved from Babcock Nuclear workshop: <https://www.babcock.co.uk>, 2013, June 04.
2. Introduction to Professional Career Development [Electronic resource]. - access mode: <https://jobtalk.indiana.edu/Courses/PCD/PCD-Syllabus.htm>. (Date accessed: 11/04/2020).
  3. World institute for nuclear security. Accountability for security and effective governance [Electronic resource]. - access mode: [https://youtu.be/zz\\_WfI6O\\_Wc](https://youtu.be/zz_WfI6O_Wc). (Date accessed on 02/04/2020).
  4. Garcia, Mary L., “Vulnerability Assessment of Physical Protection Systems from the Sandia National Laboratories”, (2005, May).
  5. Stacey Barr, 5 basic KPI Formulas to quantify performance measures, August 6, 2013.
  6. Key Performance Indicator. [Electronic resource]. - access mode: <https://www.klipfolio.com/resources/articles/what-is-a-key-performance-indicator>. (Date accessed: 11/04/ 2020).
  7. Impraise blog. Company culture [Electronic resource]. - access mode: <https://blog.impraise.com/360-feedback/3-performance-indicators-that-will-make-or-break-your-company-performance-review>. (Date accessed: 11/04/2020).
  8. Leigh E. Ways to measure career success [Electronic resource]. - access mode: <https://projectbliss.net/ways-to-measure-career-success/>. (Date accessed:11/04/2020).
  9. Francis-Smythe J., Haase S., Thomas E., Steele C. Development and validation of the Career Competencies Indicators [Electronic resource]. - access mode: <https://core.ac.uk/download/pdf/9554238.pdf>. (Date accessed:11/04/2020).

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## **ALPHA SPECTROMETRY IN EMERGENCY PREPAREDNESS**

### **ABSTRACT**

A study to assess the choice of science as a vocation and career, considering alpha spectrometry in emergency preparedness, was carried out. The

development of a career or a vocation by any individual in the field of science could better be achieved through consolidated plan towards a goal. In this assessment, a number of required variables for developing skills by scientists for the future have been analyzed and considered to be essential in a strategic build-up to a career. Through the various fields of scientific-radiation technology from their operation through to waste management, contamination measurement and other radiological analysis are identified to be very important. To make this approach more proficient, certain required variables for developing skills by scientists for the future have been elaborated in this study. Some of the requirements considered are; Education, Creativity, Culture, Employment, Finance and Governance. It was resolved that in evaluating the choice of a career, the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis relating to the parameters (requirements) indicated above cannot be overemphasized in the buildup of a modern scientific career.

Keywords: Vocation, Education, Alpha radiation.

## INTRODUCTION

The study of the characteristics of alpha radiation detectors and their functioning could be done using some common and simple devices such as smoke detectors. Most of these smoke detectors (the ionization model) use  $^{241}\text{Am}$  which emits alpha particles. Positioned between two electrically charged plates, the radionuclide ionizes the air inside of it, which then creates a current flow between the two plates. Smoke sets off the alarm when it disrupts the ion flow [4]. Such awareness could be used to sensitize the populace about the needful use of radioactive materials in the daily upkeep of our livelihood. For precise and accurate data, nuclear technology largely depends on alpha spectrometry with  $^{232}\text{U}$ ,  $^{236}\text{Pu}$ ,  $^{238}\text{Pu}$  and  $^{241}\text{Am}$  in different fuel samples [1]. Alpha Spectrometry offers, with certain limitations, rapid identification and quantification of radioactivity in a variety of environmental and bioassay matrices [2]. This is suitable for radiological emergency response.

### Education:

This can be described as a grooming process through which knowledge is acquired and manifested by exhibiting intellectual abilities. This includes; training, discussion, research and design, etc. Education could be described as the main foundation for economic progress which could also develop the culture of a society, community or even a state/country. Many approach education with the mindset of securing a well-paying job without considering detailed commitments that come with them. Using the Ghanaian educational system as a reference frame, a student basically decides on his/her, would-be career, right from high-school. The educational system at that level is not

very flexible or liberal enough for students to choose a variety of subjects constituting programs that would define their preferred careers. Thus, the system defines for the majority of students, what is expected of them instead of allowing prospective scientists to develop their careers using their respective skills. Teenagers love competing as individuals and in groups. Therefore, this should be encouraged with a positive mindset. Organizing competitions within schools, districts and at the national level with reward schemes, such as; scholarships and other benefits could go a long way to motivate teenagers to develop their skills with specific interests.

#### Creativity:

This involves the ability of a person to overcome limitations which could be obvious and rather come up with new ideas. This can be realized through brainstorming with colleagues, leadership, improvisation, etc. It is said that, "Necessity is the mother of inventions". The current situation of corona virus infections has made a number of people come up with innovative ideas and developments. If people are sensitized well enough about the need to put measures and certain infrastructure in place before any emergency (disaster) hits us, the repercussions could be prevented or reduced. A research work is currently being done at MEPhI in designing a new geometry of a collimator used in alpha spectrometry. This is could help improve the resolution and hopefully the efficiency of the detector system. The main goal is to enhance its use in emergency exposure situations.

#### Culture:

This can be identified as a characteristic of humanity which goes a long way to define the way people project themselves. This is often seen through; customs, architecture, history among other ways of expressing the nature of people in a particular community. Contemporary science has undergone major changes in the last half century at all levels: institutional, intellectual, and social, as well as in its relationship with society at large [3].

#### Finance:

This is basically the management of money (financial resource). It generally involves the practice of asset management whiles carrying out our duties as environmental analysts. It is about time institutions and communities realized the need to contribute and save bits of money to invest in scientific knowledge and technology. The government could then be asked to support our goals with the plans we would present for implementation. Benevolent individuals (donors) within communities and across the globe could also be consulted to support.

### Employment:

This can be directly attributed to the working experience of all individuals. Being able to connect career goals with career plan helps to adequately define the career path, which relates theoretical studies to practical aspects for development. In such a competitive environment, an important measure of academic success is the ability to maintain a long active career in science [3].

### Governance

Consolidation of the mission, vision, policies and principles of any organization or establishment with an already formulated constitution of a country or state is key for its success in any research/venture. Industries could partner with government in Public – Private – Agreements which could support in the strategic procurement of certain infrastructure. Accountability in the activities of staff in an institution, considering adequate compliance with Information Security regulations, does go a long way in gaining the trust and support of a government. Notwithstanding, governments are encouraged to support in several ways to assist in grooming and sustaining the academia to produce the required human resources for the various institutions.

### CONCLUSION

There is the need for a paradigm shift from the seemingly complex scientific approach to a liberal (flexible) form in nurturing teenagers with the study of science. With respect to the requirements discussed above, there is the need for a much more liberal but all-inclusive approach with practical-oriented measures being considered and implemented leading to desired goals. To build a sustainable workforce that delivers services needed for development, a high level of cooperation is expected between government officials and the various institutions. Governments could help a lot with tax-relief packages which would even motivate other investors to come on board in building better infrastructure for the workforce.

### REFERENCES

1. Aggarwal, S. K. Alpha particle spectrometry for the determination of alpha emitting isotopes in nuclear, environmental and biological samples: Past, Present and Future. 2016. Analytical methods 8(27).
2. Semkow, T. et al. Alpha Spectrometry of Thick Samples for Environmental and Bioassay Monitoring. 2009. American Chemical Society.

3. Milojevic, S. Principles of Scientific Research Team and Evolution. 2014. Proceedings of the National Academy of Sciences of the United States of America.
4. Nefer, B. The Function of a Smoke Detector. 2018. Hunker.

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## **APPLICATION OF PHASED ARRAYS IN ULTRASONIC NONDESTRUCTIVE TESTING**

### **Abstract**

The object of the research is ultrasonic nondestructive testing. The purpose of the work is to make analytical comparison of the techniques for ultrasonic with phased arrays. In the course of research the most promising techniques for ultrasonic imaging with phased arrays was determined according to analytical study of literature sources. The comparison of these techniques was conducted by the application of computer simulations which was made in CIVA software. Results obtained through the simulations were verified via the real experiment. As a result of research the technique which provides the most quality imageries of internal structure of testing objects was defined. Basic structural, technological and technical-operational characteristics: Applies only to laboratory installation. Degree of implementation: Implementation of obtained results for the developing of advanced ultrasonic imaging systems. Application area: development of advanced ultrasonic imaging systems. Future prospects: the additional example of the inspection further explores the real world uses of on scale in NDE applications.

### **Introduction**

The utilization of ultrasonic phased array frameworks for non-destructive assessment (NDE) has expanded drastically lately. Such frameworks have been utilized for a long time in the field of Non-destructive testing. Non-destructive testing strategies assume an imperative part in surveying the honesty of solid structures [1]. NDT techniques help distinguish potential shortcomings or basic insufficiencies early so Nuclear industries can address them before unnecessary downtime or loss of energy age capabilities happen. Such strategies guarantee the security of the nuclear power plant and fill in as verification to government organizations that the organization is proactive in