SCIENCE JOURNALISM IN GHANA: A STUDY OF JOURNALISTS WHO COVER SCIENCE

A Thesis

by

BERNARD APPIAH

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2010

Major Subject: Science and Technology Journalism

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Approved by:

Chair of Committee,	Barbara Gastel
Committee Members,	James Burdine
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ABSTRACT

Science Journalism in Ghana: A Study of Journalists Who Cover Science.

(December 2010)

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Chair of Advisory Committee: Dr. Barbara Gastel

Science journalism has been studied from the perspectives of science journalists in the West. However, studies of science journalism from the perspectives of general reporters in developing or developed countries are scarce.

This study was a survey of general reporters in Ghana belonging to the Ghana Journalists Association. In all, 151 members responded to a self-administered questionnaire that the researcher delivered to their worksites and a central location. Respondents were asked mainly about their demographic and professional characteristics, sources used for reporting science, number of science stories reported in the past 12 months, topics of science reporting interest, factors motivating or serving as barriers to science reporting, and the future of science journalism in Ghana. Data were analyzed using statistical tools and content analysis.

The demographic and professional characteristics resembled those found previously in Ghana and elsewhere. The most commonly cited format of science journalism training was workshops or seminars after graduation. Health professionals

and scientists were perceived as very important sources for science stories, and the respondents recalled interviewing them more frequently than others. Generally, respondents reported writing more science news stories than science features. There was an inverse correlation between the number of years spent in journalism and the number of science features reported ($p = 0.017$). Health science was the most commonly cited topic of reporting interest. Most respondents indicated that training in science journalism or access to scientific research findings would motivate them to report science more. Many cited lack of training in science reporting or lack of contact information for scientific researchers as barriers to science reporting. Many respondents said the current status of science journalism in Ghana is low, and most favored increasing the amount of science journalism, in part to promote public literacy in science.

The findings indicate that Ghana should consider offering more science journalism training, particularly in journalism schools, and should promote ready access of journalists to research findings and to contact information of scientific researchers.

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DEDICATION

This thesis is dedicated to two main persons who have made huge impressions in my life but are no more around to celebrate with me my joy. First, my late father, Kwaku Appiah, who used to carry the message of a village chief to the community members by speaking at the top of his voice and beating an African gong to attract the attention of the public. I used to accompany him around the village for this task but did not envisage that years later I would be beating the gong on science and technology for the global community. Second, my late mother, Mame Yaabah, who sacrificed her limited resources to ensure that I get a better education.

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NOMENCLATURE

AAAS	American Association for the Advancement of Science
AGI	Association of Ghana Industries
AUC	African Union Commission
CIA	Central Intelligence Agency
CSIR	Centre for Scientific and Industrial Research
CSRPM	Centre for Scientific Research into Plant Medicine
GIJ	Ghana Institute of Journalism
GJA	Ghana Journalists Association
IDRC	International Development Research Centre
KCCR	Kumasi Centre for Collaborative Research
MEST	Ministry of Environment, Science and Technology
NMC	National Media Commission
NMIMR	Noguchi Memorial Institute for Medical Research
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization
WSJF	World Federation of Science Journalists

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CHAPTER I

INTRODUCTION

During my brief stay in Ghana to collect data for this study, I woke up in the morning of January 18, 2010, to discover—from the news—that thousands of Ghanaians spent the previous night in the open places. The reason? A rumor had it that there was an impending earthquake with a magnitude similar to the one that had recently hit Haiti. People preferred to stay awake outside their homes because of the fear of their houses collapsing on them. It was alleged that the rumor started with someone who sent a text message about the earthquake. It took media interviews of some geologists to persuade some Ghanaians that earthquakes could not be predicted with precision and that it was a rumor. The science of earthquakes became a hot topic on several radio stations nationwide.

Science journalism plays an important role in a nation's development (Ugandan Science Journalists Association, n.d.). For example, it promotes literacy in science (Nelkin, 1995). For instance, if many Ghanaians had known that earthquakes could not be predicted with precision, they would not have allowed an earthquake rumor to disturb their sleep. Science journalism has been hailed by Patairiya (2007) as "the key to the real treasure of the [*sic*] scientific knowledge, by virtue of which scientific knowledge and concepts could be carried to the common man" (Introduction section, para. 1).

This thesis follows the style of the journal *Science Communication*.

However, a report of the United Nations Conference on Trade and Development [UNCTAD] secretariat (2001) based on content analysis of two Ghanaian newspapers indicated that the amount of science reporting was "in decline in the country [Ghana], after peaking between, [*sic*] 1992 and 1994" (p. 11). The report also noted that many journalists in Ghana cover science as part of their general journalism assignments. Almost a decade after the report, it is unknown to what extent, if at all, the amount of science reporting has changed in Ghana.

At the annual meeting of the American Association for the Advancement of Science (AAAS) in 2009 in Chicago, it was observed that science journalism was growing in developing countries (Russell, 2009). This was in contrast to the advanced world, where prominent media organizations, including the Cable News Network (CNN), had cut their science and technology reporting sections.

Russell (2009) quoted Akin Jimoh, a science journalist from Nigeria who attended the session, "Science Journalism in Crisis," as saying: "The loss in your part of the world is a gain in our part of the world … Journalism is growing in developing countries" (para. 10). Valeria Roman, an Argentinean science journalist, was quoted as saying: "We are in the beginning. Science journalism is increasing fortunately" (Russell, 2009, para. 10).

It might be expected that the increase in science journalism practice in developing countries, including Ghana, might lead to an increase in science journalism scholarly work. But I recently did a systematic literature review of science journalism research in five sub-Saharan African countries, including Ghana, and found that there is

a dearth of scholarly papers on the topic (Appiah, 2010). The review also showed that most of the few scholarly papers used content analyses of newspaper science reports to assess science journalism. This approach has two main limitations. First, it excludes science journalism in other media, including radio, television, and the Internet. Second, it provides information on the product, not the practice of science journalism.

To identify science journalism practice in Africa, this study involved a comprehensive survey among journalists in Ghana to determine how they practice science journalism. I focused on journalists in general because specialized science journalists are scarce in Ghana (UNCTAD secretariat, 2001). I sought to uncover many factors that influence science journalism in Ghana. The findings of the study will contribute to knowledge of science journalism practice in Africa. They will also help in making recommendations to advance science journalism in Ghana and other African countries.

Objectives of the Study

This study sought to uncover science journalism practice from the perspectives of general reporters. These reporters are active members of the Ghana Journalists Association who work in Accra, the capital of Ghana. This study had two main objectives:

1. To identify the self-reported demographic and professional characteristics of journalists in Ghana, such as the following:

    (a) Age and gender,

(b) Years of journalism practice,

(c) Education,

(d) Sector of employment (private or public),

(e) Type of mass media (newspaper, radio, etc.), and

(f) Membership in other associations.

2. To identify, from the perspectives of journalists in Ghana:

(a) the number of science stories they covered in the past 12 months;

(b) the sources used for science reporting;

(c) their current topics of interest in science reporting;

(d) the factors that appear to influence science reporting such as the motivators for, and barriers to, science reporting; and

(e) the future of science journalism in Ghana.

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Research Questions

The study addressed the following research questions:

1. What are the demographic and professional characteristics of journalists in Ghana?

(a) What are their ages, genders, and educational backgrounds?

(b) How long have they been practicing journalism?

(c) What type of media do they work for?

(d) In which sector are they employed—public or private or both?

(e) Do they belong to professional groups or associations other than the Ghana Journalists Association?

2. What sources do they use to cover science stories?

3. How many science stories do they recall covering within the past 12 months?

4. What types of science topics do they cover?

5. What factors—including political, social and cultural—motivate them to cover science?

6. What challenges do they report in covering science?

7. How would the journalists like science coverage in Ghana to be in the next 10 years?

Definition of Terms

The following are terms used throughout this thesis.

(a) What is science? I adopt the definition of science provided by Friedman, Dunwoody, and Rogers (1999):

> Science not only encompasses the natural and physical sciences, but also the social and behavioral sciences as well as medicine, environmental sciences, technology, and engineering. *Science writing* includes coverage of the accumulation of knowledge in these fields, as well as the political, economic, and social aspects of science. (p. xiii-xiv)

(b) What is journalism? Journalism involves reporting on ideas and events as they occur for public consumption, and is characterized by (1) news or news

judgment, (2) reporting or evidentiary method, (3) linguistic technique, (4) narrative technique, and (5) method of interpretation or meaning (Adam, 1993).

(c) What is science journalism? From the definition of science and journalism above, I define science journalism as follows: The reporting and writing for the public about the natural and physical sciences; social and behavioral sciences; and applied sciences such as medicine, environmental sciences, technology, and engineering. It also includes reporting and writing about the political, economic, and social aspects of science.

(d) What is science reporting? This is synonymous with science journalism or covering science in the mass media.

(e) Who is a journalist in Ghana? For the purpose of this study, a journalist in Ghana is one who is an active member of the Ghana Journalists Association (GJA).

(f) What is a news story? A news story is a "brief, tersely written, factual account often hurriedly written to meet . . . [a] deadline" (Burkett, 1973, p. 69). A science news is a news story about science.

(g) What is a feature story? A feature story "permits the writer to present color, anecdote, detail, evidence or drama. It offers a more personal, intimate or human (focus on the people involved) story than the impersonal news account" (Burkett, 1973, p. 69). A science feature is a feature story about science.

(h) What is a news source? A news source provides journalists with "direction, clarification, context, perspective, and commentary" (Conrad, 1999, p. 286).

(i) What is a mass medium? This is "any medium that communicates to large numbers of individuals: newspapers, television, radio, magazines, books, and the ever-expanding Internet and World Wide Web are prime sources" (Friedman, Dunwoody, & Rogers, 1999, p. xiv).

CHAPTER II

LITERATURE REVIEW

The current research focuses on the reporting of science in the mass media in Ghana. In order to understand this subject and put it in context, it is useful to know the literature on the following topics:

- the importance of science journalism,
- international perspectives on science journalism,
- dominant topics of science coverage,
- challenges of covering science, and
- science journalism practice in Africa and factors that influence it.

In addition, it is valuable to know and understand many contexts that influence science journalism in Ghana, including socio-economic, political, and cultural factors.

This chapter reviews the literature on the topics noted above and provides an overview of the socio-economic, political, and cultural contexts that influence science journalism in Ghana.

Importance of Science Journalism

Science journalism has implications for various stakeholders, including members of the public, scientists, and policymakers. Science has been described as the fulcrum of a nation's development (Merkel, 1998). Scientists usually communicate scientific knowledge through specialized journals (Nelkin, 1995). However, members of the

general public normally do not read scientific journals. Also, members of the public may find it difficult to understand scientific articles published in such journals. To make science understandable to a variety of people, including policymakers and consumers, journalists help translate such knowledge. Thus, science journalism promotes public understanding of, and engagement with, science (Gregory & Miller,1998).

Science journalism may also help members of the public make rational choices on scientific issues that affect their daily lives. In her book *Selling Science: How the Press Covers Science and Technology*, Nelkin (1995) stated:

> For most people, the reality of science is what they read in the press. They understand science less through direct experience or past education than through the filter of journalistic language and imagery. The media are their only contact with what is going on in rapidly changing scientific and technical fields, as well as a major source of information about the implications of these changes for their lives. Good reporting can enhance . . . the individual's ability to make rational personal choices; poor reporting can mislead and disempower a public that is increasingly affected by science and technology and by decisions determined by technical expertise. (p. 2)

The ability of science journalism to empower individuals to make rational personal choices in scientific issues may be particularly more important in societies where literacy in science is low. In such societies, individuals may consider whatever science information they receive from the media as the "gold standard." For instance, a communication scholar from Ghana, Kwadwo Bosompra (1989), in his assessment of the sources of health

information among rural dwellers in Ghana found that radio was second to health officers as the most credible source of health information.

Worldwide, governments, corporations, and many charitable foundations help fund scientific research (Nelkin, 1995). Some organizations even fund science popularization by scientists. For instance, the Wellcome Trust (2007), a medical charity in the United Kingdom, has special funding for science popularization by biomedical researchers from developing countries. When governments use the taxpayers' money to fund scientific research, the researchers have a responsibility to inform the members of the public —the taxpayers—of their findings. Science journalism helps scientific researchers to fulfill this responsibility to the public. Indeed, scientists in Europe are now obliged by research funders to communicate their research with the public (Claessens, 2008). When members of the public become aware of the research findings, they may lend support to researchers to acquire further funding for more research. Support for researchers from members of the public has recently become more important because of the limited public and charitable funding and stiffer competition among prospective applicants. Given the competition for funding for scientific research, researchers who popularize their scientific findings may be more likely to receive further funding than those who shield their research findings from the members of the public (Nelkin, 1995).

In addition to helping scientific researchers to obtain funding for more research or helping to shape personal choices on scientific or technological issues, science journalism may influence public policymaking on scientific issues (Nelkin, 1995). Science journalism may influence public policymaking in two main ways. First, the media can set the agenda for the members of the public through the framing of scientific issues (Nisbet, 2003; Antilla,

2005; Reis, 2008). Based on media contents, individuals or public interest groups may either support or oppose a public policy related to a scientific or technological issue.

Second, the media may influence politicians or policymakers either directly or indirectly through influence on voters. For example, when members of the public become more knowledgeable on a scientific issue, they can influence politicians to make decisions. For fear of losing their votes, politicians may side with the public or interest groups. Also, politicians may become more informed about scientific policy issues through science journalism. This information may influence their decisions on science-related public policies.

Given the above importance of science journalism, it is useful to know how different countries practice science journalism.

International Perspectives on Science Journalism

Science journalism—reporting science to the members of the public—is not new in the Western world. But in many developing countries, particularly those in Africa, its development has been slow. The differences in the status of science journalism may reflect in its history, backgrounds of its practitioners, topics of science reporting, and the challenges of reporting science.

History of Science Journalism

Some accounts of the history of science journalism suggest that scientists, science writers, and the industrial revolution played a major role in its development (Gregory & Miller, 1998; Nelkin, 1987, 1995; Rensberger, 2009). Gregory and Miller

have noted that science popularization and science began at similar times and have argued that "popularization pre-dates scholarly communication" (p. 19).

The industrial revolution in the nineteenth century led to the formation of scientific societies that had an interest in popularizing science (Gregory & Miller, 1998). As the industrial revolution led to new technological inventions such as the steam engine and the telegraph, members of the public became interested in knowing the science behind the inventions. Some scientists seized the opportunity by organizing lectures on science for the public. The printing press, an invention of the industrial revolution, also aided science popularization through the print media. A magazine known as the *Athenaeum* was launched in London in 1828 (Gregory and Miller, 1998). The magazine reported on the annual meetings of the British Association for the Advancement of Science—formed in 1831—for most of its issues (Gregory & Miller, 1998). In the 1830s, the magazine also published reports of the meetings of the Geological Society of London (Nelkin, 1987). The magazine ceased publication in 1921 (Princeton University Library, 2010).

The establishment of the American Association for the Advancement of Science (AAAS) in 1847 contributed to increased science popularization in the United States (Gregory and Miller, 1998). Gregory and Miller have noted: "At the AAAS meetings before the Civil War, scientists talked to each other in closed sessions during the day, and the public were admitted only to free lectures in the evening" (p. 23). In the late nineteenth century, lectures of star scientists such as Thomas Huxley, Louis Agassiz, and Asa Gray were published in both European and American newspapers (Nelkin, 1987).

The history of science journalism in India and Russia seems to mirror that of Britain and the United States. In India, science journalism has been traced to April 1888, at which time newspaper articles on science appeared in the monthly *Digdarshan* from Srirampur (Hooghly) in West Bengal (Patairiya, 2007). For Russia, science journalist Viola Egikova (2009), who is president of the Russian Association for Science Writers and Journalists Intellect, has noted:

> Until 1914, before the First World War, Russia was among the most powerful countries in Europe, having not only great literature and art, but very good science, universities, science museums and science popular media. There was a strong tradition of public lectures in the Politechnical Museum, the Art Museum and at different universities, which had a great impact on the media. . . . But there is no historical research on the popular science media that existed before the revolution in 1917. (p. 2)

Dramatic scientific discoveries, no doubt, helped make science popular in the press. For instance, in 1919, Albert Einstein's theory of relativity received considerable coverage in the British press (Gregory & Miller, 1998). At the turn of the century, some scientists wrote articles for the popular media, particularly magazines and newspapers. These scientists mainly wrote about the "good" side of science and were therefore not critical of it. But the first World War, which occurred from 1914 to 1918, revealed the "bad" side of science.

In the 1920s, advancement in science led to an economic boom in the United States and Europe (Gregory & Miller, 1998; Nelkin, 1987). As a result, even journalists

who hitherto found it difficult to report science "conveyed an image of science as an economic resource, an instrument of progress, a servant of technological needs" (Nelkin, 1987, p. 88).

In the United States, newspaper entrepreneur Edwin W. Scripps established a national news agency for science in 1921. The news agency was known as the Science Service (Gregory & Miller, 1998; Nelkin, 1987). Gregory and Miller have stated: "From 1921, the Science Service . . . was distributing science news produced by and for science journalists—a step toward the professionalization of science popularization [science journalism] and away from the utterances of the big men [great scientists]" (p. 29).

In Britain and the United States, the formation of professional groups interested in reporting science influenced science journalism. In the United States, 12 science reporters established the National Association of Science Writers (NASW) in 1934 (http://www.nasw.org/about/index.htm). Science journalist Boyce Rensberger (2009) has noted that the group "called themselves 'writers' rather than 'journalists' or 'reporters' because they felt it sounded more professional" (p. 1055). The Association of British Science Writers (ABSW) was started in 1947 (http://www.absw.org.uk/about-the-absw).

Until recently, science writers tended to report about the good side of science without being critical of it (Rensberger, 2009). Beginning in the 1970s, some reporters and environmentalists became more concerned about products of science destroying the environment. This was in part due to "controversies and crises such as the reactor meltdown at the Three Mile Island nuclear power plant near Harrisburg, Pennsylvania"

(Rensberger, 2009, p. 1056). Thus, science journalists—like general reporters—increasingly provided the social and political contexts of the stories they reported.

In the early1980s many newspapers in the United States had weekly science sections. Since the late 1980s the number has declined, in part because of the proliferation of the Internet (Rensberger, 2009). The Internet has influenced science journalism in at least three main ways. First, the Internet has led to the decline of traditional newspapers and simultaneously has led to many journalists to self-publish online. Second, some scientists are also publishing science online, thereby "bypassing journalists altogether and taking their science—and their agendas—directly to the public" (Rensberger, 2009, p. 1056). Finally, the Internet has made it easier for science reporters, as Barbara Gastel (2005), author of *Health Writer's Handbook*, has noted:

> Today, health writers commonly begin their information searches online. Indeed, some young health writers may have difficulty imagining any other way.
>
> Similarly, much of what health writers formerly did by letter or telephone is being done by e-mail. As well as supplying old types of information in new ways, online capabilities are providing new and increased opportunities to find story ideas and information. (p. 65)

This is how science journalism began, but who is reporting science now?

Science Journalism: Science Journalists, Science Writers or Scientists?

Some science reporting is done by science journalists, some by others. The title *science journalist* may be assumed by a journalist who specializes in writing or reporting

about science. But who is a science journalist or a science writer? According to Natasha Loder (2002), science and technology correspondent for *The Economist* in the United Kingdom, science writers are usually employed by scientific organizations to write about science for the public in a manner that makes science interesting to the public. The two terms, science journalists and science writers, often are used as synonyms. And when a distinction is drawn, it generally seems to be that science journalists are employed by the media whereas science writers, a broad term, may be employed by the media or other sectors.

In a review article on science communication—a component of which is science journalism—Weigold (2001) posed a number of questions that should be addressed in science journalism scholarship, including:

> How do journalists balance their needs for close working relationships with scientists with their need for autonomy? Do journalistic norms for the coverage of government and policymakers hinder or enhance the quality of coverage of scientists? What is the effect of a reporter's own science literacy on his or her coverage of science, selection of stories, choice of sources, and quality of reporting? (p. 186)

According to Weigold, the label science journalism fails to recognize the different aspects of science reporting. Thus, some journalists who may cover social and political aspects of science may not see themselves as science journalists. Ed Yong (2010), a British science writer, aptly gives four main reasons why the term science journalist seems odd:

> **Journalists often switch beats.** While many are specialist reporters with the expertise and experience needed to critically analyse a given area, others are drafted in from different disciplines and increasingly so as jobs are lost. . . .
>
> **Science is culture.** Stories don't always fit nicely into the compartments that media organisations decide to place their news into. . . .
>
> **It doesn't matter to readers.** The name and title on the byline hardly matters to readers or the general public perception of science. You could argue that a news outlet's contribution to science journalism is everything within its pages with a scientific element, regardless of who writes it.
>
> **It's very old media.** The playing field has changed. Anyone can pick up a keyboard and communicate to the entire world about science. . . . (para. 2)

As a profession, science journalism thrives on the relationship between science journalists and the sources of scientific information. According to Maillé, Saint-Charles and Lucotte (2010, p. 77), journalists should consider scientists as "partners" rather than as "sources" to ensure they build professional relationships with scientists. Maillé, Saint-Charles and Lucotte also call for studying science information flow among journalists and other stakeholders related to science, including activists, politicians, industry, communities, and editors.

Earlier studies of the relationship between science journalists and scientists showed a widening gap between the sources (see for example, Dunwoody & Ryan, 1985; Dunwoody & Scott, 1979; Peters, 1995). A recent study in the United States, Japan, Germany, Great Britain, and France (Peters et al., 2008) has showed that the gap

between journalists and scientists is smaller than previously thought. Yet, in many developing countries, although little scholarly work has been done on the topic, anecdotal evidence suggests that a large gap exists between science journalists and scientists (World Federation of Science Journalists [WFSJ], 2009).

Whereas in developed countries, some journalists who specialize in reporting science for major news organizations stay in that specialty throughout their careers, in some developing countries, as in smaller media in developed countries, many journalists cover science as part of their general reporting duties. At a United Nations-sponsored workshop on science journalism, a Pakistani science journalist is reported to have stated: "We need to assure that they [journalists who develop an interest in reporting science, but switch to other careers] become bona fide science journalists" (Lane, 2007, para. 16). Although many studies have explored the characteristics of science journalists (for example, Dennis & McCartney, 1979; Dunwoody, 1986; Sachman, Simon, & Valenti, 2002), such studies have largely been done in advanced countries where bona fide science journalists exist. However, science journalists in Africa may not have the same characteristics as those in the countries where these studies were done. The difference may lie in the training of science journalists.

Backgrounds of Journalists Covering Science

Scientists need special training to investigate science. Journalists normally require training to practice journalism. So do journalists covering science need training

in both science and journalism? Many scholars and science journalists offer different opinions.

In his book *Medical Journalism: Exposing Fact, Fiction, Fraud*, Ragnar Levi (2001), a physician and medical journalist, quoted an editorial from a medical website that seems to favor a training in science as necessary for science journalism: "Weather reports, whether in newsprint or on television have their origins from registered meteorologists. Isn't the public entitled to have science reported by those who have at least been trained in the scientific method?" (p. xiii). However, a former science correspondent for the Press Trust of India, K.S. Jayaraman (2008), writing on the subject "How Do I Become a Science Journalist?" has indicated that "there is no single designated pathway into science journalism" ("Getting Started," para.1). Jayaraman has noted that to become a science journalist, one must not necessarily have a detailed knowledge of science, but one must have good writing skills and an interest to learn and communicate science.

Unlike Jayaraman, Loder (2002) identifies two main routes through which one can become a science journalist or science writer. First, one must have a specialized training in science journalism. Some earlier studies have shown that many journalists who cover science lack training in science or science journalism (for example, Dennis & McCartney, 1979; Henningham, 1995). Second, general reporters may become science journalists by acquiring the desire and the experience to cover science as they advance in their career. In a national survey of health and medical journalists in the United States, 70 percent of the 468 respondents had bachelor's degrees, 19 percent had master's, and

4.5 percent had doctorates (Viswanath et al., 2008). In the study, 8 percent of the respondents reported having life sciences as majors in college, almost half of the respondents had journalism degrees, and 13 percent had communication degrees. It was not clear from the paper published about the study whether those with journalism degrees had received any education in science journalism or medical journalism, although many courses or programs in science journalism exist in the United States. For example, Atkinson, Deith, Masterson, and Dunwoody (2007), at the School of Journalism and Mass Communication of the University of Wisconsin-Madison, have compiled a directory of science communication training courses or programs in the United States. As of January 8, 2010, this directory listed 51 training courses or programs across the United States.

In most developing countries, many educational institutions lack science journalism courses or programs (Econnect Communication, 2007; WSFJ, 2009). In contrast, a report by the European Commission (2008) showed that science journalism training in Europe is in abundance. The second paragraph of the introduction couldn't have said it better:

> From Master programmes specifically dedicated to science journalism, to individual modules within general journalism or science degrees, to *ad hoc* workshops and debates on science communication, Europe clearly has a wealth of formal and informal training opportunities in the field of science journalism. (p. 7)

The report identified 27 countries in Europe that have science journalism training programs.

Nelkin (1987) noted the potential problem of lacking experience or training in science journalism:

> Most journalists who cover science and technology, especially those working for small-town newspapers, write about science only part of the time. And even general reporters, when covering national security, crime, trends in education, budget priorities, or health, must often touch on some scientific or technical issues. . . . And lacking both training and experience, they are less able to evaluate what they are told. (pp. 101-102)

Given the differences in the educational backgrounds among journalists covering science in developing countries and the Western world, do the dominant topics of science coverage differ?

Dominant Science Topics Reported by Journalists

Journalists normally rely on scientific information available at a given time before they can report science in the media. Thus, dominant scientific topics covered in the media seem to mirror the changing trends in the scientific fields.

In analyzing the science topics reported by the media, science communication scholars normally face one main challenge: the definition of science. Friedman, Dunwoody, and Rogers (1999) define science as comprising "not only the biological, life, and physical sciences but also the social and behavioral sciences and such applied

fields as medicine, environmental sciences, technology, and engineering" (p. ix). Friedman, Dunwoody, and Rogers have noted that there are political, economic, and social aspects of science.

Given this broad definition of science, it is unsurprising that many scholars who analyze science topics covered in the media have used different criteria to identify science topics. For instance, science journalism scholar Carine van Rooyen (n.d.) in evaluating science and technology coverage in South African print media had 19 categories: from astronomy to zoology. Van Rooyen identified 994 science stories in 15 popular newspapers over three months in 2002 and found that the greatest proportion (18 percent) related to biomedicine whereas the least (0.2 percent) related to mathematics.

In contrast, in analyzing science coverage in the Italian daily newspaper *Il Corriera della Sera* from 1946 through to 1997, Bucchi and Mazzolini (2007) identified only six categories of science topics: astronomy, biology, chemistry, ecology, engineering, medicine, and physics. Bucchi and Mazzolini found that prior to the 1960s, physics and mathematics related-topics (physics, mathematics, and astronomy) dominated but since the 1970s, biomedical topics dominated science stories.

The dominance of science topics in the mass media may depend on at least three main factors. First, an increase in events or research publications related to a scientific field may contribute to more coverage. For instance, the dominance of physics-related topics before the 1960s might have been as a result of events and research in astronomy during the period, which attracted increasing media coverage. Similarly, Bauer and

Gregory (2007) analyzed the trends in science coverage by *The Daily Telegraph* of the United Kingdom from 1946 through to 1996, and stated:

> In terms of content, we find that the first expansion of the 1950s is dominated by astronomy, the beginning of the space race, and by nuclear power, . . . Space and nuclear issues were replaced first by environmental news, then by computers, then in the 1990s by biotechnology as the dominant techno-scientific theme of the mass media. Over this period the public space commanded by the physical sciences declines, while that of the biomedical and social sciences increases. (p. 35)

Bauer and Gregory attribute the new trend to a focus on reporting commercial and private technologies such as biotechnology in recent times.

Second, the dominant topics of science covered in the media may reflect how much time reporters devote to a particular scientific or technological area. For instance, a survey of 75 science journalists on metropolitan dailies in the United States (Dennis & McCartney, 1979) showed that on average, the science journalists devoted 39 percent of their time to covering medicine, 27 percent to environment and energy, 11 percent to technology, 10 percent to biological sciences, 7 percent to physical sciences, and 6 percent to behavioral sciences. Thus, the dominant coverage of biomedical topics may be because journalists devote more time to covering such topics.

Finally, press releases may contribute to coverage of a science area. A content analysis of science reported in two media outlets in the United States—the *New York Time Magazine* and *NBC News*—showed that 33 of the 38 science stories published in

the *New York Time Magazine* were on health whereas all the 41 (100 percent) science stories broadcast on *NBC News* related to health (Suleski & Ibaraki, 2010). The authors indicated that leading medical journals—unlike non-medical journals—that published the scientific articles sent press releases to the journalists, thus making it easier for the journalists to report health. But do science journalists face challenges in reporting science?

Challenges of Covering Science

Journalists normally consider science as a complex subject requiring much attention if they are to cover it accurately. Many communication scholars have enumerated the challenges journalists face in covering science (for example, de Semir, 2000; Nelkin, 1987, 1995; Ward & Jandciu, 2008).

Nelkin (1987) stated that every journalist faces challenges in reporting, but those faced by science journalists are greater. According to Nelkin, editors who lack training in science journalism sometimes distort stories science journalists write. In addition, lack of training in science makes it difficult for general reporters to cover complex science.

Science journalist Vladimir de Semir (2000) has enumerated some challenges faced by science journalists in covering science: separating probability from truth, the reliability of the source, and the impact of press releases. According to de Semir, scientists usually use words such as "may" or "seems" to describe probabilities of events, but journalists view that language as too weak to hook the audience. Thus, journalists often distort the scientific findings through use of absolute or commanding terms. De

Semir also has noted that because of the competition for space and time, some science journalists make their stories sensationalistic. Moreover, de Semir has stated that reporters sometimes rely on sources that do not have authority in the fields being discussed, but just because these sources are prize winners, they are consulted unquestionably. Although press releases can be useful, over-reliance on them makes science journalists neglect equally important science journals that do not produce press releases (de Semir, 2000; Kiernan, 2006).

Ward and Jandciu (2008) interviewed 25 science journalists in Canada and categorized the challenges science journalists face into two main groups: individual and systemic. The authors explained:

> By 'individual challenges' we mean the personal abilities, skills, and qualifications of the individual journalists interviewed, such as their level of scientific knowledge. By systematic challenges we mean the challenges faced by the science journalism 'system' such as how newsrooms gather and edit science stories. Often, journalists have limited or no control over systematic factors yet these factors still significantly affect how they do their job. (p. 13)

Ward and Jandciu said that journalists are not given enough time to report science, hence they often depend increasingly on science journals as the main source of information.

However, the findings of a recent study suggest that some science journalists may not be "slaves to journals" after all. According to Suleski and Ibaraki (2010), despite the increase in number of scientific papers published, very few articles are covered by the mass media. The authors provide this analogy:

> If the output of science articles were the volume of a swimming pool, the total papers that made it to a mainstream audience through news media would fill only a quart, and the nonhealth/medicine papers would be just two tablespoons. (p. 120)

The authors further indicated that indeed, access to too many scientific research papers is a challenge to Western science journalists:"With the exorbitant amount of science output there is simply only so much published research science journalists can effectively cover (Suleski & Ibaraki, 2010, p. 123).

In contrast, in developing countries, access to scientific information even by scientists is limited. In Pakistan, Ahmed (2005) has identified a lack of government support—particularly for publishing science journals—and inaccuracies in science reporting as barriers to science journalism. Lack of access to science journals in developing countries has prompted initiatives from some international organizations. For instance, the International Network for the Availability of Scientific Publications [INASP] (2006) has launched initiatives to alleviate the problem. Through INASP's Journals Online project, many African and Asian journals are available online. In addition, to support authors to write scientific papers—since lack of writing and editing skills is a problem—AuthorAID at INASP provides training to researchers largely through mentoring and research-writing workshops (Walker, 2009). The World Health Organization has an initiative known as the HINARI program that enhances access of researchers in developing countries to biomedical and health literature (http://www.who.int/hinari/en/). Through the HINARI program, health workers and

researchers in 109 countries, including those in Africa, can now access the contents of more than 7,000 journals. I was not, however, able to find any literature on whether researchers or scientific journals in developing countries try to provide scientific outputs to journalists for coverage in the mainstream media.

Accuracy of science reporting has been a subject of study in developed nations. Considerable disagreement exists on what constitutes accuracy of scientific reports (Carsten & Illman, 2002). Carsten and Illman have therefore suggested a framework for grouping five types of errors or perceived inaccuracies: (1) minor inaccuracies, such as wrong spellings; (2) objective technical errors, such as presenting wrong numbers; (3) subjective errors, such as saying X causes Y when it should be the opposite; (4) lack of completeness, such as writing "a Texas A&M University professor " when " a professor of biology at Texas A&M University" would be better; and (5) style and usage, such as using writing "located next to" when "adjacent" could mean the same. In a developing country like Pakistan, it appears that science journalists do not consider accuracy as a problem. Ahmed (2005) explained: "Misreporting political issues can cost a journalist their job, but incorrect science reporting carries no such risk—creating little incentive for accuracy" (Problems within the media, para. 3).

Recently, the impact of technology on science reporting has also been a challenge, particularly in the Western world. Science journalist Michael Gross (2008) has stated that science reporting is turning to fast food because bloggers without training in adequately explaining science to the general public are producing all sorts of information on the Web. Gross suggests:

> Rather than shrinking science reporting into ever faster and shorter snippets, we should look at ways in which we can invest more time and space into explaining to the general public the more demanding, but also more rewarding, insights that science is obtaining now. (p. 3)

The impact of technology on science journalism is also felt in Africa, although to a lesser degree than in the Western world. Given all these challenges, what is the status of science journalism in Africa?

Science Journalism in Africa: Training, and the Birth of Professional Associations

Science journalism is relatively new in Africa. However, there were initiatives to boost its growth in the early 1980s. At that time, the International Development Research Centre (IDRC) organized workshops on development science writing for English-speaking and French-speaking African journalists (Hibler, 1981). Yet, many African nations have only recently begun to promote science journalism. Many factors may account for this phenomenon. First, the media in Africa originated in part as a tool to fight colonialism. Unfortunately, the growth of science journalism in the late twentieth century occurred while most African countries were fighting for independence from colonialism. Odhiambo (1991, p. 21) explained: “[I]f nineteenth century African history was the history of European activities in Africa, then twentieth century African history has been the history of African reaction to Europe (and its diaspora)." Thus, in Africa political reporting receives much more attention than science reporting.

Second, in most African countries after independence, the media were used mainly to promote the propaganda of the governments, and many journalists had to support the governments or be deemed as enemies to progress. Odhiambo (1991) put it:

> Most African countries explicitly stated that it was the role of the mass media to create national unity and foster development. In fact this was deemed so important that many governments became the mass media through nationalization. Journalists suddenly became civil servants and government spokespeople. Most journalists did not object to this development and actively supported government nationalization in the belief that this was being done for patriotic reasons, and that politicians would play their traditional role of leadership and leave journalist to play theirs of watchdog and sentinel. (p. 23)

Finally, because of the focus on developing the continent, development journalism has become more entrenched in Africa than science journalism. Thus, because science is deemed to be a component of development, the slow growth of science journalism may reflect a focus on more non-science related development issues such as poverty alleviation and corruption that confront Africa's progress. Development is defined as "the improvement of the quality of life of the individual" (as cited in Ongkiko & Flor, 1998, p. 26). Development journalism involves reporting on issues that brings development, and it has a particular emphasis on rural communities (Shah, 1990). Development journalism is an offshoot of development communication, a concept first proposed in 1971 by Quebral (as cited in Ongkiko & Flor, 1998). Quebral defined development communication as:

> the *art* and science of *human communication* applied to *the speedy transformation* of a country and the mass of its people from *poverty* to a *dynamic state of economic growth* that makes *greater social equality* and *the larger fulfillment of the human potential*. (p. 130)

The former president of Tanzania, Julius Nyerere, who was also a publicist, noted: "While others race to the moon, we try to reach the village" (Wimmer & Wolf, 2005, p. 3). Because science helps develop a nation, science journalism is a component of development journalism. For instance, in an assessment of development news in three Indian daily newspapers, Shah coded development news into eleven categories: social welfare; international and domestic economics; agriculture and rural development; industry, science, and technology; politics and diplomacy; human interest; health or medicine; transportation and communication; employment or labor; education; culture; and human rights. Shah's study found that 22 percent of the 632 stories were on social welfare, 16 percent were on agriculture and rural development, and 12 percent related to industry, science, and technology. In addition, 16 percent were on agriculture and rural development, and 5 percent were on health or medicine. If the newspapers were analyzed for science-related stories today, news on science, technology, industry, agriculture, and health or medicine would have met the inclusion criteria. Thus, it could be argued that science news is a component of development news.

Wimmer and Wolf (2005), who have analyzed journalism training in African institutions, have found that development journalism is entrenched in the continent's schools. For instance, the School of Journalism of the University of Nairobi has a four-

year bachelor's degree program in journalism and media studies. The University of Nairobi (2010) has on its Web site an introduction to the program. The introduction demonstrates an emphasis on development journalism:

> It has been realised that the technical and practical skills orientation of journalism training in Africa is no longer adequate in the current context: communication and media practitioners require a clear understanding of their society and forces affecting them such as the challenges of *development*, globalisation and the impact this has on Africa. (para. 2) [emphasis added]

In the first two years of the program, among the 24 core courses students should study are science and technology in development, HIV and AIDS instruction, and development communication. During the third and final years, students are expected to specialize in one of these four areas: print journalism, broadcast journalism, public relations, or development communication. Moreover, during the third and fourth years, based on a student's interests and specialization, elective courses such as reporting on science and technology, statistical methods, and reporting on information communication and technologies (ICTs) are available. African journalists trained in development communication may therefore be practicing some aspects of science journalism within development journalism. But "true" science journalists are rare.

Realizing the lack of science journalists on the African continent, there have been some initiatives to promote science journalism. The website of SciDev.Net (2010a) was launched on December 3, 2001, in part to contribute to the growth of science journalism in developing countries, including those in Africa. After its official launch, the first

regional branch was established in sub-Saharan Africa in 2002 (SciDev.Net, 2010a). SciDev.Net has held science journalism workshops in developing countries. The website often carries news on science and development that focus on Africa. In addition, the website has useful resources for science journalists in developing countries. The resources include practical guidelines on science journalism (SciDev.Net, 2010b). By 2008, people in sub-Saharan Africa constituted 21.8 percent of the more than 41,000 registrants who receive regular communications from SciDev.Net (SciDev.Net, 2008). This proportion, which is the highest, is followed by Latin America and the Caribbean (19.6 percent), South Asia (17.2 percent), Europe (14.7 percent), and the United States and Canada (10.9 percent). A freelance journalist from China, Chong Wu, has reflected on SciDev.Net (2008):

> It was such a wonderful experience for me of writing with SciDev.Net. The editors were helpful and professional. More importantly, the experience changed many of my ideas about science journalism and switched my focus onto more of development issues rather than a simple innovation. It also expanded my vision and my network. It opened another door to me. So, I would like to write for Sci.Dev.Net forever. (p. 16)

A Kenyan freelance journalist, Zablon Odhiambo, also expressed his views (SciDev.Net, 2008): "It [Sci.Dev.Net] has built in me a culture of tracking the emerging science news and events and in sourcing for compelling story ideas for both local and international media audiences" (p. 17).

In 2007, the World Federation of Science Journalists (2009) launched a mentoring program to train science journalists in Africa. The project, known as "Science Journalism COOPeration" or "SjCOOP," initially enrolled 60 journalists, mainly from Africa and the Arab world. However, 21 mentees were dropped for not being active and were replaced. Overall, 32 journalists successfully completed the mentoring program over the course of three years (World Federation of Science Journalists [WFSJ], 2009). One of the mentees from Nigeria, Abiose Adelaja, stated:

> The lesson helped me sharpen my skills now as a science writer. I never knew of such a database as Plumb. It is also interesting to walk around universities and put names down of researchers, which you will contact a year down. What interested me is the issue of fraud. It makes me more careful with scientists seeking to use me to get publicity. (p. 92)

Through the SjCOOP, seven new science journalism associations have been formed in Africa and the Middle East. The African countries that have new science journalism associations are Cameroon, Ghana, Rwanda, South Africa, Sudan, and Uganda. According to the WFSJ (2009), between 400 and 500 journalists are now members of science journalism associations in Africa and the Middle East. Some of the newly formed associations have organized workshops and conferences on science journalism. Some of the SjCOOP graduates have been publishing their stories on the SciDev.Net website. Moreover, some of the graduates have won awards in science journalism (World Federation of Science Journalists, 2009).

The second phase of the SjCOOP began in 2010 (Erasmus, 2010). The second phase will train 60 young journalists in Africa and the Middle East on issues that affect the regions, such as health, the environment, agriculture, research, and science and technology. In addition, 15 journalists will undergo a train-the-trainers program. The project intends to establish 10 new science journalism associations in the two regions.

Science journalism in Africa received a further boost on July 8, 2009, when the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the African Union Commission (AUC) signed a three-year special agreement on science and technology journalism training in Africa (UNESCO & AUC, 2009). Article one of the special agreement stated:

> 1. The parties acknowledge that the collaboration will facilitate the realization of their shared aim of contributing to journalism training particularly in science and technology in Africa. . . .
>
> 2. The parties share a common understanding of the vital role of quality journalism and the media in communicating important aspects of life that are increasingly dependent upon science and technology and its applications. . . .
>
> 3. Bearing this in mind, the parties will cooperate to create both continent-wide and international synergies to reinforce journalism training particularly in science and technology in Africa to:
>
> i) Provide support for the development of regional science and technology networks for journalism students and media professionals;

> ii) Improve the range and scale of journalism training in science and technology in Africa;
>
> iii) Develop a Centre of excellence in journalism training in science and technology in Africa. (p. 2)

Science Journalism in Africa: Some Fellowships and Awards

African journalists can compete for a number of science journalism fellowships and awards. These opportunities may have contributed, in part, to the growth of science journalism in Africa. Some African journalists have participated in the Knight Science Journalism Fellowships of the Massachusetts Institute of Technology (http://web.mit.edu/knight-science/fellowships/overview.html). This program, which was started in 1983, provides recipients with nine-month fellowships. Since 1984, some journalists outside the United States with interests in covering science, technology, and the environment have been fellows. Philip J. Hilts, the director of the Knight Science Journalism Fellowships, has noted (personal communication, July 20, 2010):

> Checking through our records of fellows, there are 13 from Africa, including this year's fellow Andrew Mambondiyani, from Zimbabwe. But still, none from Ghana, though we have had a couple of candidates from Ghana who came close, and we're hoping to have more applications from Ghana. The [African] country that has sent us the greatest number of Fellows is Nigeria, with six.

On the African continent, some awards related to science journalism exist. The CNN MultiChoice African Journalists Competition (http://edition.cnn.com/WORLD

/africa/africanawards/categories.html) has 16 categories of awards. The competition was started in 1995 through an initiative of a Ghanaian, Edward Boateng—then the regional director of CNN's parent company, Turner Broadcasting (http://edition.cnn.com/WORLD /africa/africanawards/about.html). Three of the awards relate to science journalism: HIV reporting, health and medicine, and the environment. According to Kelvin Talbot, of Turner Broadcasting System Europe Limited, whose organization has records of the award winners, 11 Ghanaians have so far won some awards (K. Talbot, personal communication, July 20, 2010). Of these, Joana Mantey, was an overall winner (CNN MultiChoice African Journalist of the Year), two journalists—Loretta Vaderpuye and Daniel Nkrumah—have won awards in the environmental category, three have won awards in categories not specified (due to lack of complete information), and the others have awards in categories not related to science and technology.

Journalists in Africa can also compete in a science journalism competition established by the American Association for the Advancement of Science (AAAS) and one established by the International Development Research Centre (IDRC). The AAAS science journalism award for reporting science news to children was started in 2005 (http://www.aaas.org/aboutaaas/awards/sja/winners.shtml). It is the only category that accepts applications from journalists worldwide. No journalist from Africa has won it to date. The IDRC science journalism award offers opportunities for journalists in Africa to undergo internships in foreign mass media organizations that report science (http://www.idrc.ca/en/ev-135527-201-1-DO_TOPIC.html).

Siemens Profile Awards is another science journalism competition in Africa. Started in 2003, it was initially only for South African journalists. Since 2004, all journalists in Africa can compete in it (http://www.profileawards.co.za/panafrican.aspx). The Profile Award focuses primarily on developing science reporting in Africa. Categories include industry, energy, health care, and information technology. Godwin Nnanna is the only Ghanaian to have won a Siemens Profile award: the information technology award in 2007 and energy award in 2008 (D. de Wet, personal communication, August 3, 2010). De Wet, who is the program administrator of a South African firm that manages the Profile Awards, has stated that so far only four media institutions from Ghana have participated in the competition.

The promotion of science journalism in Africa through the fellowships and awards discussed thus far has benefitted some Ghanaian journalists and possibly the media they work for. But how is Ghana as a whole responding to science journalism? What contexts influence science journalism in Ghana?

Ghana: Geography, People, Culture, and Human Development Indices

Ghana is located in West Africa (Figure 2.1) and borders three countries: Côte d'Ivoire (Ivory Coast) to the West, Togo to the East, and Burkina Faso to the North. Ghana has a total population of 24,339,838 (Central Intelligence Agency [CIA], 2010) and a total area of 92,100 square miles or 239, 460 square kilometers (Boateng, 1966).

Figure 2.1. Location of Ghana [Online image].
Source: Central Intelligence Agency (2010). The World Factbook: Ghana. Updated August 3, 2010, Retrieved August 4, 2010, from https://www.cia.gov/library/publications/the-world-factbook/geos/gh.html

The size of Ghana is similar to Oregon State (CIA, 2010). Ghana "sits" on the Gulf of Guinea (Figure 2.2).

Figure 2.2. Map of Ghana Showing Accra and Some Other Cities [Online image]. Source: Central Intelligence Agency. (2010). The World Factbook: Ghana. Updated August 3, 2010, Retrieved August 4, 2010, from https://www.cia.gov/library/publications/the-world-factbook/geos/gh.html

The county is divided into 10 administrative regions and 230 districts. The capital city of Ghana, Accra, lies on the coast (Figure 2.2).

Ghana is mainly a lowland country with abundant vegetation and natural resources, including gold, timber, industrial diamonds, bauxite, manganese, and salt. Recently, Ghana discovered petroleum on the coast of the Western region, near Côte d'Ivoire. Petroleum production is set to begin in the last quarter of 2010. Ghana's richness in gold was responsible for its former name, the Gold Coast. The lowest point of Ghana is 0 m above sea level, and, the highest point is Mount Afadjato, which is 880 m (CIA, 2010). The Greenwich Meridian—which divides the Earth into eastern and western halves—passes through Tema, a city near Accra (Figure 2.2). Thus, Ghanaians often say "Ghana is at the Center of the Earth." Ghana's Lake Volta is the largest artificial lake in the world. It was created from River Volta in 1964 through the construction of the Akosombo Dam, which is Ghana's main source of hydroelectric power (De Graaf & Ofori-Danson, 1997). The lake has a surface area of 8,400 km^2, a shoreline length of 4,800 km, a maximum depth of 70 m and an average depth of 19 m (De Graaf & Ofori-Danson, 1997).

Agriculture is the main occupation in Ghana. About 56 percent of the people engage in agriculture, whereas 15 percent and 29 percent are employed in industry and services, respectively (CIA, 2010). Retail and wholesale businesses, restaurants, and hotels dominate services (Aryeetey, n.d.). Ghana is the second largest producer of cocoa beans in the world, after Côte d'Ivoire (Ntiamoah & Afrane, 2008).

Like many African countries, Ghana is multi-ethnic and multi-lingual. About 46 languages are spoken in Ghana, of which nine are written and are studied in schools (ICYEGhana, 2010). The most dominant language—Akan—is spoken by an ethnic group called the Akan. Dialects of Akans include Twi, Fante, and Ashanti. A Ghanaian who speaks one Akan dialect can understand a person who speaks a different Akan dialect. Bodomo (1996) has categorized the main languages into ten, but not based on the ten regions. For instance, the Akans, who form about 44 percent of the population, are concentrated in six of the ten regions (Agyekum, 2006). The Akans are also present in the other regions, albeit in smaller numbers.

Despite the multiple languages, a unifying foreign language exists: English. Ghana is a former colony of the British, and so the official language of the people of Ghana is English. However, many media houses, particularly radio stations, promote Ghanaian languages by using them for broadcast. Journalists working for such media houses who cover science usually translate the content into the main language of the communities they serve. However, compared with countries like Japan and China that have their official languages and have to learn English as a second language, journalists who work in Ghana do not face the difficulty of using English to communicate science. This is because English is the main language of instruction in schools. Formerly, Ghanaian languages were used in the first three grades of schools for instruction, but a law promulgated in 2002 has made it compulsory for English language to be used as the medium of instruction even in the lowest level of education (Owu-Ewie, 2006).

Ghana was the first sub-Saharan African country to achieve independence from colonial rule. Formal education has not changed much of the indigenous cultures of the people of Ghana. For instance, it is not culturally acceptable for one to speak while gesturing with the left hand. When greeting an elderly person, one is supposed to remove his or her hat. In addition, when one approaches someone face-to-face to request help, rather than merely making the request via e-mail or the telephone, it is seen as a sign of respect.

Ghanaians are also welcoming. Visitors traditionally enjoy some privileges. If there is a new cup in the house, it is usually reserved for visitors. In addition, Ghanaians are very religious. About 68.8 percent of the population are Christians, 15.9 percent are Muslims, and 8.5 percent follow traditional religion (CIA, 2010). Because Christianity is the dominant religion, it is often difficult to reach many workers at their worksites on Sundays, the day many people go to church.

Soccer (usually known in Ghana as football) is the commonest sport. Ghanaians love cheering their soccer teams. There are national teams in different age categories for both males and females. The senior male team, known as the Black Stars, is a force to be reckoned with in African and world football. It was the first African team to win the African Cup four times, but it has now been surpassed by Egypt, who have now won the Cup seven times. In the 2006 World Cup in Germany, Ghana was the only African country to qualify to the next round. In the 2010 World Cup in South Africa, which was the first World Cup to be hosted in Africa, Ghana was the first African country to win a match, and it was the only one of the six African countries to qualify to the knockout

round. Ghana reached the one-eighth stage, becoming the third African country—after Cameroon in 1990 and Senegal in 2002—to reach that stage in the history of the World Cup. Two of the junior male soccer teams have won World Cups. The under-17 soccer team was world champions in 1991 and 1995. In 2009, the under-20 soccer team became the first African team to win the World Cup at that level. When a national soccer team is playing another country, that may not be a good time to engage a Ghanaian in a conversation, unless it is related to the match. When the Ghanaian team wins the match, you don't need to be told: There will be celebration everywhere. That is a time when people of all walks of life celebrate the national pride together. While collecting data for this research, Ghana was playing in the Africa Cup of Nations in Angola. I had to re-schedule some of my earlier appointments to meet respondents because they left their worksites to watch the matches at home. Ghana won silver in the tournament.

According to the 2009 human development report (United Nations Development Programme [UNDP], 2009), adult literacy in Ghana is 65 percent.

Ghana has a human development index (HDI) value of 0.526 on a scale of 0 to 1 (UNDP, 2009). The HDI takes into account such factors as life expectancy at birth; total school enrollment rates (primary school through university); and a decent standard of living (United Nations Development Programme [UNDP], 2009). Ghana is said to belong to countries referred to as medium human development group because its HDI lies between 0.500 and 0.800 (http://glossary.econguru.com/economic-term/Human+Development+Index).

The UNDP has been factoring gender inequality into its Human Development Reports since 1995. It would be interesting to know the current distribution of gender in Ghana's media landscape. According to data gathered in the late 1970s, 86.7 percent of the 467 journalists working in the state-owned media organizations were men (Boafo, 1988). However, later, it was stated that 31 percent of media practitioners in Ghana were women (Ansu-Kyeremeh & Karikari, 1998). Thus, compared with the 1970s, there has been an improvement in gender equity. The UNDP report further indicates that Ghana has a life expectancy of 56.5 years and has a GDP per capita of $1,334. According to the UNDP (2009), the HDI provides a more complete picture than the GDP per capita alone because it incorporates development indicators as well.

According to a policy document on science, technology, and innovation (Ministry of Environment, Science and Technology, 2010), Ghana's resource allocation to science and technology fluctuates between 0.3 and 0.5 percent of the gross domestic product even though the target is 1 percent (p. 10). The policy underscores constraints to the application of science and technology in Ghana, including inadequate number of scientists, lack of advocacy for science and technology at high political and policy levels, and low scientific literacy of the population (p.13). Among the strategies proposed to popularize science and technology is the use of the Ghanaian media (p. 23). The document also identifies the Ghana Journalists Association (GJA) as a potential partner in the implementation of the science, technology, and innovation policy. But are institutions that generate scientific information in Ghana and the media adequately prepared to promote science, technology, and innovation? What contexts of the

institutions that generate scientific information may influence science, technology, and innovation promotion in Ghana? A brief description of scientific institutions might give clues.

Some Scientific Institutions in Ghana

Like the countries in the Western world, Ghana has many institutions that generate scientific information for the media. Ghana's policy document on science, technology, and innovation identifies many such institutions as key to promoting science in Ghana (Ministry of Environment, Science, and Technology [MEST], 2010). These institutions may be grouped into five: (a) universities and polytechnics, (b) research centers, (c) government ministries, departments, and agencies, (d) industries or enterprises, and (e) non-profit organizations.

Universities or Polytechnics

Universities may influence science journalism in at least three main ways. First, they generate scientific research findings from studies undertaken by the faculty, research scientists, and students. Writing on the topic "Universities" in the multi-authored book *A Field Guide for Science Writers*, public information officer Earle Holland (2006) has stated: "More research emerges from university campuses than from any other source in society" (p. 271). However, in Ghana, many faculty do little research. Francis Atuahene (2006), in his dissertation on financing tertiary institutions in

Ghana, quoted an administrator of the University of Ghana, who explained the reasons faculty do little research:

> Faculty members have not been able to commit their time on research in their respective fields of study. . . . There are some researches you really do not need to invest so much of money . . . into it. But they have not been able to spend time outside the classroom to do this. Part of the problem is attributed to the absence of incentives for academic staff. The pay structure and incentive system at the universities is not good. Most faculty members at the University of Ghana have more than two other part-time jobs in addition to their fulltime academic loads and responsibilities. With the escalating inflation and economic downturn coupled with low income, most faculty members have to support their families if worked extra hours beyond the fulltime academic load. Hence, time for rigorous academic research is not an option. (p. 152)

Second, universities or polytechnics may provide employment for journalists as public information officers or public relation officers. These journalists help promote science through various communication channels, including the mass media. Third, universities produce scientific journals that may be used by journalists interested in covering science. For instance, the Kwame Nkrumah University of Science and Technology, an institution noted for churning out scientists and technocrats in Ghana, publishes the *Journal of Science and Technology (Ghana).*

The MEST (2010) has identified six public universities as important for promoting science. These universities are the University of Ghana; the Kwame Nkrumah

University of Science and Technology; the University of Cape Coast; the University for Development Studies; the University of Education, Winneba; and the University of Mines and Technology. These institutions have several science colleges, faculties, or departments. The policy document also identifies private universities as important for promoting science, although none is named (MEST, 2010).

In addition to the universities, Ghana has a polytechnic in each of the ten regions. The polytechnics grant mainly higher national diplomas (HNDs), a qualification slightly lower than a bachelor's degree. These polytechnics also engage in scientific research, although the universities tend to be more involved in research. Many factors account for this difference. First, unlike the universities, the polytechnics do not offer postgraduate education. Second, universities usually receive higher research funding than the polytechnics do. Third, the universities often attract faculty with higher qualifications, who may be more qualified to do scientific research. Finally, unlike the polytechnics, the universities normally have several research centers.

In a paper titled "African Higher Education: Challenges for the 21st Century," Teferra and Altbach (2004) identified the important role played by universities in developing countries, including Ghana, in generating research:

> Universities, as creators and brokers of these products, are situated at the center of the knowledge and information supermarket. For all practical purposes, universities remain the most important institutions in the production and consumption of knowledge and information, particularly in the Third World. This is particularly so in Africa, where only a few such institutions serve as the

> preeminent and dominant centers of knowledge and information transactions (p. 38)

In many research-based public universities of the Western world, governments provide substantial funding for research and development. In Ghana and many African countries, regarding research funding, Teferra and Altbach (2004) have said:

> Most countries in Africa have practically no funds allocated to research in the university budgets. Expenditures on research and development (R&D) in Ghana, for example, show a declining trend from around 0.7 percent of the gross domestic product (GDP) in the mid-1970s to 0.1–0.2 percent of the GDP in 1983–1987. There is little evidence to suggest that this trend has changed. Paul Effah (2003) reports that the University of Ghana received only US$ 1.4 million to fund the operations of its ten research institutes in 2000. (p.38)

Like many universities in the Western world, public universities in Ghana have offices of public relations. However, in Ghana few generate press releases on scientific research findings, although generating press releases on matriculations, graduation ceremonies, and some major events such as awarding distinguished individuals in society with honors are common practices. Journalists who wish to know the scientific research going on in the universities normally might have to contact the researchers.

Scientific Research Centers in Ghana

There are many scientific research institutions in Ghana. Like the universities, these institutions generate research that journalists can cover or employ journalists to serve as public information officers or public relations officers. In Ghana, these institutions may (a) be located in universities, (b) exist as separate entities, or (c) be part of specific ministries or departments of the government of Ghana.

Some notable health research centers at the public universities are the Noguchi Memorial Institute of Medical Research (NMIMR) of the University of Ghana and the Kumasi Centre for Collaborative Research (KCCR) of the Kwame Nkrumah University of Science and Technology. The website of the Noguchi Memorial Institute of Medical Research has the names, e-mail addresses, office phone and fax numbers, and expertise of most of the researchers (http://www.noguchimedres.org/). It also shows that there is a librarian at the NMIMR, but no public information or public relations personnel are listed. According to the director, the NMIMR does not have a communication or public relations office and journalists wanting to contact a researcher could do so by sending an e-mail to the Webmaster or to the director (A.K. Nyarko, personal communication, July 26, 2010). However, the contact information and the areas of expertise of the researchers may be helpful to journalists interested in seeking health research findings from the NMIMR. The KCCR of the Kwame Nkrumah University of Science and Technology specializes in tropical diseases. Its Web site does not have any contact information of researchers. Journalists wanting to contact researchers at the KCCR may do so through a

common contact phone number. Such journalists may also contact the KCCR by typing a message in the part of the KCCR Web site that is provided for public inquiries.

One of the research centers that exist as a separate institution in Ghana is the Centre for Scientific Research into Plant Medicine (CSRPM). The website of the CSRPM has the names, curricula vitae, research areas of expertise, e-mail addresses, and cell phone numbers of some of its research staff. The website also has a list of journal articles about research the staff have undertaken (http://www.csrpm.org/journals.html). The CSRPM has a scientific information department responsible, among others, for producing annual reports, brochures, and newsletters and for disseminating information through workshops, internal seminars, and conferences (http://www.csrpm.org/scientific.html).The CSRPM has a public relations office—established in 2005—that issues press releases with video clips or photographs to the mass media and "maintain[s] contact with the media people and extend[s] co-operation to them" (http://www.csrpm.org/public_rel_dept.html). The public relations office also liaises with the scientific information department in producing publications. Some articles from the newsletter are uploaded on the website. One such article, written by a senior medical officer, relates to an herbal medicine the center has produced called Mist Tonica. Part of the article reads (http://www.csrpm.org/tonica.html):

> Individuals and some hospital institutions have claims that this medicine [Mist Tonica] is able to improve on appetite and enrich haemoglobin levels. . . .
>
> Also, it has been reported that some teenagers have been scolded at home because their appetites were so huge that food meant for their siblings had been

> consumed by them, after taken [*sic*] Mist Tonica. As a result of these reports on the effectiveness of Mist Tonica, the writer undertook a study as part of his M.Phil. programme to validate the claims.
>
> The study was conducted at two institutions. . . , Mist Tonica was given to 45 volunteer patients with varying causes of anaemia, including cases of anaemia due to **ruptured ectopic gestation**, malaria and **helminthes infestations**, for a period of two weeks.
>
> The results of the study were remarkable. **Haemoglobin** levels increased by a minimum of 1.6 g/dl and a maximum of 2.3 g/dl within the two week period. . . . Most of the patients (88.9%) had an increased appetite for food. Unlike some orthodox medicines that are associated with typical **epigastric** pains, with Mist Tonica, only few patients experienced **epigastric** pains. Safety profiles monitored in the patients were within normal range. (para. 1-5)
>
> [emphasis added to indicate terms unlikely to be known by the general public]

The above article, which was published in the 2007 newsletter of CSRPM, closely resembles a press release. General reporters may have difficulty in translating such articles for the general readerships. In addition, editors may see such articles as advertisements. Thus, such scientific findings may be unlikely to be reported in the media.

Some government institutions have research centers. For example, the Ghana Health Service has a health research unit at its headquarters in Accra. It oversees three research centers at different regions of Ghana: Dodowa (Greater Accra region),

Kintampo (Brong Ahafo region), and Navrongo (Upper East region). These centers sometimes obtain funding from international agencies for health research, as John Gyapong, the director of the health research unit, stated in an annual report (Ghana Health Service, 2003):

> In an environment where funding for service delivery is relatively inadequate, funding for research is usually relegated to the background and sometimes perceived to be unnecessary.
>
> In spite of this major challenge of inadequate funding, the Health Research Unit together with her satellite health centres in Dodowa, Kintampo and Navrongo managed to access substantial amount of research grants from both national and international arena to investigate relevant health issues to guide policy formulation and programme implementation in various fields. (p. 2)

Apart from scientific research centers at the public universities and some other research centers, Ghana has 13 research institutes that constitute a national research organization known as the Council for Scientific and Industrial Research (CSIR). Eight of the institutes are responsible mainly for generating research that relates to agriculture. The institutes that constitute the CSIR include the Animal Research Institute, Cocoa Research Institute, Institute of Industrial Research, Science and Technology Policy Research Institute, and Institute for Scientific and Technological Information. The Institute for Scientific and Technological Information has many objectives, including disseminating the results of national research activities. The website of the CSIR has a

library that can be used to find useful information, including expertise and contact information of researchers, and abstracts of scientific papers or reports published (http://library.csir.org.gh:8080/wwwisis/appli.htm). Journalists may find the online library helpful.

Government Ministries, Departments, and Agencies

In Ghana, many government institutions may not be very involved in undertaking research but may provide scientific experts who can serve as sources from whom journalists may receive scientific information. These institutions may also develop science and technology policies that may be worthy of coverage by the media. Moreover, government agencies in Ghana sometimes employ journalists to serve as public information officers or public relations officers. Colleen Henrichsen (2006), who has worked as chief of the Office of Clinical Center Communications at the Clinical Center, National Institutes of Health, of the United States, has noted:

> Government science agencies need a media-savvy cadre of communication professionals because politics inevitably plays a significant role in how the media covers the government science. . . .
>
> Because government scientists essentially work for the American public, government communicators have an obligation to engage proactively with the media and encourage scientists to talk to reporters. (p. 282)

In Ghana, public information officers at institutions sometimes respond to queries from the media on science and technology issues.

Table 2.1 shows that many government institutions are potential sources for generating science stories. Most of the institutions have websites with contact information that may be of help to journalists. Those institutions that regulate the standards of goods, such as the Ghana Food and Drugs Board and the Ghana

Table 2.1. Some Areas of Science and Technology and Government Institutions From Which Journalists in Ghana Can Obtain Information on Science and Technology and Related Policies

Specialty Area	Ministry, Department, or Agency
Agriculture	Ministry of Food and Agriculture Ministry of Lands and Forestry Fisheries Commission Forestry Commission
Engineering	Architectural and Engineering Services Ltd
Environment	Ministry of Environment, Science and Technology Environmental Protection Agency
Health	Ministry of Health Food and Drugs Board Ghana AIDS Commission Medical and Dental Council National Health Insurance Authority Nurses and Midwives Council Pharmacy Council
Mining and Energy	Ministry of Mines and Energy Electricity Company of Ghana Geological Survey Department Ghana Atomic Energy Commission Ghana Energy Commission Ghana National Petroleum Corporation Minerals Commission Volta River Authority
Scientific standards	Food and Drugs Board Ghana Standards Board
Statistics	Ghana Statistical Service
Transportation	Ministry of Roads and Transport Ghana Civil Aviation Authority Ghana Highway Authority Ghana Ports and Harbors Authority National Road Safety Commission
Weather	Meteorological Service Department

Standards Board, normally send press releases about problems with goods on the Ghanaian market. The government of Ghana has a series of press conferences called "meet the press," which is normally organized in Accra. Journalists who attend such programs may obtain science-related information from the relevant ministries.

Ministers—who head the government ministries—are appointed by Ghana's president with approval of Ghana's parliament. Thus, the ministers are mostly supporters of the ruling government. When these government institutions organize events related to their functions, the state-owned media and some well-established private media often cover them. Obeng-Quaidoo (1988), a communication scholar from Ghana, who has analyzed the socio-economic factors that affect health reporting in Ghana, has noted:

> If there is a political event in some parts of the region, the administration staff [who may work with a government institution] would come with their vehicle, collect the journalists and the event would appear in the national media the next day. It is not strange, then, that most of the health issues we came across in the content analysis [of two state-owned and two private-owned newspapers] evolved around political personalities. (p. 98)

Industries or Enterprises

Many industries in Ghana manufacture or import scientific products. The Association of Ghana Industries (AGI), a non-profit organization of registered industries in Ghana, has the contact information and the types of goods of their individual members on its Web site (http://www.agighana.org/Members.aspx). A search through this

association's website on July 22, 2010 yielded 1,218 members. Table 2.2 shows the numbers of industries that are associated with some categories of science- or technology-related products and services. There are many industries associated with garments, textiles, and leather; and food and beverages (see Table 2.2).

AGI members include both state-owned and private industries. These industries normally have their phone numbers in telephone directories and on the AGI Web site Some of the industries employ journalists as public relations officers or public information officers. Journalists may obtain scientific or technological information from these industries in a number of ways. First, some industries send press releases to media organizations on matters related to their products and services. Second, many of the industries advertise their products and services in the Ghanaian mass media. The advertisements may generate ideas for stories in the popular media. Third, some industries support activities of the Ghana Journalists Association (GJA), including the GJA's annual journalism awards. For instance, Unilever Ghana Ltd and the GJA hold an annual soiree for journalists. While collecting data for this research, I attended this event at the Ghana International Press Centre in Accra. Unilever Ghana Ltd not only sponsored the event but gave the participants souvenirs that included some of their products such as soaps and toothpaste. Through such interactions, members of the GJA may have easy access to key individuals in those industries for science- and technology-related and other stories. Finally, journalists may do investigative reporting

Table 2.2. Some Categories of Products Associated With Members of the Association of Ghana Industries[1]

Category of Products and Services	Number of Industries
Garments, Textiles and Leather	249
Metals and Building Products	162
Food and Beverages	160
Printing Stationery and Packaging	110
Wood Processing	97
Rubber and Plastics	80
Toiletries and Cosmetics	59
Electrical and Electronics	55
Pharmaceuticals	48
Automotive and Transportation	47
Chemicals	30
Agri-Business	12
Energy	4
Information and Communication Technology	3
TOTAL	1,116

Source: Association of Ghana Industries website (http://www.agighana.org/Members.aspx). Searched July 22, 2010.
1. This table excludes members of the Association of Ghana Industries that are associated with categories of products and services that appear to have little relation to science and technology, namely advertising, associates, financial services, hospitalities and tourism, and miscellaneous products and services.

in those industries, particularly when they suspect wrong-doing, as happened in 2006 when Ghana's ace investigative reporter, Anas Aremeyaw Anas, investigated a biscuit manufacturer that was suspected of manufacturing under unhygienic conditions.

Non-profit Organizations

Some non-profit organizations do not generate much research but serve as idea sources for science stories or employ journalists. The Ministry of Environment, Science, and Technology (2010) recognizes some non-governmental organizations as important for promoting science in Ghana (Table 2.3). Some of these organizations employ journalists. Frank Blanchard (2006), a journalist who joined the Whitaker Foundation as director of communications in 1994, has noted:

> In the nonprofit sector, the science writer routinely handles a vast array of assignments. You may write news releases, annual report articles, newsletter stories, brochures, policy briefings, white papers, talking points, meeting reports, research abstracts, website stories, occasional papers, or pitch letters to journalists. (pp. 289-290)

In Ghana, some nonprofit organizations publish science journals and newsletters. Journalists may find those journals and newsletters helpful in reporting science. For example, the Ghana Medical Association publishes the *Ghana Medical Journal*, the Pharmaceutical Society of Ghana publishes the *Ghana Pharmaceutical Journal*, and the Ghana Science Association publishes the *Ghana Science Journal* in collaboration with a public institution, the Council of Scientific and Industrial Research. Rarely do

Table 2.3. Some Areas of Science and Technology and Non-Profit Institutions From Which Journalists in Ghana Can Obtain Information on Science and Technology and Related Policies

Areas of Specialty	Non-profit institution
Basic sciences (biology, chemistry, biochemistry, and physics)	Ghana Biochemical Society Ghana Chemical Society Ghana Institution of Biology Ghana Institution of Physics
Engineering	Ghana Institution of Engineers
Environment	National Union of Environmental Non-Governmental Organisations
Health	Ghana Medical Association Ghana Registered Nurses Association Pharmaceutical Society of Ghana
Land and Mining	Ghana Chamber of Mines Ghana Geological Society Ghana Institution of Surveyors
Science and Technology	Ghana Academy of Arts and Sciences Ghana Association of Science Teachers Ghana Science Association Women in Science and Technology
Others	Association of Ghana Industries Association of Small Scale Industries Centre for Policy Analysis Ghana Journalist Association Ghana National Association of Garages Ghana National Chamber of Commerce Institute of Economic Affairs Mathematical Association of Ghana Research Staff Association (of the CSIR) Trades Union Congress Private Enterprise Foundation

Source: Ministry of Environment, Science and Technology (2010)

journalists in Ghana cover research from these journals. It may be that journalists do not have access to the journals. For instance, the editor-in-chief of the *Ghana Medical Journal* has noted that they do not send copies of the journal to media organizations (D. Ofori-Adjei, personal communication, May 17, 2010). However, the *Ghana Medical Journal* is available online (http://www.ghanamedassn.org/Journal/html/journal.html) although it is unknown whether journalists are aware of its online availability.

Most of the non-profit organizations organize annual meetings and invite journalists. Journalists who attend such events are likely to report science-related stories. At the end of the annual meetings, these organizations send communiqués to media organizations, which may serve as source ideas for stories. In addition, most of these associations have Web sites that provide their contact information.

With many institutions that promote science in Ghana, it might be necessary to understand different contexts of journalism in Ghana that may influence how the journalists interact with these institutions, and other sources, to cover science.

Journalism in Ghana: Historical, Political, and Economic Contexts

Milestones in the history of journalism in Ghana include the introduction of the printing press, the radio, and television; the establishment of journalism training institutions, and the formation of the Ghana Journalists Association (GJA). These milestones continue to influence journalism in Ghana. For instance, the introduction of newspapers as a tool for fighting colonial rule has made political reporting increasingly common in Ghana.

A number of Ghanaian scholars (Ansu-Kyeremeh & Karikari, 1998; Asante, 1996; Boafo, 1988) have given accounts of journalism in Ghana. According to Asante, journalism in Ghana can be traced to the period when Ghana (then called the Gold Coast) was under colonial rule. In April 1821, the first newspaper—called the *Royal Gold Coast Gazette and Commercial Intelligencer*—was founded by the British adminstrator Sir Charles MacCarthy, the first governor of the Gold Coast. The main aim of the newspaper was to help the British to exert their authority over the people of West Africa. However, after the death of the founder in 1824 in a battle between the Ashantis and the British, publication of the newspaper ceased (Asante, 1996).

Christian missionaries are reported to have contributed to developing the Gold Coast press, particularly with the establishment of the *Christian Messenger and Examiner* in 1859 and the *Gold Coast Methodist Times* in 1894 (Asante, 1996). Asante noted that the *Gold Coast Leader*, which was founded in 1902, played a key role in the fight for independence. As more nationalist newspapers joined the crusade for improvement in political and socio-economic conditions, the British set up the *Gold Coast Pioneer* in 1921 to counter the attempts. In the 1930s the newspaper industry boomed. This prompted the British to enact harsher laws against "raising discontent or dissatisfaction; promoting feelings or [*sic*] ill-will between classes or of one 'color' against another; printing, selling or distributing seditious matter" (Asante, 1996, p. 4).

In the mid-1930s, a Nigerian journalist trained in the United States, Nnamdi Azikiwe, arrived in the Gold Coast to promote nationalism among the people of West Africa by establishing the newspaper *African Morning Post*. But he was arrested because

his paper published a libelous article titled "Has the African a God?" (Asante, 1996, p. 5). Azikiwe later relocated to Nigeria. Despite the threat posed by the law, Ghanaians established many newspapers.

In order to provide more information to the citizens of the Gold Coast and counter the activities of the printing press in Ghana, the British established another communication channel in 1935: the radio. However, the radio was initially limited to the people of Accra (Asante, 1996).

In 1947, Dr. Kwame Nkrumah, who later became the first president, returned to the Gold Coast after his studies in the United States and Great Britain. Nkrumah, even though not a journalist, established his own newspaper called the *Accra Evening News* in 1948 (Asante, 1996). The newspaper called for self-government and mobilized more people against the colonial masters. The 1950s also saw the establishment of the *Daily Graphic* by a British newspaper giant called Daily Mirror Group of London (Boafo, 1988) and *The Ghana Times* by Nkrumah and the leadership of his party—the Convention People's Party (Asante, 1996). Boafo noted the composition of journalists in the period before the Gold Coast gained independence from the British:

> In the colonial period, newspapers were run not by professional journalists but rather by nationalist leaders who were professionals in such other fields as law, medicine, religion and teaching and by amateurs who acquired their technical skills on the job. (p. 58)

Nkrumah, who got into trouble many times, was imprisoned. But on March 6, 1957, the day Ghana won independence, he became the first president. Upon independence, the Gold Coast became Ghana.

Asante (1996) has noted that before independence some changes occurred in the media landscape. First, the Gold Coast Broadcasting System was established in 1954 to provide a radio service for all the regions (This became the Ghana Broadcasting Corporation in 1962). Second, a news wire service (now called Ghana News Agency) was founded in 1957, becoming the first to be established in sub-Saharan Africa. Finally, Nkrumah helped launch a television service known as Ghana Broadcasting Corporation-Television (GBC-TV) in 1965.

From the late 1960s through to the late 1980s, military regimes in Ghana made it difficult for press freedom and some journalists left the profession or moved into public relations or advertising (Boafo, 1988). However, since the establishment of multi-party democracy in the early 1990s, Ghana's press has been thriving under the freedom of the press the constitution guarantees. According to an international organization that ranks the performance of media under governments of countries in the world, Freedom House (2010a), Ghana is ranked as a country with "free" media environment. In sub-Saharan Africa, there are five such countries (Freedom House, 2010b). Freedom House also shows that Ghana has more than 137 newspapers, including 2 state-owned dailies, about 110 FM radio stations distributed nationwide, and 27 television stations in operation.

In describing the media practice, Ansu-Kyeremeh and Karikari (1998) have noted that “the success of the media industry tends to be closely tied to the socio-political conditions within which it operates” (p. 8).

However, a freedom of information bill is yet to be passed into law by Ghana's parliament. The bill, if passed into law, will allow Ghanaians and foreign nationals to demand information from government agencies. The bill is similar to the Freedom of Information Act (FOIA) in the United States. The FOIA was passed by Congress in 1966 and has been amended periodically since (Henrichsen, 2006). This bill has implications for investigative journalists who may want to cover scientific institutions that are funded by the government. Currently, Ghanaian government institutions are not bound by law to release information to journalists who request for it.

Despite the lack of passage of the freedom of information bill, Ghana's press freedom is hailed as among the best in Africa. This press freedom has resulted in the proliferation of private media. Some of the private media employ individuals with no training in journalism. But is journalism regulated in Ghana? Which institutions are responsible for training and regulation?

Journalism in Ghana: Training, Regulation, and Professional Groups

Journalism in Ghana has seen developments in terms of training, regulation, and professional associations. Boafo (1988) has noted that formal journalism training in Ghana became a reality when the Ghana Institute of Journalism (GIJ) was established in 1959. According to Asante (1996), the GIJ by 1988 had trained 1,538 journalists, 200 of

whom came from other African countries. The GIJ formerly offered only diploma courses in journalism, but has since 2001 it been accredited to offer a bachelor's degree program. The GIJ (2009) has development communication as a course at the bachelor's level (http://www.gij.edu.gh/courses_comm.html#comm). The United Nations Educational, Scientific and Cultural Organization [UNESCO] (2010) estimates that about 60 percent of communication professionals in Ghana are graduates of GIJ.

Another public institution that trains journalists is the School of Communication Studies of the University Ghana. The school was established in 1973 and has been offering only post-graduate studies in communication-related disciplines (Boafo, 1988). The school admits students from all backgrounds, including the sciences, for postgraduate education. It offers development communication as a core course. Electives include statistics in communication research and new information communication technologies (http://srgs.ug.edu.gh/programmedetail.php?id=43). According to Boafo (1988), the school had trained 200 graduate diploma and 15 master's degree graduates by 1988. Recently, a number of institutions, including private ones, have been offering courses in journalism. IREX (2008), an international non-profit organization for strengthening independent media, has identified a lack of specialization in journalism training in Ghana and low remuneration of Ghanaian journalists as problems in Ghana. Currently, science journalism is not offered as a course or program; however, in the past the GIJ offered courses in aviation reporting, health reporting, and agricultural reporting. According to the GIJ rector, David Newton, there previously was funding from the CSIR, the Ghana Civil Aviation Authority, and the Ministry of Food and Agriculture for

running science reporting courses, but since the funding has ceased, the GIJ has stopped offering the courses. However, with the discovery of petroleum in Ghana, GIJ is considering introducing petroleum reporting (D. Newton, personal communication, August 15, 2009).

Journalism in Ghana is regulated by the National Media Commission (NMC), which was created in 1993 to help maintain highest journalistic standards and "to insulate state owned media from government control" (National Media Commission, n.d). The NMC has guidelines on political reporting and general broadcasting, but not science reporting. The Ghana Journalists Association (GJA), the main professional body of journalists, was formed in 1949. The GJA has codes of ethics that its members subscribe to. Journalists who are not members of the GJA are not bound by the GJA code of ethics. Many journalists who work for the state media are members of the GJA. The GJA has annual awards for its members, one of which is “Best Reporter on Health."

Numerous smaller associations of journalists also exist in Ghana. Some notable ones are the Health Communications Institute, the Environmental Club of Journalists, the Economic and Financial News Reporters Association, and the Ghana Association of Science Journalists and Communicators. According to the World Federation of Science Journalists (2009), the Ghana Association of Science Journalists and Communicators, formed in 2007, is among the latest associations to be formed in Africa. The term "science journalist" appears to be new in Ghana, although Ghanaian journalists have been covering science alongside other beats. To my knowledge, there has not been any study in Ghana to identify the characteristics of journalists who cover science and the

factors that influence how they report science. This study will attempt to help fill this research gap.

CHAPTER III

METHODS

This study was designed to identify—from the perspectives of journalists—(a) the demographic and other characteristics of journalists in Ghana, (b) the sources used for science reporting, (c) the number of science stories the journalists had reported within the past 12 months, (d) the enabling and challenging factors that influence science reporting in Ghana, and (e) the future of science journalism in Ghana.

I chose Ghana, a country in West Africa, as the focus of this study for three main reasons. First, I am a Ghanaian with a passion for science reporting in Ghana. Second, I have interacted with some Ghanaian journalists through workshops, symposia, and radio and television programs. Thus, I believed that my knowledge of some Ghanaian media institutions and personnel would help me obtain enough respondents for the study. Third, a systematic review of the literature on science journalism in sub-Saharan Africa that I have previously carried out has identified Ghana as one of the sub-Saharan African countries with little research on science journalism (Appiah, 2010).

Design

This study was a comprehensive survey using a self-administered questionnaire. I chose this approach for several reasons. Surveys have been used less than interviews and content analyses in science journalism research in sub-Saharan Africa, and therefore there is a gap in the literature in this regard (Appiah, 2010). Moreover, surveys help in

collecting large amounts of data with ease (Wimmer & Dominic, 2011). In addition, both qualitative and quantitative data can be obtained simultaneously from surveys.

I chose a census survey because the population of study was not large.

A 21-item questionnaire was designed for the study (Appendix A). The questionnaire had 19 closed-ended items and two open-ended items. The choices for the items were influenced by conversations I have had with professional journalists in Ghana. The topics of questionnaire items included sources from which Ghanaian journalists gather information for science stories, training of journalists in science and in science reporting, perceptions and attitudes toward science reporting, motivators and challenges of science reporting, and gender of the journalists. Gender was included in part because a study by Kwami (2007) has indicated that men journalists in Ghana tended to cover stories related to information and communication technologies more than women journalists in Ghana did.

Four items related to eight potential sources of science stories: consumers, scientists, staff of non-governmental organizations, staff of science journals, public information officers, health professionals (for example, doctors, nurses, and pharmacists), traditional or alternative medicine practitioners (for example, herbalists), and staff of industry or business community. In addition, there was an option for respondents to indicate sources not found on the list. To eliminate bias, I randomly assigned the order of the sources. The order of the sources was the same for all the four items. The four items were (a) a rating of the perceived importance of the sources, (b) number of interview of the sources within the past 12 months, (c) who initiated the

latest contact with the sources, and (d) a characterization of the latest contact with the sources.

The questionnaire was in English because it is the official language of Ghana and all professionally qualified journalists in Ghana are proficient in it.

The questionnaire was first pilot tested among three fellow students in the MS in science and journalism program at Texas A&M University. The pretest resulted in some changes including clarification of some wording and rearrangement of options on some items. The revised questionnaire was then pilot tested in Ghana in a convenience sample of four Ghanaian journalists within the sample population. In response, some options on the questionnaire were revised, and the informed consent form, which had stated that the survey would take about 45 minutes to complete, was revised to say it would take about 25 minutes.

Study Population and Setting

For this study, I included only journalists who are active members of the Ghana Journalists Association (GJA) and work in Accra, the capital of Ghana. I did so for three main reasons. First, the GJA is the main body of professionally qualified journalists in Ghana. It has more than 1,000 members. To be a member of the GJA, one must either have formal training in journalism or have at least five years of on-the-job journalism training under an experienced member of the GJA. The GJA includes many but not all trained journalists in Ghana. Restricting the population to the GJA members thus excluded some trained journalists. However, it also had the advantage of excluding

individuals who termed themselves journalists but lacked background in the field. Second, it would not have been feasible to identify all journalists in Ghana, because there is not a comprehensive list thereof. Third, I decided to focus on the GJA members in Accra because time and finances permitted me to visit only one region of Ghana and the greatest concentration of GJA members (about 40 percent) are in Accra**.** Finally, using one city for the study limited the transportation cost related to administering the written questionnaire at media organizations.

Data Collection

Originally, I hoped to obtain the names and contact details of all the GJA members in Accra. However, the chief administrative officer of the Ghana International Press Centre, who also handles administrative issues of the GJA in part because he is employed by the GJA, informed me that some officers of the GJA were not in favor of my doing so. He said the officers considered the contact details of the GJA members as private information. Therefore, the chief administrative officer provided me with phone numbers of about 90 influential and senior journalists who work in private or state media organizations in Ghana. He described them as journalists who would be willing to help because they know him very well.

The chief administrative officer also called some of the journalists to introduce me and to encourage participation in the survey. My knowledge of some media institutions and some journalists worked in my favor because I would visit the journalists on the lists—including many of those he had called. I did so for three main reasons.

First, it is as a sign of respect that I visited the senior journalists instead of contacting them by phone. Second, by visiting the senior journalists, it helped me to inform them of the nature of the research and to respond to queries related to the research. Third, my visits to the worksites also helped some senior journalists to introduce me to their newsroom staff. I visited the senior journalists at the worksites on January 12 through January 19, 2010.

To collect data for the research, I hand-delivered the questionnaires to the journalists' worksites on January 20 through February 1, 2010. I hand-delivered the questionnaires because in Ghana, doing so—rather than mailing surveys—is seen as a sign of respect. To obtain as many respondents as possible, in addition to visiting media organizations, I left some questionnaires at the Ghana International Press Centre. The press center attracts many journalists, in part because it houses the national office of the GJA. Leaving the questionnaires at the press center allowed me to reach some freelance journalists. In addition, I went to Ghana's Parliament House to distribute questionnaires to some members of the Parliamentary Press Corps who are members of the GJA and could not be reached when I visited the premises of their media organizations.

To encourage participation, I gave a pen to each participant who read the informed consent form and decided to take part in the study (Figure 3.1).

A few respondents completed the questionnaire while I was present at the media site. I left the room in order not to influence them.

Respondents were instructed to seal their informed consent forms and responses in separate envelopes to promote anonymity. However, for respondents who chose to

insert their consent form into the questionnaires, I removed the consent forms and kept them separate from the questionnaires. This was to prevent me from knowing the identity of the respondents.

Figure 3.1. A Customized Pen for Journalists Who Agreed to Undertake the Study

Photo credit: Deborah Daniel

Of the more than 400 GJA members in Accra, 300 were reached for the study. I excluded the four journalists who participated in the pilot test. There were two main reasons that some others could not be reached for the study. First, during the period of the study, about 60 members who were continuing their journalism education at the Ghana Institute of Journalism were taking examinations and therefore did not take part. Second, 10 members decided not to take part in the study.

Of the 300 questionnaires administered, I received 129 within 13 days. Another 22 questionnaires were returned within six weeks to the press center. Thus, the overall response rate was 151 of 300 (50.3 percent).

Data Analysis

PASW Statistics version 18 (SPSS Inc., 2010) was used to generate descriptive statistics such as frequencies and means. For the responses to the two open-ended questions, I performed content analysis (see Appendix B for coding schedule).

Institutional Review Board (IRB) Approval

A request for approval of the research was filed with the Division of Research and Graduate Studies/Office of Research Compliance at Texas A&M University on December 22, 2009.

The study was approved on January 6, 2010 (Appendix C). In order to approve the study, the IRB required an informed consent form (see Appendix D) and a letter

from an expert in Ghana that attested to the appropriateness of the study to the Ghanaian setting (Appendix E).

After the IRB approval, the questionnaire was revised slightly as noted. The recruitment strategy also was changed slightly as described. Appropriate paperwork noting these amendments was filed and approval was obtained.

CHAPTER IV

RESULTS

This study identified, through self-administered survey questionnaires, (a) some demographic and other characteristics of journalists in Ghana, (b) the sources used for reporting science, (c) the number of science stories the journalists recalled having reported in the past 12 months, (d) the topics of science of interest to journalists, and (e) the motivators for, and barriers to, science reporting in Ghana. Furthermore, the study identified—from the perspectives of the journalists—what science journalism in Ghana should be in the next 10 years.

The study addressed the following research questions:

1. What are the demographic and professional characteristics of journalists in Ghana?

    (a) What are their ages, genders, and educational backgrounds?

    (b) How long have they been practicing journalism?

    (c) What type of media do they work for?

    (d) In which sector are they employed—public or private or both?

    (e) Do they belong to professional groups or associations other than the Ghana Journalists Association?

2. What sources do they use to cover science stories?

3. How many science stories do they recall covering within the past 12 months?

4. What types of science topics do they cover?

5. What factors—including political, social and cultural—motivate them to cover science?

6. What challenges do they report in covering science?

7. How would the journalists like science coverage in Ghana to be in the next 10 years?

This chapter presents the findings obtained from the 151 respondents out of the 300 journalists who received the questionnaires. Because a few respondents did not answer some of the questions, the findings of this study do not reflect the opinions or comments of all the 151 respondents.

The findings of this study are grouped into six main categories:

- demographic and other characteristics of journalists in Ghana,
- sources used for reporting science,
- number and topics of science stories,
- motivational factors toward science reporting,
- barriers to science reporting, and
- future of science journalism in Ghana.

Demographic and Other Characteristics of Journalists in Ghana

The demographic and other characteristics that this study identified were age and journalism experience, education, gender, type of mass medium in which the journalists work, sector of employment, and membership in groups or associations other than the Ghana Journalists Association (GJA).

Age and Gender

The largest proportion of journalists in the study population (45.3 percent) were aged 20 to 30 years (Table 4.1). In all, 33.1 percent were aged 31 to 40 years and 16.9 percent were 41 to 50 years. Few were less than 20 or more than 50 years. The median age of the journalists was the age category 31 to 40 years.

Table 4.1. Age Categories of Journalists in Ghana (n = 148)

Age Category	Number	Percent
Less than 20 years	2	1.4
20–30 years	67	45.3
31–40 years	49	33.1
41–50 years	25	16.9
More than 50 years	5	3.4
TOTAL	148	100.0

Men constituted 62.1 percent (90 of 145) of the study population, and women formed 37.9 percent (55 of 145). Six respondents did not indicate their gender.

In each age category except less than 20 years, the proportion of men exceeded that of women. The discrepancy increased with age (Table 4.2 and Figure 4.1).

Table 4.2. Age and Gender Distribution of Journalists in Ghana (n = 143)

Age Category/Years	Male	Female	Total
Less than 20	1 (50.0 %)	1 (50.0 %)	2 (100%)
20–30	36 (55.4 %)	29 (44.6 %)	65 (100%)
31–40	29 (61.7 %)	18 (38.3 %)	47 (100%)
41–50	19 (79.2 %)	5 (20.8 %)	24 (100%)
More than 50	4 (80.0 %)	1 (20.0 %)	5 (100%)
TOTAL	89 (62.2 %)	54 (37.8 %)	143(100%)

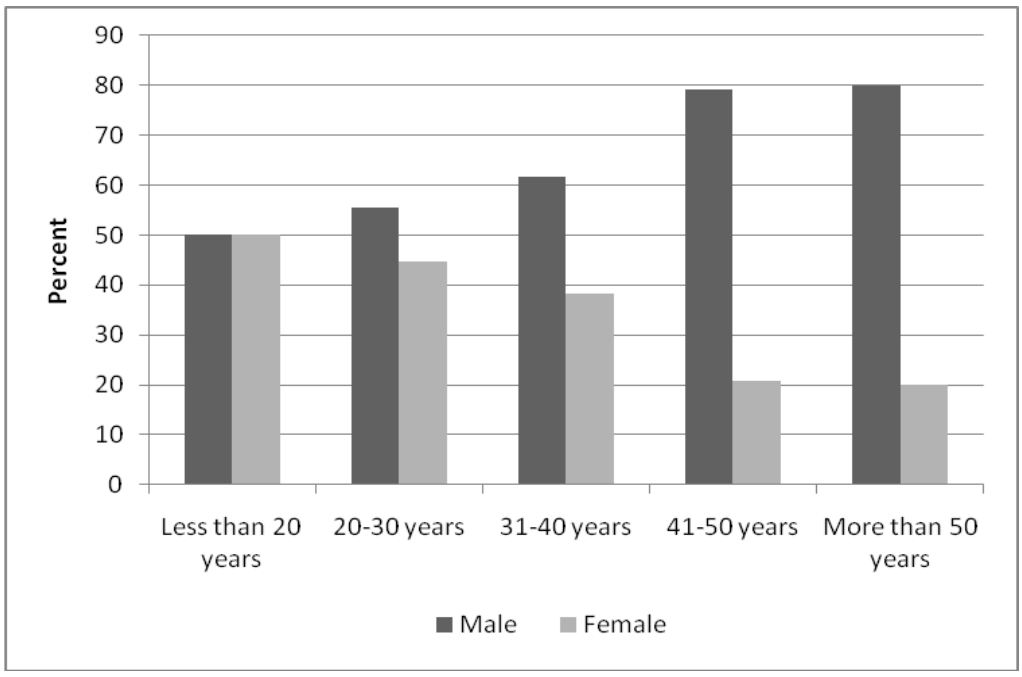

Figure 4.1. Distribution of Journalists in Ghana, by Gender and Age Category (n = 143)

Years in Journalism

The largest proportion of the respondents (37.4 percent) had been working in journalism for 5 to 10 years (Table 4.3). Almost a third (30.6 percent) had been doing so for less than 5 years. The remaining third or so had been practicing for 11 years or more; 18.4 percent had more than 15 years of experience.

Table 4.3. Years in Practice of Journalists in Ghana (n = 147)

Years in Journalism	Number	Percent
Less than 5 years	45	30.6
5–10 years	55	37.4
11–15 years	20	13.6
More than 15 years	27	18.4
TOTAL	147	100.0

When gender was cross-tabulated with years in practice, among both men and women, the highest proportion of respondents said they have been practicing journalism for 5 to 10 years (Table 4.4 and Figure 4.2). Moreover, among both men and women, the lowest proportion of respondents said they have been practicing journalism for 11 to 15 years. The proportion of women who said they have been practicing for less than 5 years was more than that of men. Conversely, the proportion of men who said they have been practicing for more than 15 years was more than that of women. There was no correlation between gender and years in journalism ($df = 3$, $p = 0.158$).

Table 4.4. Gender of Journalists, by Number of Years in Journalism (n = 142**)**

Number of Years in Journalism	Gender		Total
	Male	Female	
Less than 5 years	23 (26.1%)	21 (38.9%)	44 (31.0%)
5–10 years	36 (36.4%)	22 (40.7%)	54 (38.0%)
11–15 years	14 (15.9%)	4 (7.4%)	18 (12.7%)
More than 15 years	19 (21.6%)	7 (13.0%)	26 (18.3%)
TOTAL	88 (100.0%)	54 (100.0%)	142 (100.0%)

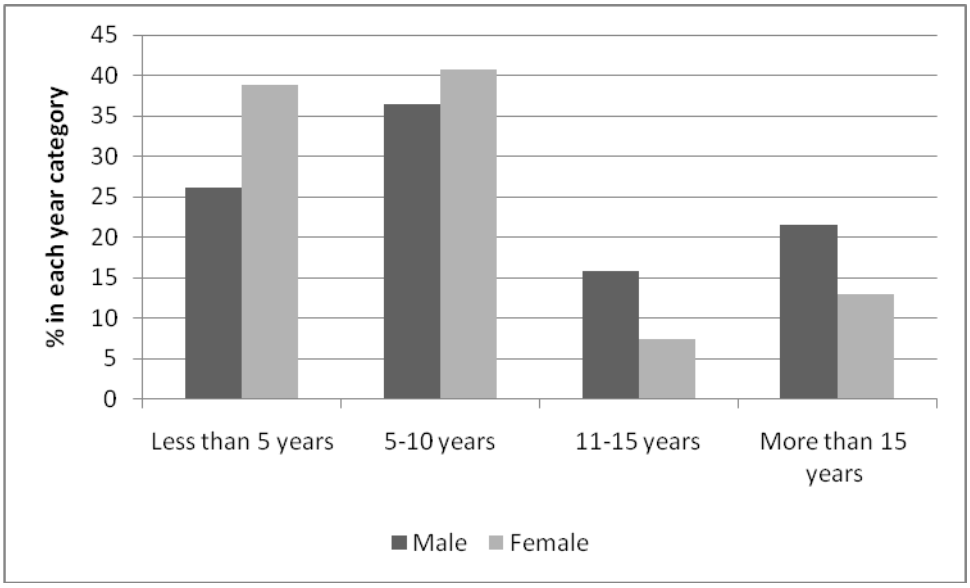

Figure 4.2. Distribution of Journalists in Ghana, by Gender and Years of Experience (n = 142)

Journalism Education

The highest educational qualification for most of the respondents was diploma (82 or 55.8 percent), a qualification similar to a US associate's degree (Table 4.5). In all, 26.5 percent of respondents indicated they had a first degree (bachelor's degree), and 12.9 percent said they had obtained postgraduate education. Three journalists (2.0 percent) said they did not have any journalism education, and four journalists said they had other journalism education (higher national diploma, broadcasting certificate, advanced broadcast certificate, or certificate).

Table 4.5. Educational Levels of Journalists in Ghana (n = 147)

Journalism Education	Number	Percent
None	3	2.0
Diploma	82	55.8
First degree[1]	39	26.5
Postgraduate education	19	12.9
Other[2]	4	2.7
TOTAL[3]	147	99.9

Notes:
1. First degree is equivalent to bachelor's.
2. Respondents specified "higher national diploma (HND),""broadcasting certificate," "advanced broadcast certificate," and "certificate."
3. The total percentage is not 100 because of rounding off.

Among both men and women, most respondents said they had obtained diplomas, and few said they did not have journalism education or had other journalism qualifications (Table 4.6). There was no correlation between gender and highest level of journalism education ($df = 4$, $p = 0.744$).

Table 4.6. Levels of Journalism Education, by Gender (n = 142)

Level of Journalism Education	Gender		TOTAL
	Male	Female	
No journalism education	1 (1.1%)	2 (3.6%)	3 (2.1%)
Diploma	47 (54.0%)	32 (58.2%)	79 (55.6%)
First degree[1]	25 (28.7%)	12 (21.8%)	37 (26.1%)
Postgraduate education	12 (13.8%)	7 (12.7%)	19 (13.4%)
Other[2]	2 (2.3%)	2 (3.6%)	4 (2.8%)
TOTAL[3]	87 (99.9%)	55 (99.9%)	142 (100.0%)

Notes:
1. First degree is equivalent to bachelor's.
2. "Other" cited were higher national diploma (HND), broadcasting certificate, advanced broadcast certificate, and certificate.
3. Total percentages for male and female do not add up to 100 because of rounding off

Science Education and Gender

Of the 143 respondents who indicated whether they had science diplomas or degrees, 30 (21.7 percent) said they did so (Figure 4.3).

When gender was cross-tabulated with having a science degree or diploma, among both men and women very few said they had a science degree or diploma (Table

4.7). There was no correlation between gender and having a science diploma or degree ($df = 1$, $p = 0.642$).

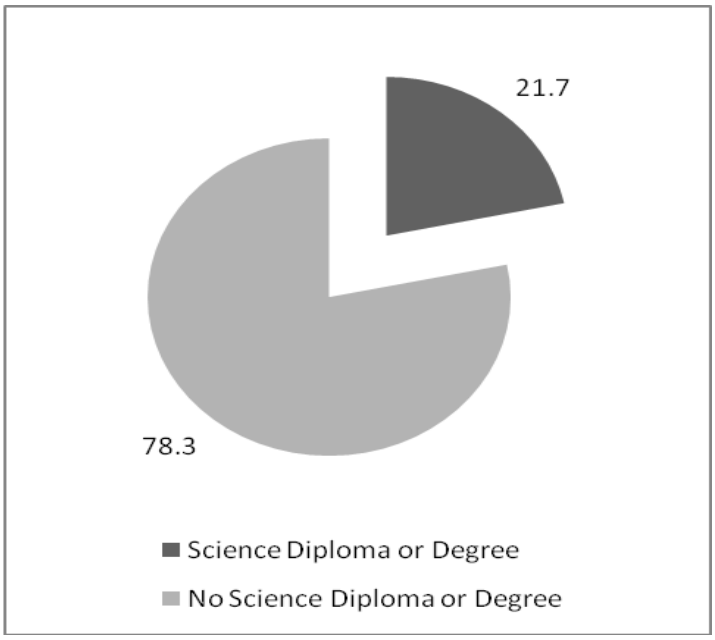

Figure 4.3. Percentage of Journalists With Science Diploma or Degree (n = 143)

Table 4.7. Training in Science, by Gender of Journalist (n = 138**)**

Training in Science	Gender		TOTAL
	Male	Female	
Have a science diploma or degree	20 (23.0%)	10 (19.6%)	30 (21.7%)
Do not have a science diploma or degree	67 (77.0%)	41 (80.4%)	108 (78.3%)
TOTAL	87 (100%)	51 (100%)	138 (100%)

Areas of Science Journalism Training

The respondents were asked to indicate whether they had received training in areas of science journalism: interviewing scientists, drug safety reporting, health reporting, agricultural reporting, aviation reporting, interpreting or reporting statistics, environmental reporting, or other. Those who had not received any training in areas of science journalism were asked to choose the option "none." Almost a third of the respondents listed "none." The most common areas of science journalism training were environmental reporting, health reporting, and interviewing scientists (Table 4.8).

Table 4.8. Areas of Science Journalism Training Received by Journalists in Ghana (n = 144)

Area[1]	Number	Percent[2]
None	44	30.6
Environmental reporting	67	46.5
Health reporting	66	45.8
Interviewing scientists	36	25.0
Agricultural reporting	26	18.1
Interpreting/reporting statistics	22	15.3
Aviation reporting	14	9.7
Other[3]	5	3.5

Notes:
1. The order of presentation of the areas of science journalism training above differs from that on the questionnaire to aid understanding relative frequencies.
2. The percentages add up to more than 100 because some respondents chose more than one option.
3. Respondents specified "population communication," "biotechnology," and "water science."

More journalists had attended workshops or seminars after graduation on health reporting than on environmental reporting (48 vs. 35), whereas more journalists (17 vs. 12) had been taught in school about environmental reporting than health reporting. Fewer journalists said they had received training in interpreting or reporting statistics, agricultural reporting, and aviation reporting.

For training in environmental and health reporting, workshops or seminars held after graduation were the most common format of training attended (Figure 4.4). The least commonly cited format of training in environmental and health reporting was diploma program or degree program.

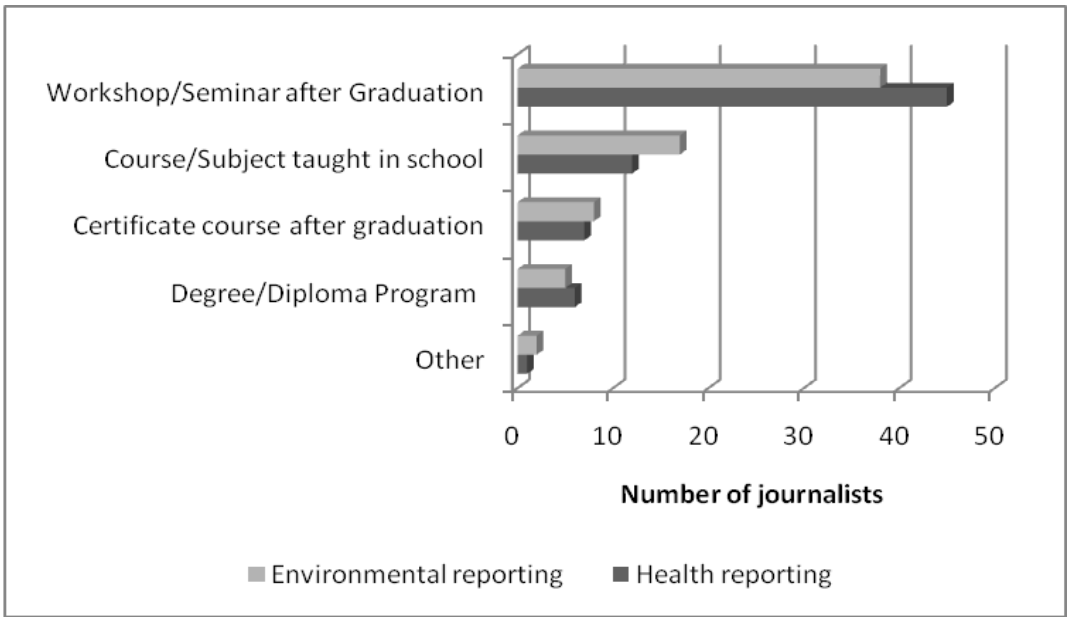

Figure 4.4. Formats of Science Journalism Training Received by Journalists in Ghana (n = 89**)**

Type of Mass Media and Sector of Employment

The respondents were asked to indicate their main area(s) of practice: newspaper, magazine, radio, television, Internet, or other. Of the 148 who did so, more worked in newspapers (80, or 54.1 percent) than any other area of practice (Table 4.9). Radio was the second most cited medium (45, or 30.4 percent). Fewer journalists (15, or 10.1 percent) worked in magazines. Many journalists (56, or 37.8 percent) cited more than one mass medium. Of the 15 journalists who listed "other," nine (60 percent) worked in a wire service, two (13.3 percent) worked in academia, and one each worked in a consultancy firm and a government policy establishment.

Table 4.9. Areas of Practice of Journalists in Ghana (n = 148)

Area of Practice	Number	Percent[1]
Newspaper	80	54.1
Magazine	15	10.1
Radio	45	30.4
Television	29	19.6
Internet	20	13.5
Other[2]	15	10.1

Notes:
1. The percentages add up to more than 100 because some respondents chose more than one option.
2. Nine respondents who listed "other" indicated they work for a wire service.

Respondents were asked to indicate their sector of employment: private-owned media, state-owned media, or freelance. Of the 140 journalists who did so, 45.0 percent said they worked for state-owned media and 55.7 percent said they worked for private media. Because one respondent cited both state-owned media and private-owned media, the total number of journalists was 141 and the total percentage was 100.7.

Both most of those working in the private-owned media and most of those working in the state-owned media worked for newspapers (Table 4.10). However, the proportion of respondents who worked for private-owned radio was more than twice that who worked for state-owned radio.

Table 4.10. The Employment Sectors of Journalists, by Area of Practice (n = 138)

Area of practice	Employment sector		TOTAL
	State-owned media	Private-owned media	
Newspaper	42 (53.8%)	34 (55.7%)	75
Magazine	6 (7.7%)	8 (13.1%)	13
Radio	16 (20.5%)	27 (44.3%)	42
Television	16 (20.5%)	13 (21.3%)	28
Internet	10 (12.8%)	9 (14.8%)	18
Other	13 (16.7%)	1(1.6%)	14
TOTAL	78	61	138

Notes:
1. A respondent cited more than one area of practice or sector of employment.
2. The percentages add up to more than 100 because a respondent cited more than one area of practice or sector of employment.

Membership in Other Journalism Groups or Associations

In all, 126 journalists responded to the item about which professional groups, if any, other than the GJA, they belonged to. Of these respondents, 52 (41.3 percent) said they did not belong to any other professional association (Table 4.11). Of the 74 respondents (58.7 percent) who belonged to other professional groups or associations, 10 to 20 percent belonged to each of the following groups listed on the questionnaire: Health Communication Institute, Ghana Association of Science Journalists and Communicators, African Media and Malaria Research Network, and Environmental Club of Journalists Ghana (Table 4.11). The journalists also belonged to a variety of other professional groups or associations. These included groups related to such themes as environment or sanitation, human rights, HIV, and water. Overall, themes related to environment and health reporting dominated the list (Appendix F).

Table 4.11. Membership of Professional Associations Other Than the Ghana Journalists Association (n = 126)

Professional Association or Group	Number (Percent)
None	52 (41.3%)
Health Communication Institute	19 (15.1%)
Ghana Association of Science Journalists and Communicators	16 (12.7%)
African Media and Malaria Research Network	13 (10.3 %)
Environmental Club of Journalists Ghana	23 (18.3%)
Other	36 (28.6%)

Notes:
The numbers and the percentages do not add up to 126 and 100 percent respectively because some respondents listed more than one association.
For names of the other groups cited, see Appendix F.

Sources Used for Reporting Science

Respondents were asked to rate the importance of types of sources using a four-point Likert scale: 1 = *not important at all*, 2 = *neither important nor unimportant*, 3 = *quite important*, and 4 = *very important*. The types of sources were consumers, scientists, staff of non-governmental organizations, staff of science journals, health professionals, traditional or alternative medicine professionals, staff of industry or the business community, and others. Respondents were also asked to indicate roughly the number of times that they interviewed the sources within the past 12 months. Those who had interviewed any of the sources were asked to indicate whether they were the initiators of the latest contacts (1 = *Yes*, 2 = *No*) and also to characterize the latest encounter with the source.

Rating of the Importance of Sources Used for Reporting Science

Of the listed sources, health professionals received the highest mean rating of importance (3.79) as shown in Table 4.12. This was followed by scientists (3.71), consumers (3.37), staff of science journals (3.15), and traditional or alternative medicine practitioners (3.11). Lower mean ratings were received by public information officers (3.06), staff of industry or business community (2.88), and staff of non-governmental organizations (2.80).

Table 4.12. Rating of the Importance of Sources Used for Reporting Science by Journalists in Ghana

Source	Not important at all	Neither important nor unimportant	Quite important	Very important	Total number	Mean
Consumers	2 (1.4%)	14 (9.8%)	56 (39.2)	71 (49.7%)	143	3.37
Scientists	1 (0.7%)	2 (1.4%)	33 (23.6%)	104 (74.3%)	140	3.71
Staff of non-governmental organizations	12 (9.0%)	24 (17.9%)	77 (57.5%)	21 (15.7%)	134	2.80
Staff of science journals	1 (0.8%)	18 (13.6%)	73 (55.3%)	40 (30.3%)	132	3.15
Public information officers	5 (3.7%)	21 (15.6%)	70 (51.9%)	39 (28.9%)	135	3.06
Health professionals (e.g., doctors, nurses, pharmacists)	0 (0 %)	4(2.8%)	22 (15.3%)	118 (81.9%)	144	3.79
Traditional or alternative medical practitioners (e.g., herbalists)	5 (3.5%)	19 (13.4%)	74 (52.1%)	44 (31.0%)	142	3.11
Staff of industry or business community	6 (4.4%)	33 (24.1%)	69 (50.4%)	29 (21.2%)	137	2.88
Others[1]	5 (14.7%)	11(32.4%)	12 (35.3%)	6 (17.6%)	34	2.56

Note:
1. Other sources cited were students, politicians, and websites. Because of the low number of other sources which the respondents cited, findings related to other sources will not be described in the text.

Frequency of Contact with the Sources

The journalists indicated the frequency with which they had interviewed the types of the sources by selecting one of four categories: 1 = *none*, 2 = *1–5 times*, 3 = *6–10 times*, and 4 = *more than 10 times.* With the exception of public information officers and traditional or alternative medicine practitioners, who were interviewed fewer times,

most respondents said they interviewed each type of source at least one to five times within the previous 12 months (Table 4.13).

Table 4.13. The Frequency of Interview of Sources for Reporting Science by Journalists in Ghana During the Past 12 Months

Source	None	1–5 times	6–10 times	More than 10 times	Total number	Mean[1]
Consumers	43(31.2%)	59 (42.8%)	22 (15.9)	14 (10.1%)	138	2.05
Scientists	36 (28.3%)	51(40.2%)	29 (22.8%)	11 (8.7%)	127	2.12
Staff of non-governmental organizations	49(36.8%)	57 (42.9%)	20 (15.0%)	7 (5.3%)	133	1.89
Staff of science journals	71 (52.6%)	46 (34.1%)	11 (8.1%)	7 (5.2%)	135	1.66
Public information officers	40 (30.5%)	36 (27.5%)	37 (28.2%)	18 (13.7%)	131	2.25
Health professionals (e.g., doctors, nurses, pharmacists)	23(16.4 %)	45(32.1%)	42(30.0%)	30 (21.4%)	140	2.56
Traditional or alternative medical practitioners (e.g., herbalists)	60 (43.8%)	42 (30.7%)	21(15.3%)	14 (10.2%)	137	1.92
Staff of industry or business community	51 (37.2%)	51(37.2%)	21 (15.3%)	14 (10.2%)	137	1.99
Others	27 (71.1%)	4(10.5%)	4 (10.5%)	3 (7.9%)	38	1.55

Notes:
Question: Thinking about reporting about science, roughly how many times in the past 12 months have you interviewed each of the following?
1 = *None*, 2 = *1–5 times*, 3 = *6–10 times*, and 4 = *More than 10 times*
1. The mean responses were calculated using 1 = *None*, 2 = *1–5 times*, 3 = *6–10 times*, and 4 = *More than 10 times*

In all, 21.4 percent of respondents had interviewed health professionals more than 10 times in the last year. The corresponding figures were public information officers, 13.7 percent; consumers, 10.1 percent; and scientists, 8.7 percent.

More than half of the respondents said they did not interview staff of science journals, nearly half said they did not interview alternative or traditional medicine professionals, and more than a third said they did not interview staff of non-governmental organizations or staff of industry or business community. When the means of the frequency of interview with the sources were computed, health professionals received the highest frequency of interview (2.56) and the staff of science journals the lowest (1.66).

The Initiator of the Latest Contact with Sources

The journalists who interviewed at least one listed type of source within the past 12 months indicated whether they (the journalists) were the initiators of the latest contact. Of the listed sources, health professionals received the highest proportion (79.5 percent) of journalists who initiated contact (Table 4.14). This was followed by consumers, scientists, and public information officers. Overall, more than half of the respondents indicated they initiated contact with all the listed sources except staff of science journals. When the means of the responses were computed, the journalists were more likely than all the sources except staff of science journals to initiate contact (Table 4.14). Staff of science journals received a mean response of 1.5.

Table 4.14. The Initiator of the Latest Contact With Sources

Source	Journalist Initiated Contact[1]	Journalist Did Not Initiate Contact[2]	Total [3]	Mean[4]
Consumers	86 (75.4.2%)	28 (24.6%)	114	1.25
Scientists	82 (73.2%)	30(26.8%)	112	1.27
Staff of non-governmental organizations	61(55.0%)	50 (45.0%)	111	1.45
Staff of science journals	51 (49.5%)	52 (50.5%)	103	1.50
Public information officers	73 (67.6%)	35 (32.4%)	108	1.32
Health professionals (e.g., doctors, nurses, pharmacists)	97 (79.5 %)	25(20.5%)	122	1.20
Traditional or alternative medical practitioners (e.g., herbalists)	64 (59.8%)	43 (40.2%)	107	1.40
Staff of industry or business community	67 (60.9%)	43(39.1%)	110	1.39
Others	12 (38.7%)	19 (61.3%)	31	1.55

Note. Question: In each of the above [previous question on frequency of interview] were you the one who initiated the latest contact?
1. A *Yes* response meant the journalist initiated contact.
2. A *No* response meant the journalist did not initiate contact.
3. Included in the total were any responses from journalists who either did not answer previous question related to frequency of contact or who indicated that they did not interview the sources (with their "none" responses).
4. The mean responses were calculated using 1 = *Yes* and 2 = *No*

Characterizations of the Latest Contact with the Sources

For each type of source contacted, respondents were asked to categorize the encounter as one or more of the following: (a) source seemed willing to help, (b) source seemed unwilling to help, (c) source provided technical information, (d) source provided easy-to-understand information, (e) source treated me with respect, and (f) source did not treat me with respect. In all, 131 journalists responded to this item, but the percentage of non-response was very high for each characterization.

The category of source that the greatest proportion of journalists considered willing to help was consumers (Table 4.15). This was followed by traditional or alternative medicine practitioners.

Table: 4.15. The Reported Willingness and/or Unwillingness to Help Journalists Who Said They Contacted News Sources (n = 131)

Source	Source seemed willing to help	Source seemed unwilling to help	No Response
Consumers	63 (48.1%)	13 (9.9%)	55 (42.0%)
Scientists	36 (27.5%)	7 (5.3%)	88 (67.2%)
Staff of non-governmental organizations	39 (29.8%)	14 (10.7%)	79 (60.3%)
Staff of science journals	25 (19.1%)	9 (6.9%)	97 (74.0%)
Public information officers	39 (29.8%)	10 (7.6%)	82 (62.6%)
Health professionals (e.g., doctors, nurses, pharmacists)	42 (32.1%)	6 (4.6%)	83 (63.4%)
Traditional or alternative medical practitioners (e.g., herbalists)	45 (34.4%)	14 (10.7%)	72 (55.0%)
Staff of industry or business community	33 (25.2%)	20 (15.3%)	78 (59.5%)
Others	8 (6.1%)	5 (3.8 %)	118 (90.1%)

The category of source the highest proportion of journalists cited as unwilling to help was staff of industry or business community.

The category of source that the greatest proportion of journalists (39.7 percent) reported as providing technical information was scientists (Table 4.16). This was followed by health professionals (32.8 percent). Of the listed categories, traditional or alternative medicine practitioners were cited by the lowest proportion (10.7 percent) as providing technical information.

Table 4.16. The Reported Provision of Technical Information to Journalists Who Said They Contacted News Sources (n = 131)

Source	Source Provided Technical Information	No Response
Consumers	26 (19.8%)	105 (80.2%)
Scientists	52 (39.7%)	79 (60.3%)
Staff of non-governmental organizations	21 (16.0%)	110 (84.0%)
Staff of science journals	33 (25.2%)	98 (74.8%)
Public information officers	20 (15.3%)	111 (84.7%)
Health professionals (e.g., doctors, nurses, pharmacists)	43 (32.8%)	88 (67.2%)
Traditional or alternative medical practitioners (e.g., herbalists)	14 (10.7%)	117 (89.3%)
Staff of industry or business community	31 (23.7%)	100 (76.3%)
Others	4 (3.1%)	127 (96.9%)

Respondents indicated whether the sources provided easy-to-understand information. The category of source that the greatest proportion of journalists (39.7 percent) reported as providing easy-to-understand information was health professionals (Table 4.17). This was followed by traditional or alternative medicine practitioners (31.3 percent).

Table 4.17. The Reported Provision of Easy-to-Understand Information to Journalists Who Said They Contacted News Sources (n = 131**)**

Source	Source provided easy-to-understand information	Total No Response
Consumers	23 (17.6%)	107 (82.4%)
Scientists	38 (29.0%)	93 (71.0%)
Staff of non-governmental organizations	29 (22.1%)	102 (77.9%)
Staff of science journals	33 (25.2%)	98 (74.8%)
Public information officers	37 (28.2%)	94 (71.8%)
Health professionals (e.g., doctors, nurses, pharmacists)	52 (39.7 %)	79 (60.3%)
Traditional or alternative medical practitioners (e.g., herbalists)	41 (31.3%)	90 (60.7%)
Staff of industry or business community	30 (22.9%)	101 (77.3%)
Others	3 (2.3%)	128 (97.7%)

With regard to whether the sources respected or disrespected the journalists, the highest proportion of the journalists (26 percent) said health professionals respected them (Table 4.18). Few sources in any category were identified as not having treated the journalists with respect (Table 4.18).

Table 4.18. The Reported Respect or Disrespect to Journalists (n = 131)

Source	Source treated me with respect	Source did not treat me with respect	No Response
Consumers	26 (19.8%)	3 (2.3%)	102 (79.9%)
Scientists	24 (18.3%)	1 (0.8%)	106 (80.9%)
Staff of non-governmental organizations	25 (19.1%)	4 (3.1%)	102 (77.9%)
Staff of science journals	13 (9.9%)	2 (1.5%)	116 (88.5%)
Public information officers	30 (22.9%)	4 (3.1%)	97 (74.0%)
Health professionals (e.g., doctors, nurses, pharmacists)	34 (26.0%)	3 (2.3%)	94 (71.8%)
Traditional or alternative medical practitioners (e.g., herbalists)	23 (17.6%)	5 (3.8%)	103 (78.6%)
Staff of industry or business community	24 (18.3%)	5 (3.8%)	102 (79.9%)
Others	2 (1.5%)	2 (1.5%)	127 (96.9%)

Number and Topics of Science Stories

Respondents were asked to indicate the number of science news and feature stories they reported within the past year. Six categories of number of reports were provided: none, 1–6, 7–12, 13–20, 21–30, and more than 30. For the topics of science stories, respondents were asked which categories of science topics they were interested in reporting on: none, health sciences, agricultural sciences, basic sciences (physics, chemistry, or biology), computer sciences and information communication and technology (ICT), and other.

Number of Science Stories Reported by Journalists

A total of 137 journalists indicated whether they reported science news stories in the previous 12 months. Of these, 16 (11.7 percent) said they reported none, whereas a little over half (71 or 51.8 percent) reported 1 to 6 science stories (Table 4.19). In contrast, of the128 journalists who indicated whether they reported science feature stories, 46 (35.9 percent) said they reported none.

Table: 4.19. Number of Science News and Science Feature Stories Reported During the Past 12 Months

Number of Stories	News (n = 137)	Features (n = 128)
None	16 (11.7%)	46 (35.9%)
1– 6	71 (51.8%)	58 (45.3%)
7–12	22 (16.1%)	12 (9.4%)
13–20	10 (7.3%)	4 (3.1%)
21–30	11 (8.0 %)	4 (3.1%)
More than 30	7 (5.1%)	4 (3.1%)

In each category of number of science stories other than *none*, the percentage of journalists who reported science news stories was higher than those who reported science feature stories (Figure 4.5).

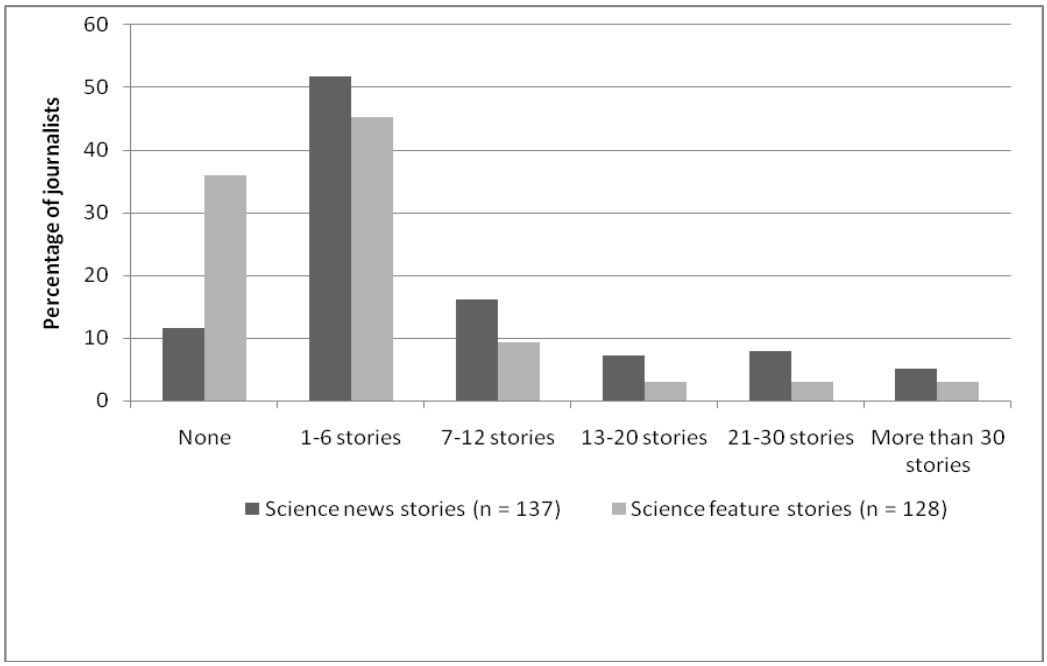

Figure 4.5. Numbers of Science News and Feature Stories Reported by Journalists in Ghana During the Past 12 Months

When the number of stories reported was cross-tabulated with the number of years spent in journalism, it was observed that for both science news and features, journalists who had spent 5 to10 years in journalism reported more stories than those who had spent less than 5 years in the profession (Tables 4.20 and 4.21). In terms of reporting 7 more science news or feature stories, the proportion of journalists who indicated they had spent less than 5 years in the profession was more than those who said they had been practicing for more than 15 years (Tables 4.20 and 4.21).

Table 4.20. Reporting of Science Features During the Past 12 Months, by Years Spent in Journalism (n = 124)

Number of science feature stories reported	Years spent in journalism			
	Less than 5 years (n = 36)	5–10 years (n = 50)	11–15 years (n = 17)	More than 15 years (n = 21)
None	18 (50%)	10 (20.0%)	7 (41.2%)	9 (42.9%)
1–6 stories	12 (33.3%)	31(62.0%)	5 (29.4%)	9 (42.9%)
7 or more stories	6 (16.7%)	9 (18.0%)	5 (29.4%)	3 (14.3%)

Table 4.21. Reporting of Science News During the Past 12 Months, by Years Spent in Journalism (n = 133)

Number of science news stories reported	Years spent in journalism			
	Less than 5 years (n = 41)	5–10 years (n = 52)	11–15 years (n = 19)	More than 15 years (n = 21)
None	5 (12.2 %)	2 (3.8 %)	4 (21.1%)	3 (14.3%)
1–6 stories	23 (56.1%)	25 (48.1%)	9 (47.4%)	14 (66.7%)
7 or more stories	13 (31.7%)	25 (48.1%)	6 (31.6%)	4 (19.0%)

For those who said they did not report any science feature stories during the previous 12 months, the proportion who said they had been practicing for less than 5 years was higher than that of those who had been practicing for 5 to 10 years, 11 to 15 years, and more than 15 years (Figure 4.6).

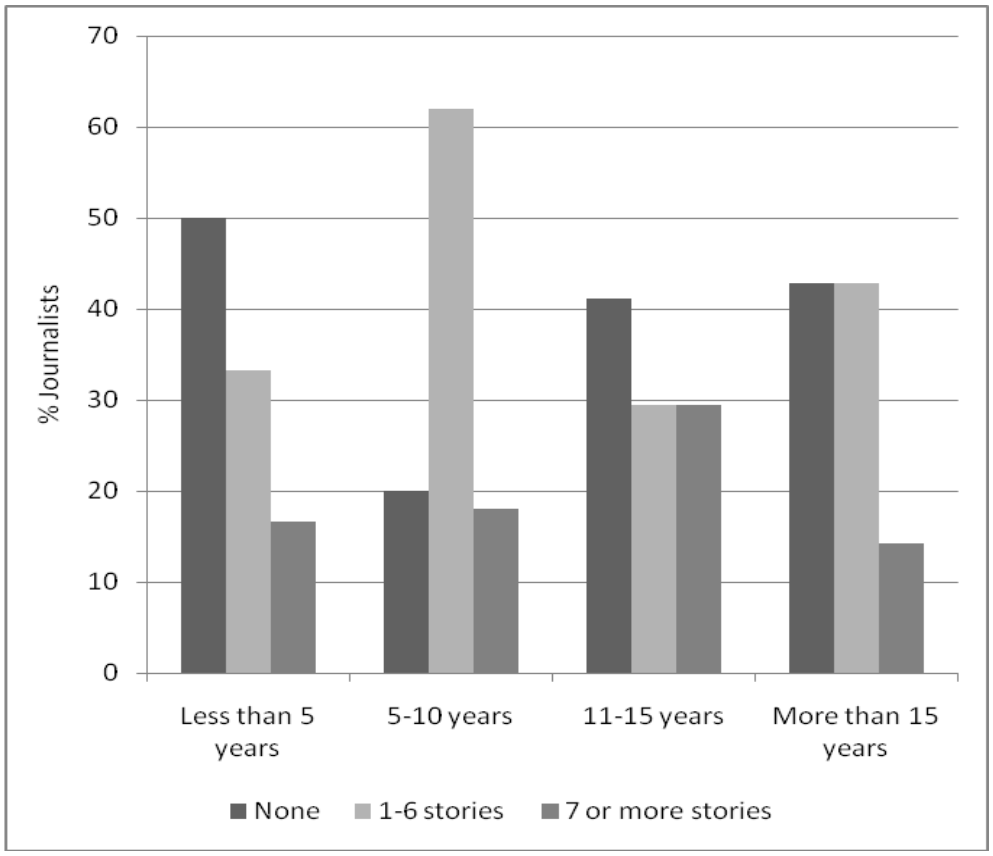

Figure 4.6. Number of Science Feature Stories Reported by Journalists in Ghana During the Past 12 Months, by Years Spent in Journalism (n = 124)

In contrast, for those who said they did not report any science news stories over the previous 12 months, the proportion who said they had been practicing for less than 5 years was higher than that of those who had been practicing for 5 to 10 years. Also, the proportion who said they had been practicing for less than 5 years was less than that for those who said they had been practicing for 11 to 15 years or more than 15 years (Figure 4.7).

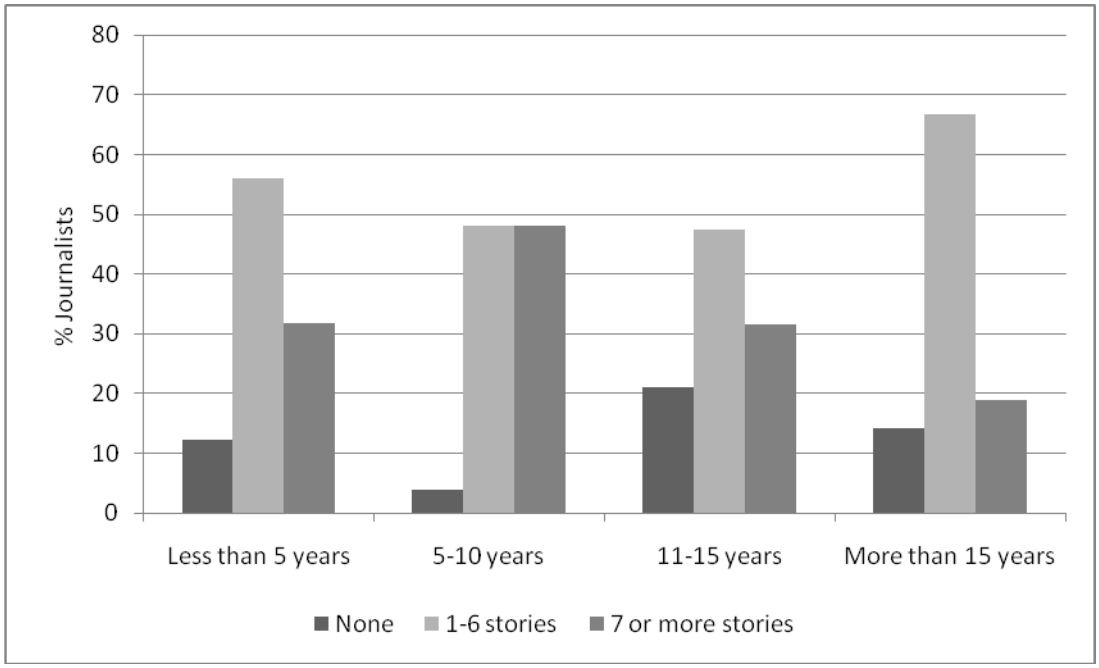

Figure 4.7. Number of Science News Stories Reported by Journalists in Ghana During the Past 12 Months, by Years Spent in Journalism (n = 133)

There was no correlation between the number of years spent in journalism and the reported number of science news stories ($p = 0.088$, $df = 15$). In contrast, there was an inverse correlation between the number of years spent in journalism and the reported number of science feature stories ($p = 0.017$, $df = 15$).

Science Topics of Interest

Among the categories of science topics provided on the questionnaire, health sciences was the area in which the highest proportion of journalists (70.5 percent) indicated interest (Table 4.22). This was followed by the agricultural sciences (37.4 percent) and computer sciences and information and communication technology (33.1 percent). Although environment was not listed as a separate category, five journalists (3.6 percent) specified it when responding to "other."

Table 4.22. Science Topics of Interest to Journalists in Ghana (n = 139)

Science Topic	Number and Percentage[1]
None	20 (14.4%)
Health sciences	98 (70.5%)
Agricultural sciences	52 (37.4%)
Basic sciences	20 (14.4%
Computer sciences and ICT	46 (33.1%)
Other[2] (the environment, sanitation science, traditional or African technology, telecommunications, water science)	12 (8.6%)

Notes:
ICT = Information and communication technology
1. The percentages do not add up to 100 because some respondents indicated more than one area of interest.
2. Some respondents who indicated others did not specify their topics of interest.

When current interest areas were cross-tabulated with gender, among men or among women the highest proportion of journalists indicated an interest in reporting health sciences (Table 4.23). There was no association between gender and having an interest in reporting health sciences, agricultural sciences, and computer sciences and information and communication technology. However, women were more likely than men to indicate basic sciences (physics, chemistry, biology) as a current area of reporting interest.

Table 4.23. Areas of Interest, by Gender of Journalist (n=144)

Areas of Interest	Gender		TOTAL
	Male (n = 90)	Female (n = 54)	
None	10 (11.1%)	9 (16.7%)	19
Health sciences	58 (64.4%)	37 (68.5%)	95
Agricultural sciences	31 (34.4%)	21 (38.9%)	52
Basic sciences (e.g., physics, chemistry, biology)	9 (10.0%)	11 (20.4%)	20
Computer sciences and ICT	27 (30.0%)	19 (35.2%)	46
Others	6 (6.7%)	5 (9.3%)	11

Notes:
ICT = Information and communication technology.

Percentages do not add up to 100 because some respondents indicated more than one current area of reporting interest.

Moreover, when the area of interest was cross-tabulated with the type of mass medium, journalists working in all types of mass media were most likely to say they were interested in the health sciences (Table 4.24). Among respondents working in newspaper, magazine, and radio, the second highest proportion of journalists indicated an interest in reporting agricultural sciences. However, among respondents working in television, the second highest proportion indicated an interest in reporting computer sciences and information and communication technology.

Table 4.24. Science Topic of Interest, by Type of Mass Media (n=137)

Area of Interest	*Type of mass media*						
	Newspaper (n = 73)	Magazine (n = 14)	Radio (n = 40)	Television (n = 27)	Internet (n = 18)	Other (n = 14)	TOTAL
None	8 (11.0%)	3 (21.4%)	9 (22.5%)	6 (22.2%)	4 (22.2%)	2 (14.3%)	20
Health sciences	53 (72.6%)	11 (78.6%)	28 (70.0%)	19 (70.4%)	13 (72.2%)	10 (71.4%)	96
Agricultural sciences	28 (38.4%)	8 (57.1%)	19 (47.5%)	11 (40.7%)	9 (50.0%)	4 (28.6%)	51
Basic sciences[1]	13 (17.8%)	3 (21.4%)	4 (10.0%)	8 (29.6%)	2 (11.1%)	0 (0%)	20
Computer sciences & ICT[2]	24 (32.9%)	7 (50.0%)	13 (32.5%)	12 (44.4%)	9 (50.0%)	5 (35.7%)	45
Other [3]	4 (5.5%)	2 (14.3%)	5 (12.5%)	2 (7.4%)	3 (16.7%)	3 (21.4%)	12

Notes:
1. Basic sciences were biology, chemistry, or physics.
2. ICT = Information and communication technology.
3. Respondents specified the "environment," "sanitation science," "traditional or African technology," "telecommunications," and "water science".

Motivating Factors Toward Science Reporting

On a four-point Likert scale, the journalists rated the importance of nine factors that could influence their decision to report science from 1 = *not important at all* to 4 = *very important*. The nine factors were (1) more support and encouragement from employer, (2) awards and prizes for me as an individual, (3) recognition of my employer with awards, (4) help with advancement of my own career, (5) relief from reporting non-science stories, (6) profitability to my employer, (7) increase in my own income, (8) easy availability of science research findings, and (9) receipt of (more) training in science journalism.

Most respondents (69.5 percent) rated receipt of (more) training in science journalism as very important (Table 4.25). The corresponding figures were advancement of my own career (57.0 percent) and easy availability of science research findings (52.9 percent). When the means of the ratings of the importance of the factors were computed, the factor that was rated most highly was receipt of (more) training in science journalism (3.48). This was followed by help with advancement of my own career (3.41) and easy availability of science research findings (3.39). The motivational factor that received the lowest mean of importance was relief from reporting non-science stories (2.19). This was followed by profitability to my employer (2.54) and increase in my own income (2.57).

Table 4.25. Potential Motivational Factors for Science Reporting in Ghana

Factor	Not important at all	Neither important nor unimportant	Quite important	Very important	Total	*Mean*
More support and encouragement from employer	19 (7.2%)	9 (6.5%)	56 (40.3%)	64 (46.0%)	139	3.25
Awards and prizes for me as an individual	23 (16.8%)	28 (20.4%)	53 (38.7%)	33 (24.1%)	137	2.70
Recognition of my employer with awards	21 (15.9%)	31 (23.5%)	50 (37.9%)	30 (22.7%)	132	2.67
Help with advancement of my own career	5 (3.5%)	13 (9.2%)	43 (30.3%)	81 (57.0%)	142	3.41
Relief from reporting non-science stories	42 (32.6%)	37 (28.7%)	34(26.4%)	16 (12.4%)	129	2.19
Profitability to my employer	24 (18.3%)	33 (25.2%)	53 (40.5%)	21 (16.0%)	131	2.54
Increase in my own income	30 (22.4%)	34 (25.4%)	34 (25.4%)	36 (26.9%)	134	2.57
Easy availability of science research findings	6 (4.4%)	7 (5.1%)	51 (37.5%)	72 (52.9%)	136	3.39
Receipt of (more) training in science journalism	9 (7.0%)	9 (7.0%)	21 (16.4%)	89 (69.5%)	128	3.48

Note:
1. The means were calculated using 1 = *not important at all*, 2 = *neither important nor unimportant*, 3 = *quite important*, and 4 = *very important*.

Barriers to Science Reporting

The questionnaire listed 13 potential barriers to science reporting. These were: (1) I am already involved enough, (2) I just don't want to report on science, (3) I am too junior, (4) The public doesn't want to know about science, (5) The public doesn't understand science, (6) I do not have the training needed to report on science, (7) There is no senior level support, (8) I do not have the contact information of scientific researchers, (9) There is no benefit or recognition, (10) I do not have the confidence, (11) I am too busy with non-science stories, (12) I have had one or more bad experiences with scientists, and (13) Other. A total of 140 journalists responded to this item.

Of the barriers, the one that the highest proportion of journalists cited was "I am already involved enough" (47.9 percent). This was followed by "I do not have the training needed to report science" (40.7 percent). There was a tie for the third highest proportion (33.6 percent): "I do not have the contact information of scientific researchers" and "I am too busy with non-science stories" (Table 4.26). The category that received the lowest proportion of respondents was "I am too junior" (5.0 percent).

Table 4.26. Reported Barriers to Science Reporting in Ghana (n = 140)

Barrier[1]	Number (percent)[2]
I am already involved enough.	67 (47.9%)
I do not have the training needed to report on science.	57 (40.7%)
I do not have the contact information of scientific researchers.	47 (33.6%)
I do not have the contact information of scientific researchers.	47 (33.6%)
The public doesn't understand science.	46 (32.9%)
There is no senior level support.	42 (30.0%)
There is no benefit or recognition.	32 (22.9%)
I have had one or more bad experiences with scientists.	22 (15.7%)
The public doesn't want to know about science.	19 (13.6%)
I just don't want to report on science.	12 (8.6%)
I do not have the confidence.	9 (6.4%)
I am too junior.	7 (5.0%)
Other[3]	10 (7.1%)

Notes:
1. Order of barriers differs from that on the questionnaire to aid in relative frequencies.
2. Percentages do not add up to 100 because some respondents chose more than one option.
3. Respondents cited barriers including, the tendency for editors to prefer political stories, research being too technical, no capacity, or having senior editorial responsibilities.

The Future of Science Journalism in Ghana

Respondents were asked to respond to the question: "In the next 10 years, how would you like the amount of science reporting to compare with the amount today?" The options were *equal*, *less than it is today*, *more than it is today*, and *don't know*. Respondents were asked to give reason(s) for their choices. In addition, respondents were asked to provide comments, if any, on the status of science journalism in Ghana. Most of the respondents (80.8 percent) said the amount of science reporting in Ghana in the next decade should be more than it is today (Table 4.27). Fourteen (9.3 percent) journalists indicated that in the next 10 years the amount of science journalism in Ghana should be equal to the current amount.

Table 4.27. The Amount of Science Reporting Desired by Journalists in Ghana in the Next Decade Compared with the Present (n = 151)

How amount of science journalism should be in the next 10 years compared with today	Number (percent)
Less than it is today	1 (0.7 %)
Equal	14 (9.3%)
More than it is today	122 (80.8%)
Don't know	5 (3.3%)
No response	9 (6.0%)

Reasons for Responses Regarding the Future of Science Journalism in Ghana

Respondents gave many reasons for their responses to the question: "In the next 10 years, how would you like the amount of science reporting to compare with the amount today?" A respondent who indicated that in the next 10 years the amount of science journalism should be *less than it is today* did not give any reason. Of the five respondents who chose *don't know*, two gave reasons. A journalist who had less than 5 years of experience and worked for a newspaper said: "Current level of science reporting is not empirically established so it is difficult to predict its future." A journalist who worked for radio and had 10 to 15 years experience wrote "because I don't hear much news and advocacy on science news from the various journalists associations that relates to health issues."

The reasons the respondents gave for selecting *more than it is today* or *equal* in response to the question "In the next 10 years, how would you like the amount of science reporting to compare with the amount today?" were similar to responses to the question "Other comments, if any, on the status of science journalism in Ghana? Thus, the responses to these two questions were analyzed together. Many themes emerged. These themes were categorized into two groups: (a) reasons for wanting the amount of science journalism to stay the same or increase and (b) status of science journalism.

Reasons for Wanting the Amount of Science Journalism to Stay the Same or Increase in Ghana

Four dominant reasons that respondents stated that the amount of science journalism should be equal to or more than it is today in the next 10 years were (a) to promote public literacy in science, (b) because science is important for development, (c) because science improves health and fights diseases, and (d) to improve science reporting (Figure 4.8).

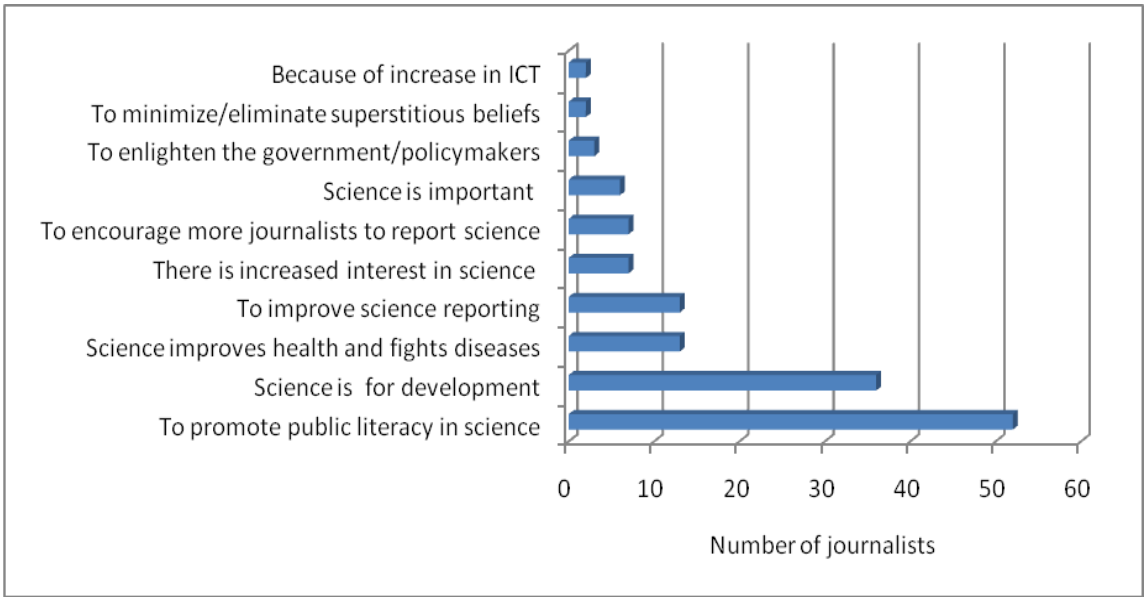

Figure 4.8. Journalists' Reasons for Wanting the Amount of Science Journalism to Stay the Same or Increase in Ghana in the Next 10 Years (n = 142)

Notes:
ICT = Information and communication technology.
Some respondents gave more than one reason. For details of the reasons and comments on science journalism, see Appendix G.

A journalist who worked for a newspaper and had 11 to15 years experience indicated that the amount of science reporting in the next 10 years should increase. The journalist stated a reason to illustrate the need to promote science literacy among the public: "If the society is knowledgeable on topics like earthquake, people will not be scared by common text messages on impending earthquake." A respondent working for a newspaper, magazines, and the Internet wrote: "Science reporting must increase so as to whip up the interest of the general public on science-related issues."

A journalist who worked for a wire service gave a reason that resonates with using science journalism for development: "Science is the basis for development so the more Ghanaians know more about scientific research and development either from abroad or around them, the easy it is for us to embrace them into our daily lives and benefit from them."

A respondent who worked for a magazine indicated the need to use science journalism to promote health: "The development of good health and a better environment depends on an improved science programmes and [science] stories in our reportage."

A journalist concerned about improving science reporting wrote: “Comparing the reportage of science and its related issues to that of Ghana, we can realize we have been left behind." This journalist commented further: "If Ghanaian journalists put in more efforts in science reportage within the next 5–10 years, it [science journalism] would be improved and if not at par with the developed countries, at least we can excel in it."

Comments on the Status of Science Journalism

Many themes emerged from respondents' comments on the status of science journalism in Ghana. In some cases, the reasons respondents gave regarding the future of science journalism, which was a different questionnaire item, resembled comments on the status of science journalism. Therefore, these two items were analyzed together. Nine themes were identified through the content analysis of the comments and reasons (Figure 4.9).

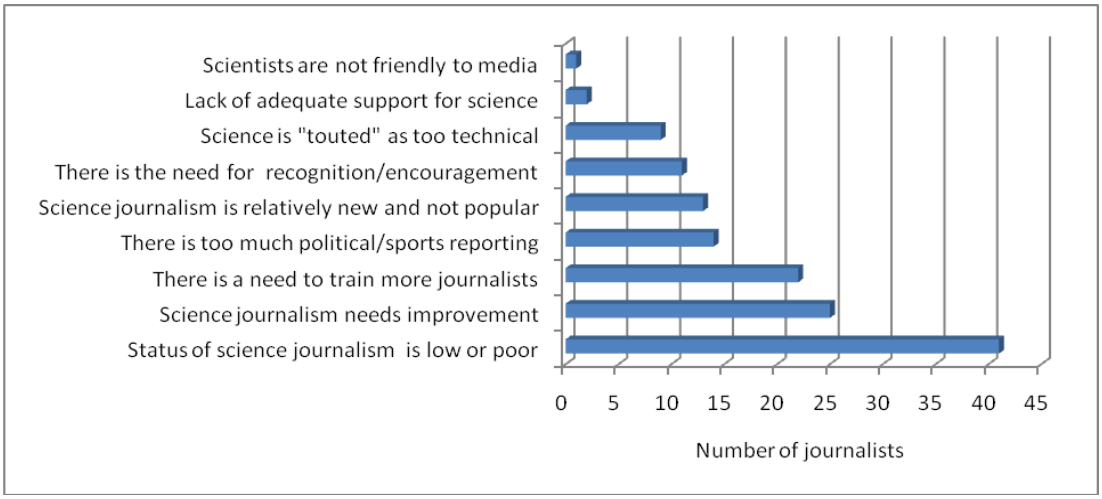

Figure 4.9. Journalists' Comments on the Status of Science Journalism in Ghana

Note:
Some respondents gave more than one comment. Some comments related to the previous questionnaire item that required respondents to answer the question: "Give reasons for your choice in question 10." For details of the reasons and comments on science journalism, see Appendix G.

Four of the comments were prominent: (a) status of science journalism is low or poor, (b) science journalism needs improvement, (c) there is too much sports or political reporting, and (d) there is a need to train more journalists.

The comment of a journalist working for radio summed up the perception of low status of science journalism in Ghana: "The state of science journalism in the country, [*sic*] is extremely low and this is affecting interest of the public and policymakers to influence a change in the way scientific issues affect Ghanaians positively." A journalist working for radio who had been practicing journalism for more than 15 years wrote: "Actually, this is the first time of hearing about science journalism in Ghana. It is rather sad . . ."

A journalist who worked for a newspaper and radio stated: "Science journalism should be promoted more in Ghana." One respondent who worked for a newspaper and magazine also added a voice for science journalism improvement: "The status of science journalism in Ghana is improving, but much needs to be done."

A comment that exemplifies Ghanaian journalists' tendency to report more on politics and sports to the detriment of science was given by a journalist working for a newspaper, who wrote: "It looks as if more journalists have their attention shifted to sports reporting. We are in an era of survival of the fittest. These journalists are into sports and political reporting where they can improve upon their finances."

A comment that exemplifies the need for training in science journalism was given by a respondent working for a newspaper, magazines, and the Internet: "Perhaps journalism institutions should consider science journalism as a major course and make it

interesting." A journalist working for radio and television advised: "Journalists should be given adequate training and be made aware of the importance of science to the present and future of Ghana."

CHAPTER V

DISCUSSION

This study had five objectives: to identify—from the perspectives of the journalists—(a) the demographic and other characteristics of journalists in Ghana, (b) the sources used for reporting science, (c) the number and the topics of science stories in Ghana, (d) the motivators for and barriers to science reporting in Ghana, and (e) the current status of science journalism and the expectation for science journalism in Ghana in the next 10 years. These objectives were motivated by a desire to make a scholarly contribution to science journalism research on the perspectives of journalists who cover science in Africa. Such journalism has been studied extensively in countries of the Western world but not in Africa. Science journalism ought to be studied in a developing country like Ghana because it can increase the science literacy of the public. Science journalism may also contribute to a nation's development.

In Western countries, many such studies have been done of respondents who hold the titles "science journalist" or "science writer." In Ghana, because journalists report science as part of other beats, this study involved the active members of the Ghana Journalists Association (GJA). This study was a comprehensive self-administered questionnaire survey of the GJA members who work in Accra, the capital of Ghana. Of the 300 questionnaires administered, 151 were received (50.3 percent response rate). However, a few respondents did not fully answer the questionnaire.

The survey addressed the following areas: (a) demographic and other characteristics of journalists in Ghana, (b) sources used for reporting science, (c) number and topics of science stories, (d) motivational factors towards science reporting, (e) barriers to science reporting, and (f) the future of science journalism in Ghana.

As indicated in the previous chapter, the study had many findings. Prominent among them were the following:

First, by way of demographic and other characteristics, 95.2 percent of respondents were aged 20 to 50 years. In all, 62.1 percent were men. The largest proportion of the respondents (37.4 percent) had been working in journalism for 5 to10 years, and almost a third had been doing so for less than 5 years. The highest educational qualification in journalism obtained by most of the respondents was diploma, a qualification similar to a US associate's degree. Few respondents said they had majored in science, but only a third said they did not have training in aspects of science journalism. More respondents worked in newspapers than any other medium, but many worked in more than one mass medium. The state-owned media employed slightly more than half of the respondents (78 of 141).

Second, as regards sources used for reporting science, health professionals received the highest mean rating of importance, and they were reported to be interviewed more often than any other source. Many respondents perceived health professionals to be a news source that provided easy-to-understand information. Many respondents perceived scientists as a news source that provided technical information.

Many respondents perceived consumers to be willing to help when contacted, but perceived staff of non-governmental organizations to be unwilling to do so.

Third, many respondents said they had written more science news stories than science feature stories within the past year. Most respondents indicated an interest in reporting on the health sciences.

Fourth, when the respondents were asked to rate the importance of some factors that may motivate them to report science, "receipt of (more) training in science journalism" received the highest mean rating of importance, and "relief from reporting non-science stories" received the lowest mean rating.

Fifth, when the respondents were asked to select among many reasons that could be preventing them from reporting science, the highest proportion selected "I am already involved enough." "I do not have the training needed to report science" came second. "I do not have the contact information of scientific researchers" and "I am too busy with non-science stories" were tied for third place. Although a third of respondents had been practicing for less than five years, the barrier identified least often was "I am too junior."

Finally, most respondents said the amount of science journalism in Ghana in the next 10 years should be more than it is today. When asked to give reasons for favoring an increase in science journalism, many indicated that science journalism was needed to promote public literacy in science. Many also indicated that science journalism was needed for developing a nation. When asked to comment on the status of science journalism in Ghana, many indicated that it was poor.

In the rest of this chapter, I will discuss the possible reasons for the findings, compare the findings with those of other studies, and identify the implications of the findings. The discussion is grouped into six main themes:

- demographic and other characteristics of journalists in Ghana,
- sources used for reporting science,
- number and topics of science stories,
- motivational factors toward science reporting,
- barriers to science reporting, and
- future of science journalism in Ghana.

Demographic and Other Characteristics of Journalists in Ghana

The demographic and other characteristics of the respondents mainly resembled those found in some studies in Ghana and many elsewhere. These characteristics were age, journalism experience, education, gender, the type of mass media in which the journalists work, sector of employment, and membership in groups or associations.

Age and Gender

The age of respondents in this study resembled that found in other studies done in Ghana and other countries. Kasoma (2007) did a study among journalists in Ghana and Zambia and found that most journalists in Ghana were aged between 26 and 30. Similarly, in my study, the highest proportion (45.3 percent) of the journalists were aged 20 to 30 years. Weaver and Wilhoit (1996) found that the highest proportion (37.2

percent) of journalists in the United States belonged to the age category 25 to 34. Similarly, Henningham (1993) found the median age of Australian journalists to be 32 years. Mwesige (2004), in a national survey of journalists in Uganda, also found that the median age was 31 years. The median age of the journalists in my study was the age category 31 to 40 years.

However, studies of science journalists have found higher averages, although Hennigham (1995) found that the highest proportion of the 34 science journalists in Australia was aged below 30 (44.1 percent). Dennis and McCartney (1979) found that of 75 science journalists who worked in metropolitan dailies in the United States, most were in their late 30s or early 40s. Storad (1984) found that among 50 science journalists who worked in metropolitan dailies in the United States, many were in the late 30s or mid-40s. Sachsman, Simon, and Valenti (2002) found that about half of 45 environmental reporters in New England (51 percent) were 45 years or older. The tendency for science or environmental reporters to be older than general reporters might be attributable to hiring of only older journalists for the environment or science beats, a tendency for the environmental or science reporters to stay in that beat for a longer time, or both (Sachsman, Simon, & Valenti, 2002).

Like age, the gender of respondents in this study resembled that found in other studies in Ghana and elsewhere. Kasoma (2007) found that most journalists in Ghana were men (73 percent). Similarly, in Mwesige's (2004) study of 104 journalists in Uganda, men constituted 73 percent. Weaver and Wilhoit (1996) discovered that men constituted 66.0 percent of the total journalists in the United States. In my study, men

constituted 62.1 percent of the population. However, Henningham (1995) found that 68.2 percent of 34 science journalists in Australia were women.

I found that beyond the age of 30 years, the percentages of both men and women decreased, but more so for women. This observation was similar to that of Weaver and Wilhoit (1996), who found that men were more likely than women to stay longer in the journalism profession. For both men and women, one factor contributing to the decrease could be the tendency to leave journalism for other professions, particularly politics, as Kasoma (2007) has observed. For instance, during the past New Patriotic Party (NPP) government, male journalists Kwesi Biney and Joe Aggrey, a former winner of GJA's journalist of the year award, had political appointments as district chief executive officer and deputy minister of youth and sports, respectively. In addition, Elizabeth Ohene, a former editor of the *Daily Graphic*, became minister of tertiary education. For women, the decreasing proportion of journalists with increasing age could reflect many additional reasons. First, fewer women than men may be entering the journalism profession at an older age, probably because of the nature of journalism such as being assigned to work that requires being away from home for long hours. Second, media organizations may tend to prefer younger women to older ones because younger women may have fewer family responsibilities, particularly if they do not have children. Finally, women journalists may be leaving the profession at later ages to attend to family responsibilities. Bohere (1984), who has studied the working conditions of journalists in many countries, has noted, "The conditions of work in the profession, such as irregular

and late working hours, could certainly account for the exclusion of women with family responsibilities" (p. 41).

Years in Journalism

I found the median number of years to be in the category 5 to 10 years, which resembles the seven years (Mwesige, 2004) found in Uganda. My study found that beyond 11 years, among both men and women the numbers of journalists decreased, but more markedly in women. This finding resembles that of Dennis and McCartney (1979), who found that on the average male science reporters working for metropolitan dailies were more experienced than their women counterparts (11 years vs. 4.8 years). The lower number of years in journalism for women observed in the current study may reflect the reasons cited earlier (under age and gender), including the possibility of women leaving journalism to take care of family responsibilities.

Education and Training

The highest educational qualification for most journalists was diploma (55.8 percent), followed by bachelor's degree (26.5 percent); postgraduate education was third (12 percent). This finding resembles that of Kasoma (2007), who found that among 107 of journalists in Ghana, 56.6 percent had a college diploma, 30.6 percent had an undergraduate (or bachelor's) degree, and 5.6 percent had a master's degree. The slightly higher proportion of journalists in my study with postgraduate qualification may be due

to inclusion of other qualifications such as postgraduate diplomas, postgraduate certificates, and doctorates, which Kasoma's study did not identify.

When the findings of my study are compared with those of Weaver and Wilhoit (1996) on US journalists, Ghana has slightly lower proportions of journalists with a bachelor's degree in journalism. Weaver and Wilhoit found that in 1992, 40 percent of US journalists had a bachelor's degree in journalism. Henningham (1993) found that of 1068 journalists surveyed in Australia, although 55 percent had attended university or college, only 39 percent had completed a college diploma or degree. Henningham found that for those with university education, 33 percent had majored in journalism and 8 percent in other communication-related disciplines. Thus, the findings of Henningham (1993) resemble those of my study.

The differences between the educational qualifications of respondents in my study and those of other studies may be traced to the history of journalism training in Ghana. Until 2001, the Ghana Institute of Journalism (GIJ) offered training only at the diploma level. The GIJ has produced more than 60 percent of communication professionals in Ghana (www.unesco.org/webworld /en/african-journalism-schools-database). Moreover, the School of Communication Studies of the University of Ghana—another key journalism institution in Ghana—provides only postgraduate education for journalists. A private institution that offers a bachelor's degree program in journalism is the African University College of Communication (AUCC) (http://www.aucc.edu.gh/academics/degree.htm). The AUCC was started in Accra in 2001 by a former director of the Ghana Institute of Journalism, Kwesi Yankah. Another

possible reason for the difference in educational qualifications may be related to the journalism job requirements of countries. In Ghana, a diploma in journalism or communication studies is a common requirement for employment in journalism-related jobs. However, in the United States because many journalists have a bachelor's degree in journalism, a diploma—lower than a bachelor's degree—may not be competitive.

In terms of majoring in science, general reporters in Ghana appear to be similar to science journalists elsewhere. In my study, few (21.7 percent) said they had a degree or diploma in science. There were similar findings in studies of science journalists in Australia (Henningham, 1995) and the United States (Viswanath et al., 2008).

In my study, two-thirds of the respondents indicated they had training in aspects of science journalism such as interviewing scientists, drug safety reporting, health reporting, agricultural reporting, aviation reporting, interpreting or reporting statistics, or environmental reporting. Nearly a half indicated they had received training in health or environmental reporting, a quarter said they had received training in reporting statistics, and less than one-fifth said they had received training in agricultural or aviation reporting. The differences in aspects of science journalism training received may reflect efforts made by scientific institutions in Ghana in promoting science journalism. My findings showed that workshops or seminars accounted for most training in science journalism in Ghana. For instance, the Ministry of Health, analogous to parts of the US Department of Health and Human Services, has organized workshops on health reporting in the past for journalists. I attended one such workshop with some journalists in 2004. International donors and non-governmental organizations have also been

offering training for journalists in Ghana. Schiffrin (2010), who has studied the roles played by foreign donors in journalism training in Ghana, Nigeria and Uganda, has noted:

> Other organizations that offer journalism training are non-governmental organizations (NGOs) that hope to encourage journalists to write about the causes that interest them such as HIV AIDS, the trafficking of women, the environment, water, the need for transparency in the extractive sector, the importance of social entrepreneurship, and public health initiatives. (p. 2)

Local NGOs also play a role in journalism training. For instance, in 2007, when I was the secretary of the public health committee of the Pharmaceutical Society of Ghana, we organized a workshop on hepatitis B reporting for some journalists in Accra.

In my study, few journalists indicated they had training in science journalism during their formal journalism education. Journalism training institutions in Ghana should consider introducing science journalism courses.

Sector and Area of Employment

This study found that state-owned media still account for the employment of many journalists in Ghana. My findings showed that 78 of 140 (55.7 percent) of respondents said they work in the state-owned media. Boafo (1988) found that of more than 650 journalists in Ghana, 467 (71.2 percent) were employed by the state-owned media. However, whereas my study focused mainly on journalists who work in Accra (Ghana's capital), Boafo's study included journalists throughout in Ghana. In Accra, the

greater number of media organizations, which are mainly private-owned, might have led to a slightly higher proportion of journalists in my findings than those of Boafo. For instance, Gadzekpo has noted that there were 80 private and commercial radio stations in Ghana whereas before 1996, there were only 11 radio stations in Ghana, which were all owned by the state (as cited in Kefewo, 2006).

This study suggests that Ghana has a greater proportion of journalists working in the private sector than in Uganda, where a national survey of 101 journalists showed that 36 percent of journalists were employed by the private-owned media (Mwesige, 2004). Although the study in Uganda was national, 92 percent of the 101 respondents came from the capital city—Kampala. Thus, my study, in which all respondents were from the capital of Ghana (Accra), may resemble that study. In part because of liberalization of the mass media, the numbers of private-owned media in Ghana (Kefewo, 2006) and Uganda (Khamalwa, 2006) have increased. Moreover, the proportion of journalists working in the private media that this study identified (45.5 percent) may not reflect all the journalists in Ghana. Had all journalists been considered for the study, the proportion working in the private-owned media might have been higher than 45.5 percent. This is because during data collection, I observed that many journalists in Ghana—most of whom work in the private-owned media—were not members of the GJA. For instance, Andrew Edwin Arthur, the dean of the Ghanaian Parliamentary Press Corps, said that of the more than 70 journalists that constitute the parliamentary press corps, only 22 (31.4 percent) are members of the GJA (A. E. Arthur, personal communication, January 26, 2010).

In terms of the type of mass media in which journalists are employed, my findings resemble those from the United Stated (Weaver and Wilhoit, 1996), United Kingdom (Weitkamp, 2003) and Uganda (Mwesige, (2004), which showed that many journalists worked in the print media. And in both the United Kingdom (Weitkamp, 2003) and my study, many journalists cited more than one type of mass media organization. Journalists may tend to work in more than one area of practice for several reasons. First, low salaries may spur some journalists to work in more than one medium. Kasoma (2007) found that although journalists in Ghana had higher journalism qualifications than their counterparts in Zambia, the proportion of journalists in Zambia who received a monthly salary of more than US$500 was higher in Zambia (17.8 percent vs. 4.6 percent). Second, the tendency to work in more than one mass medium may be due to the contractual agreement at the time of employment or the employment system inherent in a particular country. In Ghana, some journalists are allowed to work in more than one media organization. For example, Ghanaian journalist Israel Laryea works for Joy FM (a private radio station in Accra) as a broadcast journalist and for *TV3* (a private television station in Accra) as a news anchor. The two media organizations are not affiliated. Describing the working conditions of journalists across several countries, Bohere (1984) explained:

> In Finland, some editors demand that the name of other employers is disclosed, but the journalist is free to refuse; in Luxembourg, however, the journalist cannot refuse. . . .

> Elsewhere it is possible to work for more than one employer within the profession. There is no ban or restriction in Austria, Brazil, Chile, Finland, Honduras, Hong Kong, India . . . Spain, and the United States. In Argentina, for example, a journalist can work "full time" for three newspapers simultaneously, and can thus receive three salaries. (pp. 27, 29)

My findings showed that slightly more than half of respondents worked for newspapers in state-owned or private media. Ghana has two main state-owned media organizations that produce newspapers. The Graphic Communications Group Ltd produces the *Daily Graphic*, *Graphic Sports* (weekly), *Junior Graphic* (weekly), and *The Mirror* (weekly). The New Times Corporation produces *The Ghanaian Times* (daily) and *The Weekly Spectator*. There are more private newspapers in Ghana than there are state-owned newspapers. However, the two state-owned media tend to employ more journalists because they usually have larger circulations.

In this study, of respondents working for the state-owned media, 20.5 percent worked in radio whereas of respondents working for the private-owned media 44.3 percent worked in radio. The lower proportion of journalists working in the state-owned radio compared to private-owned radio may be because of the increased number of private radio stations in Ghana, as noted by Gadzekpo (as cited in Kefewo, 2006).

Membership in Professional Associations

Given the inclusion criteria, all the respondents in this study belonged to the GJA. In addition, most belonged to one or more other professional associations. In the study by Dennis and McCartney (1979), 60 percent of science writers at metropolitan dailies in the United States belonged to professional societies. Weaver and Wilhoit (1996) found that in 1992, 36.1 percent of US journalists belonged to professional associations.

In my study, a high proportion of the respondents were members of other professional associations with an interest in reporting social and science issues, including HIV, environment, and sanitation. The GJA requires payment of annual professional dues. During data collection, it was realized that the state-owned media usually pay the professional dues for their employees whereas few private-owned media do so. This observation may account at least in part for the low numbers of GJA members who work in private-owned media.

At least two factors may account for the tendency of the respondents to belong to some smaller professional groups. First, usually membership dues in such groups are low. Second, respondents might have joined the professional groups to get support of friends who are members. Diedong (2008), describing the establishment of journalistic standards in Ghana, stated: "The single most important reason why journalists persist in an occupation that is badly paid . . . is the support of close friends" (p. 212).

Sources Used for Reporting Science

In a variety of countries, journalists who report science rely on human sources for information (Van Trigt, de Jong-van den Berg, Haaijer-Ruskamp, Wiellems, & Tromp, 1994; Conrad, 1999; and Elias, 2007). Journalists may also call on sources for effective quotations (Conrad, 1999). The interaction between sources and science reporters has been studied in a number of Western countries (Dunwoody**,** Brossard, & Dudo, 2009; Peters, 1995; Peters et al., 2008). This study attempted to gauge how reporters in Ghana perceive the importance of some sources for gathering information on science and to identify their attitudes toward those sources. The sources were consumers, scientists, staff of non-governmental organizations, staff of science journals, health professionals, traditional or alternative medicine professionals, staff of industry or the business community, and others.

In the study, many respondents highly rated health professionals and scientists as important. The perceived importance of health professionals and scientists as sources for reporting science may stem from their credibility or the fact that medicine and health are major areas of public interest and thus major topics of reporting. Indeed, in a national survey of 2,051 adults in Ghana, 76 percent said they pay a great deal of attention to health news whereas 52 percent said so for entertainment (Bowen, 2010). Some other factors may also contribute to the respondents' high ratings of health professionals and scientists. First, there are councils that regulate the training and the practice of the three main health professionals in Ghana—nurses, pharmacists, and physicians. The use of the titles "nurse," "pharmacist," and "physician" are regulated by laws in Ghana, thus

fostering the credibility of individuals who hold such qualifications. Thus, any such professional is deemed as credible not only by the public, but by journalists.

Second, health professionals—more than the other human sources—may be interacting with journalists regularly. Thus, journalists might have developed an understanding of their importance. Such interactions may take the form of annual meetings and workshops. For instance, the Ghana Medical Association, the Pharmaceutical Society of Ghana, and the Ghana Registered Nurses Association hold annual meetings that journalists are invited to cover. In addition, the Medical and Dental Council, the Pharmacy Council, and the Nurses and Midwives Council organize induction ceremonies for new members of their respective health professions. Journalists often attend such ceremonies. Usually at the annual meetings or induction ceremonies, the important roles played by health professionals in national development are highlighted.

Third, scientists may be perceived as credible because of their qualifications and their affiliations to credible professional bodies or institutions. For example, during the January 2010 rumor about an impending earthquake in Ghana, some journalists interviewed a geologist who was formerly the executive director of the Centre for Remote Sensing and Geographical Information Services at the University of Ghana. The journalists probably interviewed this source because of the former affiliation and perceived expertise.

In my study, the business community received the lowest mean rating of importance as a source of information. Based on the assumption that the perceived

importance of sources relates to credibility, this finding resembles that of a study of medical, health, and science journalists in the United States (Yoon, 2005). In that study, "reporters perceived not-for-profit research institutes as the most credible, followed by university sources, professional associations, government sources, advocacy organizations, and business sources, in that order" (p. 291). At least two main factors may account for the low ratings of importance of industry or the business community. First, journalists may perceive of the business community as important for securing advertisements, but not as important sources for science news. Jonathan Gmanyami, a Ghanaian journalist who works for a newspaper and is often assigned to the science or health beat, told me that editors sometimes do not like journalists to cover the business community because that is like a promotion for industry (J. Gmanyami, personal communication, January 20, 2010). Second, the business community may be biased in providing scientific information. For instance, the pharmaceutical industry may promote a medicine without noting its side effects. Journalists may not trust sources deemed to be providing biased information.

However, credibility is not the only factor in the perceived importance of the sources. It was surprising to find that traditional or alternative medicine practitioners (for example, herbalists) received nearly the same mean rating of importance as public information officers, and an even higher mean rating than staff of non-governmental organizations. Herbalists are not currently integrated into the formal health sector in Ghana, although a new council on alternative medicine practice was inaugurated on April 2010 (http://news.myjoyonline.com/health/201004/44960.asp). One possible

reason for their relatively high rating could be their easy accessibility and the tendency for traditional medical practitioners to speak the local language, which journalists may easily understand. As noted by Conrad (1999), "[l]ocating sources depends in part on space, time, and accessibility" (p. 290). Another reason may be the active role played by the Ghana Federation of Traditional Medicine Practitioners Association (GHAFTRAM) in making the voices of traditional medical practitioners heard by the public and the media. GHAFTRAM advocated for the above-noted council on traditional medical practice. Finally, more than 70 percent of the people of Ghana use traditional medicines (World Health Organization, 2001), perhaps in part because they are easily affordable. Thus, journalists may highly esteem individuals such as herbalists with expertise in producing these medicines.

Not surprisingly, the more important a source was perceived as being, the more likely it was that journalists would report having interviewed that source frequently. Thus, in my study, the most frequently interviewed source was health professionals. However, although scientists were rated as the second most important source, the findings indicate that public information officers were interviewed more frequently than scientists. Two main factors may account for this. First, the journalists might have contact information for public information officers because they were classmates at the Ghana Institute of Journalism, an institution that trains many journalists and public information officers in Ghana. Second, public information officers may be actively promoting the organizations they work for to journalists through press conferences, news releases, and other means, whereas scientists may not be actively promoting their work

to the media in Ghana. At a media forum on climate change held in Germany on June 22, 2010, Ghanaian scientists and journalists discussed issues related to their interactions (Boakye-Dankwa, 2010):

> The scientists complained that the Ghanaian media were generally not keen in following their activities unless they organised a programme and invited them, and even that the journalists left after the opening ceremony and seldom sat in to listen to presentations. . . .
>
> They [the scientists] also complained of misrepresentation by the media, which they said, [*sic*] affected their credibility among their peers, citing the recent media report of an impending drought in Ghana this year, when in reality what the Ghana Meteorological Agency had said was that the country was going to experience lower rainfall.
>
> The journalists countered by saying that the scientists had rather not been forthcoming and cited instances where scientists had told them that they needed to get clearance from their superior officers before they could grant interviews. They [the journalists] pointed out to the scientists that if the media did not go to them and they had anything for the people all that they needed to do was to call any media house and to ask for an interview just as they did whenever they organised an event. ("Ghanaian scientists complain," para. 3, 5-7)

In terms of initiating contacts with sources, health professionals were the sources that many journalists initiated contact the most, followed by consumers, scientists, and public information officers. Consumers could be patients, their care-givers or others.

Journalists often want to include human interest in their stories, hence many respondents might have contacted consumers.

Not surprisingly, few journalists reported having initiated contact with staff of science journals. At least six possible reasons may contribute to this finding. First, the authors, not the staff, are the experts on the research reported in the journals. Second, journalists may not be aware of science journals in Ghana. Third, contact information for staff of science journals may not be accessible to journalists in Ghana. Fourth, journalists may have little access to science journals in Ghana. Fifth, even when journalists have access to science journals, they may be intimidated by the scientific terms often used in the journals. Finally, public information officers may be responsible for the interaction between journalists and the staff of science journals.

In interpreting the findings related to who initiated the contact, one must be very careful. Originally, only the respondents who interviewed at least one source in a given category within the past 12 months were to answer that question. Some other respondents also answered the question. The reason other respondents answered might be that the question asked them to indicate who initiated the "latest contact" and not the latest "interview." Contact can include not only interviews but also other forms of contact such as e-mail, phone calls, or news releases. A study of 56 science writers who were members of the Association of British Science Writers (ABSW) showed that non-governmental organizations, universities, and industry or commercial organizations contacted them through e-mail more than telephone, news release, and post (Weitkamp, 2003). Thus, in my study, some respondents might have not interviewed a source but

might have had contact through e-mail or news releases. A topic for further research might be to evaluate the different kinds of contact between journalists and their sources from which they get information on science.

In describing the latest encounter with the sources, six characteristics of encounters were provided for respondents: (a) source seemed willing to help, (b) source seemed unwilling to help, (c) source provided technical information, (d) source provided easy-to-understand information, (e) source treated me with respect, and (f) source did not treat me with respect. Respondents were asked to choose all that apply.

Given the high non-response rate to questionnaire items that addressed the characterization of the interactions between the respondents and the sources, one must be careful in interpreting the findings related to these items.

Many journalists rated consumers as most willing to help. The second most willing source, according to the respondents, was the traditional medicine practitioner. The fact that many journalists said traditional medicine practitioners were willing to help—more than health professionals and scientists—may result from several factors.

First, traditional medicine practitioners have been advocating for their inclusion in Ghana's health care system. Therefore, unlike orthodox health professionals, traditional medicine practitioners may be more eager to engage with the Ghanaian media. Second, compared with orthodox health professionals, traditional medicine practitioners are noted for spending more time with their patients. Perhaps, the tendency to be more willing to help journalists may be an extension of this characteristic. Thus, traditional medicine practitioners also might have more time to talk with reporters.

Third, traditional medicine practitioners—unlike health professionals or scientists—may not care much about the potential for misrepresentation in the mass media. This is because traditional medicine practitioners may not be chastised by their colleagues when incorrect information is attributed to them in the media. Therefore they may be more willing to talk with reporters. Finally, traditional medicine practitioners may not represent institutions, and may therefore speak for themselves.

In describing the use of expert sources in writing genetics stories, Conrad (1999) has written:

> The stature of a source may be important. While younger scientists are often most willing to talk with reporters, experts with recognizable names, titles, or affiliations are prized sources. The journalistic ethos suggests that a source should be a "top guy in the field" to safeguard credibility. That's why directors of institutes, scientists at prestigious universities, and well-known figures are frequently used as experts. (p. 291)

But in Ghana journalists may find it difficult to contact "top guys" in their fields because of bureaucracy. Also, younger scientists may need to seek clearance from their superiors before they can grant interviews. These factors might have contributed to scientists not being among the top four sources the respondents selected as willing to help when contacted.

The category of source that the greatest proportion of journalists cited as unwilling to help was staff of industry or the business community. One main factor may be related to the nature of information journalists might have requested from staff of

industry or the business community. For instance, these businesses may want to protect their image, and thus may not release information deemed to be "private."

In the study, many journalists said scientists provided technical information. Of the listed categories, traditional or alternative medicine practitioners were cited by the lowest proportion of respondents as providing technical information. It was not clear from the study whether respondents viewed technical information as being good, bad, or indifferent. A potential topic of research should be what reporters consider as technical information. Scientists may lack the skills needed to communicate with the media in non-technical language.

In my study, many respondents said health professionals and traditional or alternative medicine practitioners provided easy-to-understand information. This finding might have resulted from the tendency for health professionals or alternative medicine practitioners to communicate with patients in easy-to-understand language as part of their routine work.

With regard to whether the sources respected or disrespected the respondents, many respondents said health professionals respected them, and many respondents indicated the staff of industry and the business community disrespected them. This finding may relate to the nature of interaction between the respondents and the sources. A lack of respect for journalists by a source may lead to decreased journalist-source interactions. Perhaps, this may explain why health professionals were contacted more often than staff of industry or the business community.

Some respondents mentioned other sources for obtaining information of science, such as students, politicians, and Web sites. How journalists in Ghana use other human sources (for example, students and politicians) and non-human sources (for example, Web sites, books, and scientific journals) for science reporting might be worthy of further study.

Number and Topics of Science Stories

Science reporting takes forms such as news stories and feature stories. Science topics that journalists cover range from archaeology to zoology. In my study, respondents indicated they reported more science news than science feature stories in the past 12 months. A typical science feature story may draw on interviews of 8 to 10 sources, but science news stories are generally shorter than feature stories and may sometimes involve interviews of only 2 or 3 sources (Conrad, 1999). In contrast, long feature stories may entail interviews of as many as 40 people (Conrad, 1999). Thus, many respondents might have chosen to write science news stories rather than science features because the former are quicker to prepare. This finding in general journalists in my study differs from those of studies involving science journalists working for metropolitan daily newspapers in the United States, which showed that science journalists reported more feature stories than science news (Dennis & McCartney, 1979; Storad, 1984).

In my study, the proportion of journalists who reported having written seven or more science feature stories in the past year was greater among those who had been

practicing journalism for less than 5 years than among those who had been practicing journalism for more than 15 years. Several factors may account for this finding. First, senior journalists may have managerial or editorial responsibilities that prevent them from reporting more feature stories. Second, senior journalists may be reporting non-science stories, such as stories on politics. Because of the risk of lawsuits, sometimes only senior journalists are allowed to report on politics. For example, some politicians have sued journalists or their media organizations for reporting false information about them. The situation in Ghana may be likened to that of Pakistan as explained by a Pakistani science journalist, Aleem Ahmed (2005). Ahmed has stated that in Pakistan, journalists reporting on science do not care much about accuracy—unlike those who report politics—because incorrect political reporting carries more risks whereas incorrect science reporting lack such risks. Finally, younger journalists might be more interested in reporting science feature stories rather than news because they may want to include their opinions in the stories. In the United States, such writing probably would be considered editorials or commentary, not features. A study of young journalists in Kenya might explain the tendency for young journalists in Ghana to prefer reporting features (Ogongo-Ongong'a & White, 2008):

> Young journalists are resigned to the fact that in the reporting of current news, regardless of what they turn in to editors, it is going to have the slant of the editor of the newspaper in general.

> The current political reporting is generally handled by more senior reporters, and young journalists much prefer to spend time on features where they can express their personal views in social-issues writing. (p. 176)

Topics of Science Reporting

Respondents were asked which categories of science topics they were interested in reporting: none, health sciences, agricultural sciences, basic sciences (physics, chemistry, biology), computer sciences and information communication and technology (ICT), and other.

The most preferred interest area was the health sciences (98 of 144 respondents or 70.5 percent). Agricultural sciences (37.4 percent) and computer sciences and ICT (33.1 percent) followed. This finding is consistent with those of several studies that have indicated that health or medicine dominates science topics in the press (Bucchi & Mazzolini, 2007; Weitkamp, 2003).

This finding suggests that interests of journalists in Ghana are consistent with interests of the people of Ghana: A recent survey of 2,051 adults in Ghana showed 79 percent paid a great deal of attention to health news and 59 percent paid a great deal of attention to agricultural news (Bowen, 2010). Moreover, according to this survey, 70 percent of adults in Ghana paid a great deal of attention to environment news. My study did not include "environment" as an option. Nevertheless, a few respondents indicated it under the option "other." Especially given that many journalists had received training in environmental reporting, it would have been desirable to include "environmental

sciences" as an option. Further research should include environmental science as an option in such surveys.

A study in Ghana has indicated that male journalists were more likely than female journalists to report on information and communication technology (Kwami, 2007). My study found that among female journalists, 35.2 percent said a current area of reporting interest was information and communication technology, and among men 30 percent said so. An association was found between gender and having an interest in reporting basic sciences such as biology, chemistry, and physics. Among men, 10 percent said one of their current areas of reporting interest was the basic sciences and among women 20.4 percent said so. Nevertheless, overall few journalists said a current area of interest was reporting basic sciences (20 of 144 respondents or 14.4 percent).

Many factors may account for the respondents' low interest in reporting basic sciences. First, journalists may not find many human-interest stories related to the basic sciences. Second, scientists with expertise in the basic sciences may not be more easily accessible than their counterparts in the health and agricultural sciences. Third, perhaps scientific institutions that specialize in the basic sciences have not organized workshops or seminars on basic sciences for journalists, hence a lack of interest in the topic. Finally, journalists may have little background in basic sciences. Thus, the basic sciences may be hard for journalists to cover.

In addition to these factors, research findings in the basic sciences may not be tailored to the needs of journalists. For instance, while collecting data for this research, a journalist working for a wire service was reporting on a chemistry-related story. The

journalist was reading the journal article when she came across the term pH. Not knowing what the term meant, she asked me, "You are a pharmacist studying science journalism. How can I explain pH to an ordinary person?" She later told me that even though she lacks a background in science, she usually has to read scientific articles and translate them herself. This observation calls for training journalists in Ghana on how to find easy-to-understand scientific information.

In this study, respondents were asked about their areas of reporting interest, not science topics reported on. In interpreting this data, one must realize that the two are not necessarily equivalent. For instance, the fact that respondents indicated the health sciences as an area of interest may not necessarily indicate that is what they cover in reality. Other motivations or barriers could influence the topics actually covered by journalists.

Motivational Factors Toward Science Reporting

When respondents were asked to rate nine motivational factors that may influence them to report more science stories, the one that received the highest mean rating on a scale of 1 = *not important at all* to 4 = *very important* was "receipt of (more) training in science journalism" (3.48). This was followed by "help with advancement of my own career" (3.41) and "easy availability of science research findings" (3.38). Given that many respondents indicated they were too busy with reporting non-science stories, it was surprising that the motivational factor "relief from reporting non-science stories" received the lowest mean rating (2.19).

The fact that most respondents considered more training in science journalism as a motivation for reporting more on science suggests there should be more training in the field. It was not surprising that "help with advancement of my own career" received a high mean rating. Perhaps younger reporters consider science reporting a means to advance in their journalism careers. The motivational factor "increase in my own income" received a lower mean rating (2.57) than "easy availability of science research findings" (3.39). This finding might suggest that journalists in Ghana consider the interests of the public more than themselves or might care more about performing their journalistic duties. Unfortunately for their employers, "profitability to my employer" received the second lowest mean rating (2.54), although "more support and encouragement from employer" received the fourth highest mean rating (3.24). Given this finding, employers might have little motivation to support journalists in science reporting. Perhaps journalism training institutions should consider offering courses in science journalism.

Because "easy availability of research findings" had a higher rating, initiatives that promote easy access to science research findings in Ghana should be considered. For instance, non-profit or state-owned media organizations with access to the Internet should consider registering with HINARI, a project of the World Health Organization that provides free access to some health and biomedical journals for non-profit institutions or state-owned organizations in developing countries (http://www.who.int/hinari/en/).

In the United States and the United Kingdom, many scientific institutions disseminate research findings through press releases, which are usually written by public information officers. For instance, the American Association for the Advancement of Science has an online service called EurekAlert! (http://www.eurekalert.org/aboutus.php), which disseminates research conducted in many scientific institutions worldwide:

> EurekAlert! provides a central place through which universities, medical centers, journals, government agencies, corporations and other organizations engaged in research can bring their news to the media. EurekAlert! also offers its news and resources to the public. EurekAlert! features news and resources focused on all areas of science, medicine and technology. (About EurekAlert!, para. 1)

Scientific institutions in Ghana without public information officers should consider hiring some to aid research translation for journalists. Doing so might help journalists to receive research findings in easy-to-understand terms.

In interpreting the motivational factor "more support and encouragement from employer," one must be cautious because the support may not necessarily be financial support, but rather may be encouragement and recognition from editors who eventually accept or reject science stories reported by journalists. Gmanyami, a journalist who is assigned to health and science beat of a newspaper in Accra, Ghana, says one main reason for the low coverage of science in Ghana is that editors often say science doesn't sell papers (J. Gmanyami, personal communication, January 21, 2010). Some studies in

the United States have indicated that editors are barriers to science reporting. Dennis and McCartney (1979) provided the following comment from an interview with a science reporter working for a metropolitan newspaper in the United States:

> Educate editors. They are irresponsible and derelict in their duty to the American people. They like to scare the public with half-fact and wrong information to attract readership. They neglect to present the steady continuing story of say, aviation, which is important to everyone. They waste news space on junk. . . . (p. 14)

The tendency for editors not to include much science coverage might be because they lack training in science or science journalism, just like many reporters. A qualitative study of 25 English-speaking science journalists in Canada lends credence to this idea (Ward & Jandciu, 2008):

> Another respondent, who is now an editor, thought back to her days as a reporter when discussing the need for editor training:
>
> 'I think we're in an era where a lot of editors are in a generation that's not very scientifically literate. . . . They may try to send you off in an angle that's kind of ridiculous.' (p. 15)

Another surprising finding of my study was that relieving journalists from reporting non-science stories was not rated highly as a motivation for reporting science. This finding may have an implication in journalism training. Given that journalists in Ghana may not want to give up reporting non-science stories, an attempt at introducing science journalism as an elective course or a degree program may not be ideal for

Ghana. If science journalism is introduced as a core course, all journalism students may benefit from it. After graduation, the journalists may decide to report only science or combine science reporting with other beats.

In this study, many journalists did not rate highly the motivational factor "awards and prizes for me as an individual" (mean rating 2.70). Many factors may account for this finding. First, the journalists may not be aware of the many science journalism awards or fellowships in Africa and the developed world. These awards and fellowships include Siemens Profile Awards, the American Association for the Advancement of Science (AAAS)'s science journalism award for reporting science news to children, the International Development Research Centre (IDRC)'s science journalism award, and the Massachusetts Institute of Technology's Knight Science Journalism Fellowship Program. For instance, despite many media organizations in Ghana, only four have taken part in the Siemens Profile Awards competition since 2004 (D. de Wet, personal communication, August 3, 2010). So far a Ghanaian journalist has won two Siemens Profile awards. Second, journalists in Ghana may hesitate to compete for such science journalism awards because they think their science stories might not be good enough. Perhaps, journalism training institutions that may introduce science journalism courses need to consider selecting winning stories from such competitions as models for quality science reporting. Third, journalists in Ghana might not know the benefits of winning individual awards or prizes in science journalism, such as the opportunities for more training, attending workshops, and networking with experienced science journalists. Finally, journalists in Ghana may not consider winning individual awards in

science journalism as contributing to career advancement. Given that many respondents rated highly the motivational factor "help with advancement of my own career," perhaps Ghanaian journalists need to be taught other ways of advancing their careers, including winning science journalism awards.

Ghanaian journalists might consider emulating Anas Aremeyaw Anas, an investigative journalist from Ghana, who has won many international awards, but mainly in human rights-related features. When President Obama visited Ghana, he praised Anas (The White House Office of the Press Secretary, 2009):

> Now, time and again, Ghanaians have chosen constitutional rule over autocracy, and shown a democratic spirit that allows the energy of your people to break through. . . . We see that spirit in courageous journalists like Anas Aremeyaw Anas, who risked his life to report the truth. (Remarks by the President, para. 23)

In June 2010, Anas won the Excellence in Journalism Award's Community Reporting category. This award was given by the Global Health Council. A press release announcing the award stated (Global Health Council, 2010):

> Mr. Anas won the award for going undercover as a mental patient in Accra Psychiatric hospital [*sic*] to expose nurses neglecting and abusing patients. He captured on video the staff selling cocaine, heroin and cannabis to patients. This included investigative work across four countries—South Africa, Burkina Faso, Ghana and Sweden—where Mr. Anas brought to light significant issues related to mental health. As a result, the Ghanaian health minister set up a committee to

> probe these revelations which led to calls for the passage of Ghana's Mental Health Bill. (Crusading Ghanaian Journalist, para. 4)

When Anas was asked about his motivation for the story, he remarked (Undercover for Change, 2010): "For me it's about people's stories, about stories that affect my grandmum in the house, stories that affect every single person" (What drives you?, para. 1).

This study presented only nine motivational factors for journalists to choose from, and there was not the option of listing others. Thus, other motivational factors may also exist. Such factors may include the desire to help humanity (for example, as mentioned by Anas), having time to report science feature stories, and having financial resources for travel (as noted by Obeng-Quaidoo, 1988). These topics are worthy of further research.

Barriers to Science Reporting

To explore what is stopping the journalists from reporting science more**,** the respondents were asked to select one or more of 13 items I considered as possible barriers to science reporting. Additionally, the respondents could list any barrier not found on the list. Nearly half of the respondents (67 of 140 or 47.9 percent) selected "I am already involved enough." At least one main reason could account for this finding. Respondents might have considered that item a socially acceptable answer. In particular, some respondents who inserted their informed consent forms (with their names) into the envelope that contained the questionnaire even though the two were supposed to be

returned in different envelopes might have wanted to impress me. I could not substantiate this speculation because, as explained in chapter three, in such cases, I removed the consent forms and put all of them in one parcel.

The second most commonly cited barrier to science reporting was "I do not have the training needed to report on science" (57 of 140 or 40.7 percent). This finding confirms the highly rated motivational factor to report science "receipt of (more) training in science journalism." Two barriers, "I do not have the contact information of scientific researchers" and "I am too busy with non-science stories," were tied for third place (33.6 percent). Thus, it could be inferred that in addition to easy availability of science research findings, respondents wanted to have the contact information of scientific researchers to facilitate reporter-source interaction. This finding resembles one from a qualitative study among three science journalists and three scientists in Australia (Reed, 2001), which led to this recommendation:

> Perhaps the most concrete proposal to advance science reporting was the establishment of a central national 'meeting point' or clearing house where scientists would register their names and expertise. This would not be simply a paper database but would include a 'hot line' which could be promoted to all journalists, especially news journalists. (p. 294)

In the United States, one model for helping journalists to get scientists to interview was the Media Resource Service (MediaResource) of the scientific research society Sigma Xi. MediaResource, which was started in 1980 as a program of the Scientists Institute for Public Information, drew on a database of more than 30,000

experts in science and technology who agreed to provide information to the media (Gastel, 2005). The experts were selected based on recommendations from professional societies, fellow scientists, and a survey of the scientific literature. Foundations, media organizations, and some corporations funded the service. Between 1988 and 1999, of the calls made to MediaResource, many inquiries related to medicine and health, and the greatest percentage of calls came from journalists working for newspapers, according to Fred Jerome (1990), a former director of MediaResource. Jerome has noted that projects similar to the MediaResource have been established in Canada and England. A similar model in Ghana might help journalists to call experts for interviews. But Jerome (1990) advised:

> Each nation, of course, has its own particular conditions to which any MRS [Media Resource Service]-type operation would have to be adapted. . . . But the fundamental principle applies: as technology expands, so too does the need for public information [on science and technology]. (p. 39)

Charles Blackburn, the communications manager of Sigma Xi, has noted that, in part because the Internet aids interactions between journalists and scientists, MediaResource has been discontinued (C. Blackburn, personal communication, August 3, 2010).

Although a third of the journalists had been practicing for less than 5 years, only 5 percent chose “I am too junior” and only 9 percent chose "I do not have the confidence" as barriers to science reporting. This finding suggests that being young or lacking confidence may not influence science reporting. In addition, because many respondents (30 percent) chose the barrier “There is no senior level support,” it was a

surprise that few chose “I am too junior” as a barrier to science reporting. Two main factors may account for this finding. First, perhaps younger respondents chose to give more socially acceptable responses to avoid being considered as incompetent in science reporting. Second, whereas I intended being "too junior" to mean having too little experience, some respondents might have interpreted being "too junior" differently. For instance, some might have understood it to mean their age, level of responsibility, level of confidence, or job title. Future research should make it clearer the statement "I am too junior."

Many respondents chose "I am too busy with non-science stories" as a barrier to science reporting. This finding was surprising given that many journalists did not highly rate "relief from reporting from non-science stories" as a motivation to cover science. It could be said that Ghanaian journalists would like to eat their cake and have it too.

Many respondents chose "the public doesn’t understand science" or "there is no senior level support" (32.9 percent and 30 percent, respectively) as barriers to science reporting. These findings are consistent with the widespread observation that both the audience and media organizations may influence science reporting.

Moreover, 22.9 percent of the 140 respondents chose "there is no benefit or recognition" as a barrier to science reporting. Given that many respondents did not highly rate personal awards or prizes or awards for their employers as motivational factors for science reporting, at least two factors may account for many respondents choosing "there is no benefit or recognition" as a barrier to science reporting. First, respondents may not consider personal awards or prizes as recognition or benefits, but

may consider respect shown to them by their employers or personal satisfaction as rewards for their work. Second, the salaries of journalists in Ghana are generally low compared with those of their counterparts in Zambia (Kasoma, 2007). It may be for this reason many reporters choose to report more on politics or sports, as one respondent commented in the earlier chapter: "It looks as if more journalists, have their attention shifted to sports reporting. We are in an era of survival of the fittest. These journalists are into sports and political reporting where they can improve upon their finances."

The Future of Science Journalism in Ghana

Respondents were asked: "In the next 10 years, how would you like the amount of science reporting to compare with the amount today?" They were given the options *equal, less than it is today, more than it is today,* and *don't know* to answer the question. Most (80.8 percent) chose *more than it is today*.

Respondents were asked to give reasons for their response to the question. In addition, respondents were asked to provide comments, if any, on the status of science journalism in Ghana. Both the reasons the respondents gave for the amount of science journalism to be *more than it is today* or *be equal* and comments on the status of science journalism were content analyzed together. Many themes emerged. The four dominant reasons that respondents said the amount of science journalism should *be equal* or be *more than it is today* in the next 10 years were (a) to promote public literacy in science, (b) because science is for development, (c) because science improves health and fights diseases, and (d) to improve science reporting.

Many factors might have influenced respondents to mention these themes. First, a widespread observation exists in Ghana that there is a low level of science literacy among the public. One respondent commented: "If the society is knowledgeable on topics like earthquake, people will not be scared by common text messages on impending earthquake." Second, journalism training in Ghana may be rooted in development journalism. As noted in chapter two of this thesis, development journalism, in part, involves reporting on poverty-related issues and has a particular emphasis on rural communities (Shah, 1990). Thus, many respondents might have considered the need to increase the amount of science reporting because science is needed for developing Ghana. Third, many donor agencies have been involved in training journalists in Ghana (Kefewo, 2006; Schiffrin, 2010). Thus, these agencies might have inculcated into the journalists the idea of using the media to develop Ghana. Fourth, the National Media Commission's *Handbook on Broadcasting Standards* calls on journalists to promote national development. Some respondents who are familiar with this policy document might have considered the need to promote science journalism to develop Ghana. Fifth, respondents might have favored increasing science reporting in the future to promote health because health is a major component of development. One respondent noted: "The development of good health and a better environment depends on an improved science programmes and [science] stories in our reportage." Finally, some respondents indicated that as more journalists specialize in science reporting in the next decade, its practice would improve.

Regarding the comments on the status of science journalism, among the nine themes identified, four were prominent: (a) the status of science journalism is low, (b) science journalism needs improvement, (c) there is too much sports or political reporting, and (d) there is a need to train more journalists. The perceived low status of science journalism may be because it is not taught in journalism institutions. Moreover, it seems likely that journalism institutions responsible for training and regulation have not done much to improve science journalism in Ghana. For instance, whereas the National Media Commission (2000) has a published book titled *Guidelines for Political Reporting*, there is no equivalent for science reporting in Ghana. A book on science reporting may be needed to help journalism students and graduates to get basic understanding of this beat and further improve its reportage in Ghana. Although the Ghana Journalists Association has "Best Reporter on Health" award as one of its prizes in the annual journalism awards, there should be similar awards for other areas of science and technology coverage including agriculture and engineering. This may help generate interest in reporting on other science fields.

Not surprisingly, many respondents indicated that journalists need training in science reporting. Such training ought to focus on a wide range of topics related to science and technology so that graduates would be able to report on different areas of science. The United Nations Education, Scientific and Cultural Organization (UNESCO) and the African Union Commission signed a-three-year agreement in July 2009 to develop centers of excellence in science and technology journalism. Therefore, Ghanaian journalism training institutions should explore avenues for tapping the

expertise of international journalism institutions to develop science and technology journalism. Also, to develop science journalism courses in Ghana, journalism training institutions should consider consulting relevant stakeholders such as the Council for Scientific and Industrial Research (CSIR), the Ghana Academy of Arts and Sciences, the Ghana Journalists Association, and the National Media Commission. Such training should take into consideration the current and future scientific needs of Ghana. One respondent commented on training: "Journalists should be given adequate training and be made aware of the importance of science to the present and future of Ghana."

CHAPTER VI

CONCLUSIONS

This study has shed light on science journalism from the perspectives of journalists in Ghana, a developing country where general reporters abound but science reporters per se are scarce. This chapter has five main objectives: (a) to provide a re-cap of the rationale and method of the study, (b) to summarize the study's main findings, (c) to make recommendations on science journalism for Ghana, (d) to discuss the limitations of the study, and (e) to point out areas for future research.

Re-cap of Rationale and Method of the Study

This study assessed science journalism from the perspectives of journalists in Ghana. The study sought to identify (a) some demographic and professional characteristics of journalists in Ghana, (b) sources used for reporting science, (c) the number of science stories and the topics of science stories, and (d) the motivators and barriers that influence science reporting in Ghana. Furthermore, the study determined the current status of science journalism and how journalists would like the amount of science reporting to be in Ghana in the next 10 years.

Many studies of science journalism in Western countries are from the perspectives of science journalists, but this study had general reporters as the respondents. General reporters were used because in Ghana science journalists per se are scarce and so most journalists cover science as part of other beats. The study was

conceived mainly because science journalism in Africa has not received much attention from scholars, but science journalism is needed for a nation's development. In addition, science journalism promotes public understanding of, and engagement with, science. Thus, studies on science journalism are needed to identify how the groups involved in science journalism—including journalists, scientists, policymakers, and the general public—affect the practice. The opportunities and challenges that influence science journalism practice also need to be investigated.

The study involved a comprehensive survey of the active members of the Ghana Journalists Association who work in Accra, the capital of Ghana. A 21-item self-administered questionnaire was used. In total, 300 members (75 percent of the total 400) received the questionnaires. They were distributed in worksite visits by the author or through leaving some questionnaires at a central location. A total of 151 journalists returned the questionnaires (50.3 percent response rate). A few respondents did not answer some of the questions.

Summary of Key Findings

This study has key findings that relate to demographic and other characteristics of journalists; sources used for reporting science; the number of science stories and topics of science reporting; the motivators for, and barriers to, science reporting; and the future of science journalism in Ghana.

(a) Regarding demographic and other characteristics, this study found that there were more male than female journalists in Ghana, with men forming 62.1 percent of the

respondents. The highest educational qualification in journalism obtained by most of the respondents was diploma, a qualification similar to a US associate's degree. More respondents worked for newspapers than any other medium, and many worked for more than one mass medium. The state-owned media employed slightly more than half of the respondents (78 of 141).

(b) Regarding information sources for science stories, most respondents perceived health professionals as a very important source. This study found that the more a source was deemed important by a journalist, the higher the likelihood of the source being interviewed. Thus, because health professionals were perceived as very important source, most respondents interviewed them more than any other listed source. Few journalists said they initiated contact with staff of science journals, whereas many did with scientists, health professionals, and consumers. Many journalists said scientists provided technical information. They also said health professionals provided easy-to-understand information. Many respondents said consumers were willing to help. Many said staff of non-governmental organizations seemed unwilling to help.

(c) Respondents indicated that they reported more science news stories than science feature stories within the past 12 months. Surprisingly, of those journalists who said they reported seven or more feature stories within the past 12 months, the proportion of those having less than 5 years of experience was higher than that of those having more 15 years experience. There was an inverse correlation between years of experience and the number of science feature stories respondents said they reported.

When asked to indicate their current areas of reporting interest from a list of topics, many respondents chose the health sciences.

(d) When asked to rate the importance of nine motivational factors that could influence journalists to report science more, many journalists rated highly "receipt of (more) training in science journalism" and "easy availability of science research findings." Few selected "increase in my own income" or "relief from reporting non-science stories." When asked to select from a list of factors that may stop them from reporting science more, many journalists chose "I am already involved enough," "I do not have the training needed to report on science," "I am too busy with non-science stories," or "I do not have the contact information of scientific researchers." Given that few journalists chose "relief from reporting non-science stories" as a motivation to report science more, it was surprising that many said being busy with reporting non-science stories was stopping them from reporting more science. Thus, journalists in Ghana would like to eat their cake and have it too.

(e) Many journalists said they wanted the amount of science journalism to increase in the next 10 years in Ghana. When prompted, they gave reasons and commented on the status of science journalism. When the reasons and the comments were analyzed, several themes emerged. Two main reasons the journalists gave were that science journalism was needed for public literacy in science and science was needed for development. Many journalists said the status of science journalism in Ghana was low and that there was need for improvement in science journalism.

Recommendations on Science Journalism in Ghana

Based on the findings of this study, my main recommendations for science journalism in Ghana regard training, accessibility of science research findings, and availability of contact information of scientific researchers.

Training

First, journalism institutions in Ghana should consider introducing science journalism as part of their curricula. The science journalism curricula should be developed and offered in consultation with relevant stakeholders, such as the Council for Scientific and Industrial Research, the Ghana Academy of Arts and Sciences, the Ghana Journalists Association, and the National Media Commission. However, instead of offering science journalism instruction as certificate, diploma, or degree program, as is available in many European countries and the United States, for Ghana it may be advisable to introduce it as a core course or subject. The main reason is that offering the instruction as a core course may help many journalists to get the skills for reporting science.

Second, media institutions should consider encouraging their staff—both young and experienced journalists—to attend seminars or workshops on science journalism. Topics of the training should include statistics, scientist-media relationships, and accessing and evaluating scientific information on the Web. There are four main reasons for this recommendation. First, this study found that few journalists had received training in reporting statistics. Because many scientific reports involve numbers, training

in statistics may be important to help journalists interpret and report accurate numerical values. Second, many journalists indicated an interest in reporting the health sciences. During disease outbreaks, having a grasp of reporting statistics may be necessary. Perhaps, there should also be instruction in epidemiology. Third, the current findings suggest a lack of good interaction with scientists; hence there seems to be a need for training in science-media relationships. Fourth, given the increasing availability of scientific information produced by individuals and institutions for the Web, it may be necessary for journalists in Ghana to understand the strategies for distinguishing good information from bad.

Finally, the findings suggest that the journalists lack training in reporting agriculture and basic sciences such as biology, chemistry, and physics. Organizations such as the Ghana Academy of Arts and Sciences and the Council for Scientific and Industrial Research should consider engaging with journalism training institutions and media organizations to promote interest in science reporting.

Many journalists said that scientists provided them with technical information, but few said scientists provided easy-to-understand information when contacted. Thus, scientific institutions should consider organizing media workshops for scientists so they could effectively communicate with journalists in non-technical or easy-to-understand language. Organizers should consider such topics as techniques for presenting science to the public or journalists, ethics of science reporting, and editing science for the public and specialists.

Existing books on science journalism should be more available in Ghana. Journalism students and professionals should be directed to openly accessible books or publications on science journalism, particularly the one developed by the World Federation of Science Journalists (http://www.wfsj.org/course/en/).

Finally, a book on science reporting should be published to aid science journalism training in Ghana. Such a book should include model articles that have won science journalism awards locally or internationally to promote quality science reporting in Ghana.

Easy Access to Science Research Findings

When asked to rate the importance of some motivational factors that may influence science reporting, many journalists highly rated "easy accessibility to science research findings" Scientific research institutions should consider making their published research findings more readily available and accessible to the media. To do this, public information officers, if available, should be tasked to translate research findings into easy-to-understand information or press releases to distribute to media houses. Such information should include contact information of scientists who would be ready to speak with journalists on the findings.

In the United States, the American Association for the Advancement of Science (AAAS) has online service called EurekAlert! (http://www.eurekalert.org/aboutus.php). This online resource features news releases on science and technology from universities, medical centers, journals, government agencies, corporations and other organizations

engaged in research in the United States and elsewhere. Local scientific institutions without public information officers should consider hiring some to aid translation of local research for journalists. Institutions with similar research areas could possibly share public information officers.

Finally, state-owned media organizations with access to the Internet should consider registering with HINARI, a project that provides free online access to some health and biomedical journals for non-profit institutions or state-owned organizations in developing countries (http://www.who.int/hinari/en/).

Finally, the Ghana Science Association (GSA), somewhat analogous to the American Association for the Advancement of Science, should consider providing active outreach to journalists. Moreover, the GSA should train scientists to interact more effectively with the Ghanaian media. The outreach and the training programs are likely to help journalists to easily access and understand science research findings.

Contact Information of Scientists and Journalists

Many journalists chose "I do not have the contact information of scientific researchers" when asked to select from a list of potential barriers to science reporting. Thus, a database of scientists with their contact information and the areas of expertise should be developed for media organizations in Ghana. This model may be similar to MediaResource in the United States, a service that had more than 30,000 experts ready to speak with the media on scientific matters. Conversely, a database of the names and

contact information of journalists interested in science reporting should be developed and made available to scientists to aid in journalist-media interactions.

Limitations of the Study

This study has some limitations.

(a) The study population was small for several reasons. First, because of cost and time constraints, I was able to survey only members of the Ghana Journalists Association (GJA) who work in Accra, the capital of Ghana. Because I could not obtain the full lists and contact information of the GJA members who work there, only 300 (75 percent) of the target population received the questionnaire. Second, the timing of the data collection was sub-optimal: It occurred when many GJA members furthering their education were taking examinations at the Ghana Institute of Journalism and therefore did not take part in the study. Finally, of the 300 who received the questionnaires, 151 returned them (50.3 percent response rate). Also, a few respondents did not answer all the questions. At least two main reasons may account for the response rate of 50.3 percent. First, the title of the survey—Science Journalism in Ghana: A Study of Journalists Who Cover Science—might have discouraged GJA members in Accra who felt they did not report science from completing it. In the future, perhaps such a study of general reporters should not have the qualifier—"who cover science." Second, respondents were more familiar with oral informed consent than written consent. Because my study required written informed consent, some might have chosen not to take part. In future, unwritten informed consent should be explored in circumstances.

Given the limitations noted, care should be exercised when generalizing the findings of this study to the members of the Ghana Journalists Association and other journalists in Ghana. This is because the respondents might not be representative.

(b) The findings may be limited by respondents' tendency to provide socially desirable answers. To encourage confidentiality, respondents received two envelopes: one for the questionnaire and the other for the written informed consent form. Many respondents chose to put the consent form and the completed questionnaire in one envelope. I removed all such informed consent forms to prevent me from knowing the identity of the respondents, but some respondents might have been motivated to provide socially acceptable answers.

(c) This study provided to the respondents some topics of science likely to be of reporting interest to them. Respondents could list other topics of interest to them. Environment was not one of the provided topics but was listed by seven respondents. Had environment been provided as a category, more journalists might have selected it.

(d) The questionnaire listed only human sources of information for science reporting. However, respondents could list any other sources. One respondent mentioned a non-human source: Web sites. This study might have underestimated sources not listed, including books, journals, and other experts.

(e) Respondents who interviewed any source within the past 12 months were asked to describe who initiated latest contact with the source. Such respondents were also asked to characterize the latest contact with a source. I did not envisage possible contacts with sources other than through interview. However, some respondents who did

not interview any source went on to describe who initiated the contact and to characterize the interaction. Some respondents who did not interview a source might have had other contact with the sources. Such contact might include e-mail messages or phone calls.

(f) This study relied on recall of the respondents, particularly on the number of science news stories and science features that they prepared within the past 12 months. Some of the responses might have been inaccurate because of the time lapse.

(g) The questionnaire asked respondents to provide comments. For the analyses of the comments, I was the only coder. I did not calculate intracoder reliability. In future, attempts should be made to do so in order to make conclusions from the comments more reliable.

Areas for Future Research

This study assessed science reporting from the perspectives of general reporters in Accra, Ghana. Based on its findings and limitations, the following areas for future research should be considered.

(a) A comprehensive survey of journalists in Ghana on science reporting should be considered. The findings from such a study are likely to be representative of journalists in Ghana.

(b) Science journalism in Ghana should be assessed from the perspectives of the wider range of sources likely to be used to generate science stories. Other human sources including engineers and politicians should be assessed. Also, written sources such as

books, Internet, scientific journals, press releases, and other publications should be assessed.

(c) I relied on self-reports of journalists to assess science journalism. To provide a more complete view of science journalism in Ghana, other methods also should be used. These methods might include content analyses, ethnographic studies, and key informant interviews.

(d) Future studies should determine the amount of time and resources devoted to reporting science by journalists and their media organizations. Perhaps time, resources, and economics may influence science reporting in Ghana.

(e) Finally, there should be multi-country studies on science journalism among Ghana and other African countries or Western countries to find broader patterns. Such studies may help determine whether collaborative training programs would be advisable.

This study contributes to research in science journalism because it utilizes perspectives of general reporters in a resource-constrained setting. It identifies potential motivations for, and barriers to, science reporting in Ghana. As more is done to promote science journalism in Ghana, another rumor of an impending earthquake may be unlikely to send Ghanaians to open places away from the comfort of their homes.

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APPENDIX A

QUESTIONNAIRE

QUESTIONNAIRE

SCIENCE JOURNALISM IN GHANA: A STUDY OF JOURNALISTS WHO COVER SCIENCE

BERNARD APPIAH
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JANUARY, 2010

SCIENCE JOURNALISM IN GHANA :
A STUDY OF JOURNALISTS WHO COVER SCIENCE

There are a total of **23** questions. Kindly respond to the questions below. For most of the questions, you would have to circle the appropriate numbers (from 1 to 4).

1. How would you rate the importance of EACH of the following as sources for getting ideas for reporting science (including health and agriculture) stories?

Please rate the importance on a scale of 1 to 4, where 1 is not important at all and 4 is very important

(Circle ONE number on each line)

	Not important at all	Neither important nor unimportant	Quite important	Very important
a. Consumers	1	2	3	4
b. Scientists	1	2	3	4
c. Staff of non-governmental organizations	1	2	3	4
d. Staff of science journals	1	2	3	4
e. Public information officers	1	2	3	4
f. Health professionals (e.g., doctors, nurses, pharmacists)	1	2	3	4
g. Traditional or alternative medical practitioners (e.g., herbalists)	1	2	3	4
h. Staff of industry or business community	1	2	3	4
i. Other (Please specify).....	1	2	3	4

2. Thinking about reporting about science, roughly how many times in the past 12 months have you interviewed each of the following?

(Circle ONE number on each line)

	None	1-5 times	6-10 times	More than 10 times
a. Consumers	1	2	3	4
b. Scientists	1	2	3	4
c. Staff of non-governmental organizations	1	2	3	4
d. Staff of science journals	1	2	3	4
e. Public information officers	1	2	3	4
f. Health professionals (e.g., doctors, nurses, pharmacists)	1	2	3	4
g. Traditional or alternative medical practitioners (e.g., herbalists)	1	2	3	4
h. Staff of industry or business community	1	2	3	4
i. Other (Please specify)	1	2	3	4

If you have not interviewed any of the above, go to question 5.

3. In each of the above, were you the one who initiated the LATEST contact?

(Circle ONE number on each line where applicable)

	Yes	No
a. Consumers	1	2
b. Scientists	1	2
c. Staff of non-governmental organizations	1	2
d. Staff of science journals	1	2
e. Public information officers	1	2
f. Health professionals (e.g., doctors, nurses, pharmacists)	1	2
g. Traditional or alternative medical practitioners (e.g., herbalists)	1	2
h. Staff of industry or business community	1	2
i. Other (Please specify)	1	2

4. How would you describe your last encounter with the source?

(Circle ALL that apply)

	Source seemed willing to help.	Source seemed unwilling to help.	Source provided technical information.	Source provided easy-to-understand information.	Source treated me with respect.	Source did not treat me with respect.
a. Consumers	1	2	3	4	5	6
b. Scientists	1	2	3	4	5	6
c. Staff of non-governmental organizations	1	2	3	4	5	6
d. Staff of science journals	1	2	3	4	5	6
e. Public information officers	1	2	3	4	5	6
f. Health professionals (e.g., doctors, nurses, pharmacists)	1	2	3	4	5	6
g. Traditional or alternative medical practitioners (e.g., herbalists)	1	2	3	4	5	6
h. Staff of industry or business community	1	2	3	4	5	6
i. Other (Please specify).....	1	2	3	4	5	6

5. Roughly how many science news and science feature stories did you report in the past 12 months?

(Circle ONE number on each line)

	None	1-6	7-12	13-20	21-30	More than 30
a. Science News Stories	1	2	3	4	5	6
b. Science Feature Stories	1	2	3	4	5	6

6. In relation to your journalism duties, how important is it to you that you find time to report science?

(Circle ONLY one number)

Not important at all	Neither important nor Unimportant	Quiet important	Very important
1	2	3	4

7. How will you rate the importance of the reasons below as a motivation for you to get more involved in reporting science?

Please rate importance on a scale of 1 to 4, where 1 is not important at all and 4 is very important.

(Circle ONE number on each line)

	Not important at all	Neither important nor Unimportant	Quite important	Very important
a. More support and encouragement from employer	1	2	3	4
b. Awards and prizes for me as an individual	1	2	3	4
c. Recognition of my employer by an award or prize	1	2	3	4
d. Help with advancement of my own career	1	2	3	4
e. Relief from reporting non-science stories	1	2	3	4
f. Profitability to my employer	1	2	3	4
g. Increase in my own income	1	2	3	4
h. Easy availability of science research findings	1	2	3	4
i. Receipt of (more) training in science reporting	1	2	3	4

8. What, if anything, is stopping you from getting involved (or more involved) in reporting science?
(Circle ALL that apply)

a. I am already involved enough.	1
b. I just don't want to report on science.	2
c. I am too junior.	3
d. The public doesn't want to know about science.	4
e. The public doesn't understand science.	5
f. I do not have the training needed to report on science.	6
g. There is no senior level support.	7
h. I do not have the contact information of scientific researchers.	8
i. There is no benefit or recognition.	9
j. I do not have the confidence.	10
k. I am too busy with non-science stories.	11
l. I have had one or more bad experiences with scientists.	12
m. Other (Please specify)	13

9. Apart from the Ghana Journalists Association, indicate any other professional group or association that you are a member of.
(Circle ALL that apply)

a. None	1
b. Health Communication Institute	2
c. Ghana Association of Science Journalists and Communicators	3
d. African Media and Malaria Research Network	4
e. Environmental Club of Journalists Ghana	5
f. Other (Please specify)	6

10. In the next 10 years, how would you like the amount of science reporting to compare with the amount in Ghana today?

(Circle ONLY one number)

a. Equal	1
b. Less than it is today	2
c. More than it is today	3
d. Don't know	4

11. Kindly give the reason(s) for your choice in question 10 above.

12. Other comments, if any, on the status of science journalism in Ghana?

In order for me to understand the views of different types of respondents, let me know something about yourself. All replies will be treated in the strictest confidence.

13. Which of these best describes the number of years you have practiced as a journalist?
(Circle ONLY one number)

Less than 5 years	5-10 years	11-15 years	More than 15 years
1	2	3	4

14. Which of these best describes your age (in years)?

(Circle ONLY one number)

Less than 20 years	20-30 years	31-40 years	41-50 years	More than 50 years
1	2	3	4	5

15. What is your current working status in journalism?

(Circle ALL that apply)

Unemployed	Freelance	Working part-time (<40 hours per week)	Full-time (≥40 hours per week)
1	2	3	4

If you selected unemployed only, go to question 17.

16. Which sector are you employed in?

(Circle ALL that apply)

Freelance	State-owned media	Private-owned media
1	2	3

17. From the list below, which discipline(s) most closely describe(s) your current area(s) of science reporting interest?

(Circle ALL that apply)

a. None	1
b. Health sciences	2
c. Agricultural sciences	3
d. Basic sciences (e.g. physics, chemistry, biology)	4
e. Computer sciences and information and communication technology (ICT)	5
f. Other (Please specify)	6

18. Which of these best describe(s) your area(s) of practice?

(Circle ALL that apply)

a. Newspaper	1
b. Magazine	2
c. Radio	3
d. Television	4
e. Internet	5
f. Other (Please specify)	6

19. Do you have a degree or diploma in any science field, including the health profession?

(Circle ONLY one number)

Yes	No
1	2

20. Which of these best describes your highest journalism educational level?

(Circle ONLY one number)

a. No journalism education	1
b. Diploma	2
c. First degree	3
d. Postgraduate education	4
e. Other (Please specify)	5

22. What was the format of the training in science reporting?

(Circle ONE number on each line where applicable)

	A course or subject taught in School	A diploma or degree program	A certificate course after graduation	A workshop or seminar after graduation	Other (Please specify)
a. Interviewing Scientists	1	2	3	4	5
b. Drug safety Reporting	1	2	3	4	5
c. Health Reporting	1	2	3	4	5
d. Agricultural reporting	1	2	3	4	5
f. Aviation reporting	1	2	3	4	5
g. Interpreting/ reporting statistics	1	2	3	4	5
h. Environmental Reporting	1	2	3	4	5
I. Other (Please specify).....	1	2	3	4	5

23. What is your gender?

(Circle ONLY one number)

Male	Female
1	2

Thank you for participating in the study.

Bernard Appiah

Master's student in science and technology journalism, Texas A&M University, USA

APPENDIX B

CODING SCHEDULE FOR COMMENTS ON SCIENCE JOURNALISM IN GHANA

I. Themes of reasons respondents stated (Question 11) for choosing "Equal" or "More than it is today" in response to question 10, *"In the next 10 years, how would you like the amount of science reporting with the amount in Ghana today?"*

1. To promote public literacy in science (see subcategory list)
    - (a) To make public understand science
    - (b) Because the public lacks knowledge in science
    - (c) The public needs to be enlightened on science
    - (d) To educate the public on science
    - (e) Science reporting can help explain science to the public
    - (f) To make science more known to the public
    - (g) To create awareness about science
    - (h) For the public to know the usefulness of science

2. Science is for development (see subcategory list)
    - (a) For development of Ghana
    - (b) For advancement of Ghana
    - (c) Science helps a nation to progress

3. There is increased interest in science

4. Because of increase in information communication and technology

5. Science improves health and fight diseases

6. To encourage more journalists to report science

7. To enlighten the government/policymakers

8. To improve science reporting

9. To minimize/eliminate superstitious beliefs

II. Themes of respondents' comments on the status of science journalism in Ghana

10. Lack of adequate support for science

11. Science is "touted" as too technical

12. Science journalism is relatively new and not popular

13. Science journalism needs improvement (see subcategory list)
    (a) More needs to be done
    (b) It needs to be revamped
    (c) It needs specialization
    (d) More journalists should go into science reporting

14. Scientists are not friendly to media

15. Status of science journalism is low or poor (see subcategory list)
    (a) Status is low or poor
    (b) "Not encouraging"
    (c) "Not impressive"
    (d) Access to science information bad
    (e) Science reporting is poorly done
    (f) Lack of training in science journalism
    (g) Don't hear about science journalism
    (h) Science journalism is underdeveloped
    (i) Science journalism is non-existent
    (j) More information about science journalism is needed

16. There is a need to train more journalists

17. There is the need for recognition/encouragement

18. There is too much political/sports reporting

Note. Some comments given in response to question 11 pertained more to Question 12 or vice versa. In those cases, the comments were re-categorized accordingly.

APPENDIX C

INSTITUTIONAL REVIEW BOARD APPROVAL

TEXAS A&M UNIVERSITY
DIVISION OF RESEARCH AND GRADUATE STUDIES - OFFICE OF RESEARCH COMPLIANCE

1186 TAMU, General Services Complex
College Station, TX 77843-1186
750 Agronomy Road, #3500

979.458.1467
FAX 979.862.3176
http://researchcompliance.tamu.edu

Human Subjects Protection Program

Institutional Review Board

DATE: 06-Jan-2010

MEMORANDUM

TO: APPIAH, BERNARD
77843-3578

FROM: Office of Research Compliance
Institutional Review Board

SUBJECT: Initial Review

Protocol Number:	2010-0002
Title:	Science Journalism in Ghana: A Study of Journalists Who Cover Science
Review Category:	Expedited
Approval Period:	06-Jan-2010 **To** 05-Jan-2011

Approval determination was based on the following Code of Federal Regulations:

45 CFR 46.110(b)(1) - Some or all of the research appearing on the list and found by the reviewer (s) to involve no more than minimal risk.

---

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation or quality assurance methodologies.

(Note: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b) (3). This listing refers only to research that is not exempt.)

Provisions:

This research project has been approved for one (1) year. As principal investigator, you assume the following responsibilities

1. **Continuing Review:** The protocol must be renewed each year in order to continue with the research project. A Continuing Review along with required documents must be

submitted 30 days before the end of the approval period. Failure to do so may result in processing delays and/or non-renewal.

2. **Completion Report:** Upon completion of the research project (including data analysis and final written papers), a Completion Report must be submitted to the IRB Office.
3. **Adverse Events:** Adverse events must be reported to the IRB Office immediately.
4. **Amendments:** Changes to the protocol must be requested by submitting an Amendment to the IRB Office for review. The Amendment must be approved by the IRB before being implemented.
5. **Informed Consent:** Information must be presented to enable persons to voluntarily decide whether or not to participate in the research project.

This electronic document provides notification of the review results by the Institutional Review Board.

APPENDIX D

INFORMED CONSENT FORM

CONSENT FORM

SCIENCE JOURNALISM IN GHANA :
A STUDY OF JOURNALISTS WHO COVER SCIENCE

The purpose of this form is to give you information that may affect your decision as to whether to participate in this research study. If you decide to participate in this study, this form will also be used to record your consent.

You have been asked to participate in a research project studying science journalism in Ghana. The purpose of this study is to identify enabling and challenging factors that influence how journalists report science in Ghana. You were selected to be a possible participant because you are a member of the Greater Accra branch of the Ghana Journalists Association.

If you agree to participate in this study, you will be asked to complete a questionnaire, which should take a maximum of 25 minutes to complete.

The risks associated in this study are minimal, and are not greater than risks ordinarily encountered in daily life.

The possible benefits of participation are that it would help in introducing interventions that would promote the practice of science journalism in Ghana. You will receive no direct benefit from participating in this study; however, this study will promote science journalism practice in Ghana.

Your participation is voluntary. You may decide not to participate or to withdraw at any time without your current or future relations with Texas A&M University or the Ghana Journalists Association being affected.

You will receive a pen for participating in the study.

This study is confidential. The records of this study will be kept private. No identifiers linking you to this study will be included in any sort of report that might be published. Research records will be stored securely and only Bernard Appiah will have access to the records.
If you have questions regarding this study, you may contact Bernard Appiah at 0543372054, or bappiah1@neo.tamu.edu.

This research study has been reviewed by the Human Subjects' Protection Program and/or the Institutional Review Board at Texas A&M University. For research-related problems or questions regarding your rights as a research participant, you can contact these offices at (979) 458-4067 or irb@tamu.edu.

Signature

Please be sure you have read the above information, asked questions and received answers to your satisfaction. You will be given a copy of the consent form for your records. By signing this document, you consent to participate in this study.

Signature of Participant: _____ **Date:** _____

Printed Name: _____

Signature of Person Obtaining Consent: _____ **Date:** _____

Printed Name: _____

APPENDIX E

LETTER OF CULTURAL EVALUATION

GHANA INSTITUTE OF JOURNALISM

32nd Gamel Abdul Nasser Road, Osu
P. O. Box GP 667, ACCRA
■ Tel:233-21-228336 ■ Fax: 233-21-221750 ■ E-mail: info@gij.edu.gh ■ Website:www.gij.edu.gh

22nd December, 2009

My Ref No.....

The Office of Research Compliance
750 Agronomy Road, Suite 3501
1186 TAMU
College Station, TX 77843-1186

LETTER OF CULTURAL EVALUATION FOR MR. BERNARD APPIAH'S RESEARCH

I write to lend support to Mr. Bernard Appiah's study among members of the Ghana Greater Accra regional branch of the Ghana Journalists Association (GJA) to identify enabling and challenging factors that influence science journalism in Ghana through a survey.

Bernard's methodology of contacting potential respondents through phone calls is culturally acceptable in Ghana.

Moreover, approaching the potential respondents at their work places with the questionnaires is acceptable in Ghana. It is even more likely to result in higher response rates because potential respondents may see that as a sign of respect.

The research also proposes that each respondent gets a free pen as a gift for participation in the research. This form of compensation will not be coercive to participants because pens are inexpensive and journalists have their own pens anyway.

The format and the language of the consent form is easy to understand. The consent form is therefore unlikely to confuse potential participants. In addition, since the participants will read the consent form in the absence of the researcher, there is adequate privacy for respondents.

Finally, Bernard Appiah's research safeguards the rights of participants by ensuring that their responses will be kept private and that names of respondents will not be identified with their responses. There is freedom of speech in Ghana, so the research is acceptable.

Yours sincerely

DAVID NEWTON
(Rector)

APPENDIX F

SOME PROFESSIONAL ASSOCIATIONS TO WHICH JOURNALISTS IN GHANA BELONG

Professional group	Frequency of citation
Africa Media Network	1
Bilingual Communicators Association	1
Catholic Journalists	1
Child Rights Journalists	1
Economic Journalists Association	1
Federation of Environment Reporters	1
Federation of Environmental Journalists	1
Ghana Bar Association	2
Ghana Watsan Journalists Network	1
Global Water Partnership West Africa Team of Journalists on Water	1
HIV Reporters, Ghana	1
Human Rights Reporters Association	2
Institute of Financial and Economic Journalists	2
Institute of Public Relations	1
International Association of Women in Broadcasting	2
International Confederation of Journalists for Human Rights	1
Journalists Club for Disaster Prevention	1
Journalists for Business Advocacy	1
Journalists for Human Rights	2
Judicial Reporters Association	1
Media Network on HIV/AIDS	2
Network of Communications Reporters	1
Network of Journalists in Sanitation	1
Parliamentary Press Corps	2
PROJAG	1
Scrap Metal Exporters and Dealers Association	1
Sports Writers Association of Ghana	1
UNESCO Communicators Committee	1
Volta River Authority/Public Utilities and Regulatory Commission Press Corps	1
Watsan Journalists Association	2
West Africa Journalists for Peace	1
West African Media Network	1

APPENDIX G

RESPONSES TO QUESTIONS 11 AND 12 ON THE FUTURE OF SCIENCE JOURNALISM IN GHANA

Question-naire Number[1]	Reasons (Question 11)	Comments (Question 12)
1	Because I want science to progress in Ghana	Not impressive
2		
3	The news is usually devoid of science reporting. Therefore its introduction in decent doses would invariably increase the interest of the citizenry in science	I believe this is also virtually non-existent. The need therefore arises to make science necessarily a part of the news. And also the need to specialise in that area
4	Yes, because I think science reporting will be of great help to the whole nation	
5	Increased extensive science reporting is an indication of high journalism standard	Needs extensive encouragement
6	To encourage more journalists to report on health matters	Room for improvement
7		
8	This is because the amount of science reporting at the moment is on a low key and hope for it to improve	
9	We need 2 let public information flow on science. Science is one area that we must enhance on	Some journalists report ignorantly on science which to me mislead the public on science information
10	It is because Ghana being a developing country, science reportage will go a long way to develop the nation	It is not all that developed. More has to be done by government and all stakeholders
11	You would be surprised to know that there are some people in the nations capital who do not know even how to administer paracetamol and other basic drugs found in our first aid boxes in our various homes. 2. More journalists are reluctant to	It looks as if more journalists, have their attention shifted to sports reporting. We are in an era of survival of the fittest. These journalists are into sports and political reporting where they can improve upon their finances

	go into science reporting which seems to impede science reporting	
12	To much information gap on science	
13	It would make the public knowledgeable about the sciences	There is so much room for improvement
14	Because I believe science is life and life is science	
15	Little report have been attached to science reporting. Science is the heart of any country. Therefore it is important for the public to be abreast with issues on science related	Science reporting must be a must in all media houses since the media has a role in educating the masses on issues of importance
16	Now people are getting interested in science stories especially on health, agriculture, and ICT. Journalists, for that matter media organisations, are also looking for speciality.	
17	I believe that by 10 years time, science would have advanced that many people would appreciate science reporting	Science journalism is not that popular as compared to other subjects
18	Science issues are very important to our daily lives. We need scientific guidance in our daily lives as well	It should be encouraged
19		
20	Science helps in reshaping our thoughts and opinions regarding issues	It is not so recognised.
21	Because there is very little on science reporting in the country	Journalists should be motivated to report on science
22	Society should be dynamic and not static	More materials, both financial and otherwise needed
23	Science touches on the core of human development and enables the individual to understand his/her nature and take control of destiny	Science as a subject has been made to look difficult and beyond the comprehension of the average journalist. Science reporting is thus not very diffused.
24	As the society gets more and more educated, they would be able to understand science issues and would therefore consume science stories	Support must be given to journalists going into the area
25	Development revolves around	Not well developed! Everybody wants to

	science and technology and there must be more news about science	write about politics at the expense of other issues
26		
27		
28		
29		
30		
31	I expect totally a paradigm shift in the way science is reported in the next decade to come	
32	In ten years to come, it is my wish that science reporting would be more than what it pertains today	Science reporting must be encouraged
33	Science reporting and scientific discovery would be more advanced where reporting would be more than it is today	
34		
35		
36	This will help educate the public about science in order to understand science and appreciate science reporting	Most people not trained and therefore lack knowledge
37	Important to increase our knowledge on science reporting	Very important area of studies
38	Because a whole lot of diseases and illnesses are plenty so we need more	
39	Science and technology is advancing and is being used in many areas of development. There is need to report more to inform the populace on its benefits and uses	There is little currently on science journalism in Ghana. Journalism training schools should go into the area of science journalism more
40	This will ensure that science-related stories or features are made more accessible to the public and policymakers to educate them on very important scientific issues that affect their daily lives	The state of science journalism in the country, is extremely low and this is affecting interest of the public and policymakers to influence a change in the way scientific issues affect Ghanaians positively
41	This is because with issues bordering on science gaining more importance in our day-to-day life there is the need for more exposure of the Ghanaian populace to scientific knowledge and how it applies to their survival	

42		Introduced as a specialized course in journalism schools
43	I would like to see an improvement in the reporting of science news	
44		
45	Believe that science is as important as other areas	
46	The awareness of science stories in the country is low and the public needs to know more about science	Journalist needs to learn about science report which would enhance their reporting ability. The GJA can organise seminars for reporters
47	Because less is been reported on it today. hoping that more will be reported on science in the future	
48	My choice for answering q10 is due to the fact that Ghana is gradually developing in the area of scientific issues. For instance, the issue of recycling waste is also taking shape	
49	Stories on science should enjoy equal media coverage with social issues	
50	Promote literacy in science	
51	Science reporting must increase so as to whip up the interest of the general public on science- related issues	Perhaps journalism institutions should consider science journalism as a major course and make it interesting
52	Politics has dominated in most media houses. Don't have specialisation, except in sports	
53	Because I don't hear much news and advocacy on science news from the various journalists associations that relates to health issues	
54	I believe it should be intensified looking at the extent to which our health status as a nation is fastly deteriorating	Not encouraging at all. It should be improved.
55	Journalists play a crucial role in informing the public about health issues. And if more health matters are reported in the next years to come, it would conscientize the citizenly in order to live a healthy	

	lifestyle	
56		
57		
58	Comparing the reportage of science and its related issues to that of Ghana, we can realize we have been left behind. If Ghanaian journalists put in more efforts in science reportage within the next 5-10 years, it would be improved and if not at par with the developed countries, at least we can excel in it.	Cannot write home about. Science reporting for me is below standards in Ghana.
59	A lot more attention is needed to give science- related stories to change the orientation of government and the general public towards science and technology	Science journalism unfortunately is restricted to ICT, environmental and health issues with little focus on research findings and its application in industry and agriculture.
60	Since science can explain well things or events like earthquake, Tsunami, and other things that happen the public needs to know how they come about and what measures to take. In short, can help humanity	Science journalism should be promoted more in Ghana
61	Because people now crave for science/health stories. I say this because I receive positive feedback when I carry science/health stories. Again many media houses now have health segments and programmes	
62	The world moves on scientific knowledge. Without science information and education people will continue to believe in superstition even on issues that can be explained scientifically. And as a developing country we need to expand knowledge in science in order to move ahead	There is limitation on reportage and feature, due to its specialised nature. Training of journalists will help increase interests in scientific writings.

63	Science is development	
64	There are very important science issues that we need to report on, particularly so when science is put at the core of good health and development	Science journalism in Ghana today is poor because many journalists lack understanding in the subject while many scientists are not media-friendly.
65	It will enable the public appreciate issues better and eliminate certain traditional and cultural norms or beliefs	
66	There is more information to give to the public through science reporting	Some journalists feel it is a specialized area that calls for specialised training
67	Reporting on science, health, and the environment needs to be boosted if the country is to progress technologically. And increased reporting in the media in collaboration with teaching and learning in schools and colleges will go a long way in achieving the desired progress	Science journalism lacks in Ghana as a result of lack of manpower, resources, and equipment. Also the media is more interested in human interest and political stories to the detriment of science stories.
68		
69	I want to see more science journalists trained as science reporters so that they can report on issues pertaining to science to members of the public.	
70	Media reportage on health, environment, HIV/AIDS, public health etc, have been poor among the journalism fraternity. But as a growing new crop of reporters with science bias emerge, I'm certain coverage would be at par with the rest of the world by 2020	
71	In the next 10 years, issues including climate change, global warming and diseases will assume a more alarming proportion. People in "information poor" countries like Ghana can only avert the situation if they are equipped with relevant information. This can only happen	Extremely dull and unnoticeable. Partly because there's a profound dearth of understanding of science and its related fields.

	if journalists highlight those issues.	
72	We need to understand our environment better	
73	Currently, everything is driven by science. Development to a higher level therefore requires the use of more science in our activities	
74	Science can engender development in any country and science reporting will educate the public to take to science.	
75		
76	Science is an important component of life. Therefore is about time we shift from political reporting to science to give it a balance. If the society is knowledgeable on topics like earthquake, people will not be scared by common text messages on impending earthquake	Science reporting is not as vibrant as environmental, political, and general news
77		
78	People need to know much about science and therefore be able to come to terms with issue of science and its benefits	
79	Yes there should be more science reporting so that people will know the effect of resources and its benefits in help of building a healthy country for a higher development	Yes, this should be considered to bring people close to their health status
80	Science is the basis for development so the more Ghanaians know more about scientific research and development either from abroad or around them, the easy it is for us to embrace them into our daily lives and benefit from them	It is woefully low and seriously needs to be revamped
81	This is because the world is moving towards scientific age	Not aware
82	As a consultant for a health NGO that is into family/reproductive	Routinely reporting science news will not make me a science journalist. One needs to

	health and HIV/AIDS, I have noticed that the media give very little attention to science/health news coverage	have a background in science and then training in journalism/communication studies.
83	Because most of the populace in my country are illiterates and so it becomes very difficult for them to understand basic information about issues especially when pandemic arise.	It must be pushed up a bit more.
84	The science journalist should increase in advance and more than before. They should train some of incoming journalists perfectly	They should try to create some relationship with the new ones and also teach them what they don't know
85	Science education has received much attention lately	
86	To make science more known to Ghanaians to make them appreciate the importance of science	Steady improvement. There is more room for improvement
87	Currently, much is not reported on the sciences. Everything is tilted towards politics and I think there is the need for a change. A lot of diseases is being caused as a result of lack of publicity on science related stories or news	I think it is about time the journalist and journalism institutions introduced specialization on it.
88	Availability of infrastructure and easy access to data	
89	This is because there is the need for the public to create awareness of the subject "science" in Ghanaians in terms of health, technology, and agriculture	
90	I think that encourage others (journalists) to start reporting science so we can educate the public who are or would like to read something on science	I will suggest that if there will be any workshop of the sort, then it should be extensive
91	1. Awareness of the climate change effects and the support to developing countries. 2. The introduction of more sophisticated mobile phones and computers 3. The banking sector is now going more electronic in terms of	

	transactions	
92	Apparently am a degree holder in Agriculture. Aside me being a journalist and there is a lot I studied that are not implemented here in Ghana. The little that I see happening is not up to standard to me. I am hoping the level of reportage in the field of science should or will be more than that of today	
93	Science holds key to development in all spheres	
94	Priority is not given to science journalism in Ghana so giving more than the amount being reported today I think science journalism will make headway	Science journalism is very low with respect to reportage in Ghana. Train journalists who cover around health and environment to be science journalists
95	It will help create much awareness on science and its related matters	Very poor. Should be improved
96	Capacity building of journalists at workshops and programmes to sensitize reporters on science reporters	The status of science journalism in Ghana is improving, but much needs to be done.
97	Room for in-depth analysis of scientific information. Need for skills to be able to break down scientific language to the understanding of readers	Room for improvement
98	This is because as the world advances through technology there is the need to spread the news about what is happening in the science world and also report on new discoveries, both in the health, agriculture, ICT, environmental sectors in order that people would understand emerging diseases among others and change their way of life and also adopt to global changes	Currently reportage on health is not all that broad and lack qualities such as facts. Science journalism is a new area that is developing gradually, but need the encouragement of all to ensure enhanced research for quality output
99	This is to ensure that there is balance in new content in order for the public to know equal more about issues relating to science	

100	It will help to improve health conditions or help to have improved healthy lifestyle and also take our environment serious	They are not too vibrant or active
101	Believe that when more attention is given to science reporting it will have a positive effect on the populace. Again, and informed society will aid eradicate diseases and ignorance hence more needs to be done.	Generally, more needs to be done in the reportage of science issues. I think journalists also needs more training in the field of science
102	Looking at the growth rate of the world in terms of technology, there is the need to get ourselves more involved in science issues before we can be at par with other developed nations	More journalists should be trained basically to write and report about issues on science
103	I would like science reporting to spread in the future because, it enlightens public on issues about science and related issues. For example research works into some diseases	I think science journalism is low Ghana and stakeholders should do well to revamp it
104	Science reporting can help propel the country's development agenda	Not encouraging
105	I think science news are not widely covered or reported because a lot of journalists are not interested due to the perception back in school that the science subjects (studying) was difficult	
106	I want it to be equal because matters bothering on science is vital to all areas	Journalists of today must make it their priority to delve into science oriented stories to keep the general public on their toes.
107	People find science stories as to technical and a "no go area". More reportage on science stories will not only boost interest of other reporters into the field but will also give the ordinary Ghanaian some level of knowledge on the importance of science and its operations	More journalists in Ghana will need frequent trainings in order to be more technical and factual in their reportage. This is not common in Ghana and it's reducing interest in the field. Access to science research findings is also bad
108	Science reporting promotes development by imparting knowledge to the public	Science journalism is not popular nor interesting to many journalists in Ghana

109	Technological advancement is at the centre of the global economic change. Human rights are key to the survival of the democratic dispensation in Ghana and [illegible word] determines the rise and fall of nations and societies	Woefully underdeveloped
110	Our society is completely reliant on information given them by politicians, rather than accurate scientific information on science-related issues. It is therefore critically essential that science reporting is taken a lot more seriously	One other reason the status of science journalism is low in Ghana is that the results are not put to any productive use, hence the lack of encouragement
111	The country's citizens need information on science for accelerated development of the country	I don't have much idea about this in the country. I may rather try and find out more science journalism
112	Because there are a number of issues that we need to have the public to know and be interested in	Needs to be encouraged to have more journalists into it
113	Reportage on science currently is not high. But as Ghana develops and more awareness is created about science, more media personnel will move into the field.	
114	More often than not most of the news item on TV or in the newspapers are all about politics. Even is schools, students are not encouraged to study science courses and this goes a long way to affect the development of the country	It will be very helpful if journalism schools are established in the country to train students to specialize in science reporting
115	Currently, there are few journalists reporting on science. Science we say is the bedrock of development of every nation but science today is not given the needed attention by the government and not full participation by all.	Very low. This is also because it does not fetch like reporting on politics and sports therefore it does not attract. More so it is a very technical area.
116		
117	Science reporting is likely to influence the individual and	Science reporting and journalism is perceived to be too technical and less reader-

	community education in Ghana	friendly
118		
119	Science reporting is very important because it always helps to put the public on their toes, to be careful especially with what they buy. Manufacturers and industrialists are always careful with respect to what they manufacture and send to the market	Science journalism should be encouraged in Ghana in order to help the public in their health
120	Current level of science reporting is not empirically established so it is difficult to predict its future	
121	There are more health, environmental and scientific issues which arise so it's very important to devote more attention to finding out more about them and educating the public	There should be more focus on training and motivating science journalists
122	In Ghana most reportage are politically biased. A lot of efforts or premium must be put on science reporting as compared to now to educate and enlighten the masses on science related issues	Actually, this is the first time of hearing about science journalism in Ghana. It is rather sad, but the perception about journalism in Ghana generally is about communication
123	So the public will know no more and understand scientific related issues	
124	To educate myself and the public	Science reporting is currently inadequate and should be improved
125	The more we report on science, the more people become conscious of their health needs	
126	There is seemingly a low interest and this has led to consumers seeking solutions. Like regarding especially in the local languages more and more people will get more enlightened and how to deal with medical and scientific world would especially on their right	This should be introduced in our training institutions. This does not seem to be the case now.
127	Currently, money allocated to science research, evaluation, and implementation is not adequate	It is not doing well as it is considered a highly technical area

128	My reason is that science reporting is very important for the public to know the usefulness of science in the development of the country. Therefore, my feeling is that for the next 10 years, science reporting should improve more than what we are seeing today.	Science journalism in Ghana has not reach the level that it should because of lack of interest by many journalists
129		
130	Information on science is vital to human existence and development	It is very low. Reportage should be intensified
131		
132		
133		
134	To educate people on health issues	Journalists must specialize in science journalism for professionalism
135	To entice and encourage others to be interested in science reporting	I think much premium ought to be placed on science journalism since science is the basis for development. Also political reporting must be toned down
136	Because reportage on science is very low compared to other areas such as politics, sports, business, and finance	Capacity building for Ghana science journalists
137	Because you need more resources to do effective and efficient reportage	
138	To increase awareness	
139	Science journalism is not as high as political and business journalism in Ghana, therefore we need a lot of encouragement and motivation. It is a subject that needs to be explained well for understanding because of its nature	
140	To be in the highest pedestal and move to different dimension	
141		
142	I believe that not much is being done with science reporting. Neither are most issues made easier for assimilation by the lay people	Information by scientists and public information officers should be made easily accessible to science journalists
143		
144	More attention to science will help propel Ghana's development	Science journalism is on the low side. There should be more specialisation in the subject

145	The world is changing rapidly by science and it is very important for me as an agenda setter to bring issues of science to the public	Journalists should be given adequate training and be made aware of the importance of science to the present and future of Ghana
146	Because science plays a key role in our day-to-day affairs	Journalists should be encouraged to write more about science issues
147	With the development of ICT in Ghana, in the next 10 years journalists will be able to report very well	No support of science journalism in Ghana. No recognition
148	The development of good health and a better environment depends on an improved science programmes and stories in our reportage	This aspect of journalism is not largely practiced since most of the issues in the media a politically related
149	The very life of the people virtually demands a thus we need to do more on science to inform people and policymakers for the betterment of all	Media needs more capacity building on the science reportage as politics seem to have taken a central stage
150	Because reporters are getting interested in science reporting	
151		

Notes:
1. The numbering from 1 to 151 reflects the order in which the completed questionnaires were received.

Grammatical errors in the responses were not corrected.

VITA

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