SCIENCE JOURNALISM IN ETHIOPIA: EVOLVING A VIABLE SCIENCE COMMUNICATION MODEL FOR SCIENTIFIC AWARENESS AMONG THE PUBLIC.

A thesis

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Abstracts

In this thesis I analyzed the science communication strategy (model) of Ethiopia as a developing country with respect to the practice of science journalism. Since it is not very developed in Ethiopia I used the discussion of science popularization and communication models of developed countries, mainly U.S.A and U.K, to understand the differences and similarities between the roles of the actors. Moreover, I related the conflicts and the consensus between the scientists and journalists with the type of the science communication model (whether it is top down or more interactive).

Investigation thus was made on science reports in the Ethiopian media using a survey and in-depth interviews with Ethiopian journalists who report science and a content analysis of newspapers with science sections. The content analysis showed that the majority of stories of newspapers (90%) were drawn from overseas (science magazines and Internet) and knowledge area of the stories were applied sciences particularly technology that is related with this modeling foreign source. No stories were found about controversial and risk communication in all the newspapers analyzed.

The survey indicated that science journalism practices are partly influenced by time constraints, lack of specialized science reporters, few formal training in science, and no science service from the scientific institution. Almost 65% of the survey respondents doesn't know the science and technology policy and do not maintain a link with the scientific institution.

The interview showed that within the same line of the top-down communication model, the reporters of major newspapers do not interpret the accuracy problem as a consequence of the different roles of the institutions (journalists and scientists) indicating that there is no interaction between scientists and journalists in Ethiopia.

Finally, the historical analyses of the popular science radio programs helped me to understand that the nature of the gap between scientists and public and the role of the scientific journalists are not the inevitable model of developing country, but socially constructed due to the roles of the actors. Accordingly, I suggest promoting scientific journalism to make the present situation of hierarchal science communication model to be more interactive due to the reflexive role of journalists.

CHAPTER 1: INTRODUCTION.

1.1. Setting out the background to the study

In a developing country, with low levels of public and private `research and development funding, a weak scientific community, and a low degree of scientific and technological culture, science has been relatively invisible in the public sphere for many years. However, when we look at the sphere of interaction between the techno-science and the public in Ethiopia, we can find some individual efforts endevored in popularizing science and technology to the public.

For example in the second half of the 1960s, where there was no science and technology policy, and strong mainstream scientific institutions, the public had a popular science radio program called; "*Science and Life*.[1]. The producer and the author of the script and head of the science program was S*hambel /captain/ Afework Yohannes* who was not a scientist by training but a journalist with 'interest in science'[2]. The content of the popular program covered all subjects and fields from mythology to atomic energy[3]. Details are shown in chapter four. This program was disseminated to a wider audience by the national radio Ethiopia until the eve revolution in 1974.

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[1] *Voice of Ethiopia (1967).*

[2] *Interview with son of Afework, Yohannes Afework, May 2006.*

3 Afeork, (1967). science scripts for Science and life radio program,

[4] *Afework,(1972). "Big questions and answers" Biranena Selam, Addis Ababa,*

The political change following the 1974 revolution was assumed for a progress to popularize science and technology to the public at a large extent. Within the conducive-situations what came into existence were: the effective literacy campaigns, the formation of professional and public associations such as writers, journalists, health professionals, artists, etc. However, such opportunities did not take shape well in the period. Various government organizations and ministries had set projects of science and technology popularization related to their specific areas of concern. They used various media for

communicating with their respective audience. But the practice did not last long. This was due to the fact that, the choice of contents and methodologies was not in consonance with the types of audience (who were mostly elites) they supposed to address[4]

From the mid-seventies onwards however, great attention was given to science and technology as agents of modernization. Accordingly, in 1975 the Ethiopian science and technology commission was established with a mandate to promote and coordinate scientific and technological activities in the country.[5]

Since inception of the commission therefore, a remarkable effort in strengthening science popularization activities has been endeavored. For example between 1983 and 1985[6], in collaboration with Canadian scholars, trainings on science and technology writing, and science radio program production for media practitioners' were given. Also science and technology popularization section as one of the line department of the commission was set up in this period. However, such settings and efforts didn't bring about a definite shape to popularization since there came another revolution that brought about the existing government in power in 1991.

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[4]*Kebede Tiku, (1988). First national conference on science and technology policy*

5. ESTA December (1993). National science and technology policy, Addis Ababa.

[6]. *ESTA (1987). Proceedings of the workshop, on science and technology writing for media practitioners conducted from November23-December 1987, Addis Ababa Ethiopia*

After a decade- and- a- half of dark period then, the present popular science radio program "*Kescience Mahider*" meaning "*From the archives of science*" was revitalized in 1992 by the joint efforts of Ethiopian Science and Technology Agency (ESTA) and Radio Ethiopia. The principal objective of the radio program was to popularize science and technology to the public. Two points can be assumed in the present initiatives of popular science radio program.

First, interestingly the policy of the science and technology agency revised in 1993 marks very general statement about public awareness of science and technology stating as:

> *Improve and develop the knowledge, culture and the scientific and technological awareness of the people of Ethiopia, and promote the development of traditional, new and emerging technologies* (ESTA, 1993 p.3).

This policy framework assumes a space explicitly devoted of science communications: science popularization and scientific journalism. Nevertheless, science journalism practice is overlooked. For about two decades, and still now, the radio phonic science scripts are written and produced by science expertise that are staff of science and technology agency. The question is why can't the journalists group take the initiatives and study the radio phonic science scripts for possible stories? The success of the agency after all depends on there being informed journalists who can communicate on issues of science and technology.

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[7]*Ethiopian Science and Technology Agency,ESTA (1993): National science and technology policy, December 1993, Addis Ababa*

Secondly, following the change in government in 1991, the private media especially private newspapers have begun their service to the public. Although, at the moment the number of private weeklies has declined very significantly, in the period of this study, there were three weeklies and one daily newspaper (writing science stories weekly) that have embarked incorporating science and technology sections into their pages. This practices particularly journalists interaction with scientists, the sources of their science articles and their perception about the development of science journalism in Ethiopia is the second question to see.

This study, therefore, seeks to explore and analyze the science communication strategy with respect to to science journalism practices in Ethiopia as a developing country. Overall the rationale underpinning this study is that there is a need for a deeper understanding of the phenomenon of science communication. If indeed science communication research is defined as the process of conducting research on., or analysis of a fundamental social problem in order to provide policy makers with pragmatic action oriented recommendations for alleviating the problems, the need to deeper insight to science popularization or science journalism can't be over-emphasized .In this vein, the study is meant to assist the government and practitioners alike their quest to develop more coherent,

consistent and comprehensive viable science communication model that will streamline the functions of science popularization /science journalism within the development objectives formulated by the government or by the non-government science communication initiators or motivators.

1.2.Statement of the problems.

The traditional view of the science communication models presents the communication gap between science and public as an inevitable consequence of the progresses in science and technology. Moreover, the correlation between the scientific and technological developments and public understanding of science calls for the mediators to transmit information in a one-way flux, stemming from the scientists to the receptive public by simplifying its language. (Vincent Bensaude, 2001)

This traditional view of the science communication and the role of the mediators have been subject to criticisms. According to Bensaude, critical analyses of the traditional view focus on improving the communication model of science rather than questioning the notion of the gap itself. Bensaude blames these criticisms, which present more interactive models and question the role of mediators for reinforcing the gap they are expected to bridge. More dynamic analyses could only be done by having an historical approach on the notion of the gap that will lead to diversifying notion of the public(Bensaude, 2001). . As in the case of Bensaude, making an historical approach to the notion of the gap and evaluating the interactive role of the mediators was most of the time an analysis of the communication models of developed countries.

Therefore, this thesis investigates the ways the radio phonic science scriptwriters' position themselves in the communication strategy with respect to the practice of science journalism in Ethiopia as a developing country. Analyzing scientific journalism in the communication strategy of a developing country questions not only the gap between the science and the public, but also the interaction between the scientists and journalists and scientific institutions.

Scientific journalism is not very developed in Ethiopia, and the scientific community, (popularization department of science and technology agency) holds the authority and power in the popularization of science. This has similarities to the hierarchal model of the

UK and the US before the 1970's. The term hierarchal according to Ulric felt in this context is defined as follows:

> The hierarchies inherent in the model are clear: Scientific knowledge was understood as being clearly distinguishable from folk-knowledge and it was seen as superior because of its specific form of rationality. Scientific knowledge became the symbol for complexity, while the public's knowledge could be ignored because of its alleged simplicity and emotionality. Interactions were thus unidirectional, from the producers to the consumers/receivers of knowledge. As a consequence only scientists could claim the status of being experts. (Felt, 2003 p.13)

However, the roles of the actors (media, scientific institutions, industry. research centers and universities etc) in the science communication model are not the same in different countries. In developing countries, the source, the scientific and technological developments, is most of the time outside cultural context. This state of affairs makes the most of scientific journals' or newspapers translations from the popular scientific magazines of the Western World. Therefore, the mediator's product, which is shaped by the culture it is produced by, is carried to a different culture. Building on the sender-receiver model that was taken over from communication sciences it described scientists in their role as the producers of genuine scientific knowledge, which would then be "translated" into a more easily understandable language in order to be transmitted to a wider public (Ulric Felt 2003).

However, changing the context of popular science articles does not make journals popular in Ethiopia, where the public segments and cultural references are no longer applicable. In turn, it cannot be independent and therefore has to be supported by the scientific community in Ethiopia. Therefore, the scientific community is the source and the mediator in the communication model, which leads to decreasing conflicts between the scientists and journalists, and also changes the nature of the gap. The top-down approach makes public understanding black boxed.

As a result, the author argues that the nature of the gap is different in Ethiopia. In the developed countries, after the scientific revolution, the scientific community gained the power and stood as being the source in the cultural context. They moved from hierarchal models of science communication to more interactive ones through the years when the public understanding of science gained importance. However, the underlying purpose of

the popularization was for the 'appreciation of science' (Lewenstein, 1992), and contrary to Bensaude's notion of the gap, popularization activities were always done as a complement for the scientific progress.

On the other hand, in Ethiopia, scientific communities do not hold the power of being the source in the country. Therefore the interaction of the journalists-mediators-with the source could not be the same as developed countries by nature. Hence, popularizes, journalists or scientists themselves, hold a missionary role of promoting science and scientific thought to catch up scientific and technological developments of the developed countries.

Therefore, I will use the historical overview of the science popularization in the UK and US in chapter two, and the discussions regarding the scientists and journalists' interaction in section two of this chapter to explain the decreasing role of the independent scientific journalists with the differences in the aims of the popularization and the nature of the gap.

In other words, I aim to analyze the science communication strategy in Ethiopia with respect to the role of the scientific journalism, and then correlate the level of practices or conflicts between the scientists and journalists with the science communication model.

1.2.1 Analyzing science communication model of Ethiopia with respect to the role of scientific journalism:

There is no systematic debate in Ethiopia of how to use or modify the communication models of science popularization discussed in the Western World. There has never been a coordination effort between the scientific institution and the media. Moreover the existing science popularization program was not based on research findings. They are individual efforts and tend to be spontaneous in nature. No systematic and scientific evaluation of the effectiveness of the strategy has been carried out.[8] Moreover the "public understanding of science" debate is seen as a luxury of developed countries since science popularizes feel the duty to protect the scientific institution rather than criticize them as they feel that the danger of anti scientists religious group for example, is greater in Ethiopia than in the West. The senior expert in the popularization department and writer of radio phonic science script Tesfahun, said, "We are trying to foster curiosity among young people and trying to legitimize science in their daily life. Criticizing science and abolishing its authority is very dangerous".

8 Kebede Tiku,1988 Proceedings of the work shop on capacity assessment in S&T popularization, July 18-19Addis Ababa Ethiopia

There are many pitfalls of not discussing the public awareness of science in a developing country. The main pitfall is as mentioned is misunderstanding or ignoring the public understandings of science. Accordingly the science popularizes, the mediators tend to increase the gap ignoring the public perceptions rather than reaching it out to it by using cultural references. As a result this inability to communicate is converted into an attitude that science is superior and fearful.

Therefore, the author can neither use an already discussed science communication model of Ethiopia, nor use the discussions of conflicts regarding the differences in the roles of the actors. However, I will use the communication models of the developed countries (mainly the UK and US) with respect to the role of their institutions throughout the history of science popularization and scientific journalism. I will use the key questions of: '**Why science should be popularized**?' '**For whom should it be popularized?**' and '**How should it be popularized** to figure out the differences and the similarities between the sciences communication model in Ethiopia and the Western models throughout history. (Ulrik Felt, 2003)

I used the academic literature especially the work of Gregory and Miller, Felt, Wynne and Lewenstein in discussing the science communication models and the work of Nelkin, Friedman and Dunwoody in discussing the scientist journalist interaction.

In Ethiopia, the aim of popularization, in other words, the answer to the question, 'Why should science be popularized?' is different than in developed countries. Because it is not for the support or the funding of ongoing research, but usually for fostering the curiosity or desire of young people to have their education in scientific and technological fields. Therefore, the method of popularization and its scope vary.

However, when we analyze the history of scientific journalism / popularization in Ethiopia, we see that in the 1960s the scope of popularization was wider, and the public understands as a whole gained more importance. Here we can see the discussions of the way of popularization.

As a result, in order to have a more 'dynamic analyses on the notion of the gap' (Bensaude, 2001), that will lead to diversified meanings attributed to science, public and mediators, I made an historical approach to science popularization /science journalism in Ethiopia and evaluated it comparatively with the historical approach of science popularization and scientific journalism of developed countries.

As I noted, there were not many works on this subject related to the Ethiopian case. However, "*Science and Life"(1964-1974)* radio program (*the first o Popular Science radio program of Ethiopia)*, was unique work on scientific journalism and science popularization, which helped me to understand the key features of the scientific journalism and science popularization in Ethiopia.

There are three distinctive periods in the history of science popularization in Ethiopia.

The first period (in the 60s) was individuals' effort to popularize science to the public as a whole. Science was not well institutionalized, nor did it exist as an authority during that period. However, efforts were made to legitimize scientific thought in the public sphere. Although the aim was to spread scientific thought in the public as a whole, targeting the wider audience caused the consideration of public perception and folk knowledge or public knowledge. Therefore, it was not a deficit model (a model that is designed to fill the deficit scientific knowledge of the public). However, there were neither public surveys nor a justification that they reached the wide audience targeted. Thus, we could not conclude that the public was seen as more diverse.

The second period, from second half of the seventies until the end of 1980's, can be defined as the dark period of science popularization. The third period was characterized by efforts of the institutionalization of Ethiopian science and technology commission. The foundation of 'the popularization department, fostered the popularization efforts, launched the second popular radio science program, "*kesience Mahider*" in 1992, after a dark period of almost fifteen years.

However, compared to the first period, the institutionalization of science reinforced the gap between science and the public. The science and technology agency, not only founded the popular science Radio phonic program of Ethiopia, it was also responsible for all other

popularization activities. However, as I have mentioned before, this situation also distinguished scientific knowledge from folk knowledge and reconstructed the gap between the science and the public. As a result, in this period, the model bears more similarities to the deficit model. To evaluate this gap, I have turned back to the previous discussions of the communication models of the Western World and started my analyses from the beginning of the institutionalization of science.

First, the foundation in the UK of the Royal Society in the 17th century and the US's American Association for the Advancement of Science (AAAS) in the 19th century revealed the distinction between science and the public just as in the Ethiopian case. However, the institutionalization of science in the Western World occurred after the scientific revolution, where science and scientific thought was considered to have won a battle against 'superstition' and 'dilution'. But this type of scientific revolution did not occur in Ethiopia, and scientific institutions were not as powerful as the Western model in their cultural context.

As I will discuss in the second chapter, scientific institutions in the UK and US first targeted their popularization activities at the elite, then to the workingmen and finally by 20th century felt the need to target wider audiences (Gregory and Miller, 1998). The main reason for this increasing scope of science popularization was the progress in science and technology, which required enormous budgets for research. This in turn led to the need for public support to survive. (Gregory and Miller, 1998).

As a result, the science communication models throughout the years, moved from black boxing the public with the deficit model to attributing meaning to the public understanding. Despite this, the aim of popularization never turned its 'Why' question to the institutions of power, but always problematized the understanding of the public.

On the other hand, the institutionalization of science did not increase the scope of the science popularization in Ethiopia. As I discussed above, in the first years, popularization activities targeted wider audiences. However the communication strategy of the science and technology agency mainly turned its attention to potential non- scientists as targets (students and teachers) to gain power.

Secondly, while analyzing the historical approach of science popularization and communication models in Chapter 2, I will also mention the crucial points of development

of scientific journalism in the West. Accordingly, I will present the parallel changes in the characteristics of scientific journalists with the changes in communication models. For instance, the social upheaval of the 1970's affected the style of journalists, while the promotional atmosphere to science and technology of the 1980's also altered the tone of articles, although in a more positivistic style. (Nelkin, 1986)

However, in Ethiopia the social upheavals of the 1970's did not yet question the necessity of scientific and technological development. On the other hand, the intellectual atmosphere of the period encouraged the foundation of Science and technology commission. Nevertheless, Journalists could not manage to institutionalize like National Association of Science Writers, (NASW) even under the authority of this scientific institutions.

1.2.2.Understanding the practices and interaction of scientists and journalists in Ethiopia.

This section explores the state of science coverage in the Ethiopian media and attempt to understand some of the factors that influence this coverage. Thus, to understand scientist-journalist interactions in Ethiopia and correlate it with the existing science communication strategy, I conducted survey of journalists' who report science in the Ethiopian mass media; analyze science articles in the newspapers that have science sections and conducted depth interviews with those who write science stories.

The purpose of focusing on this relationship is the following theory: Regardless of the assumptions of different communication models, interaction of journalists with, scientist and other actors always results in change of content (knowledge area) and new meanings are attributed when the messages are transferred from one source to another (Bensaude, 2001). This change in meaning creates conflicts between these two groups: scientists and journalists. However, a lack of these conflicts means a lack of interaction. Therefore, before defining the role of journalists as a bridge between science and public, it is very crucial to understand the nature of the interaction itself.

This study showed that science is not a specialist subject area for most mass media organizations in Ethiopia. Only one reporter had a dedicated science round at the time of this study and all of them covered other rounds in addition to science. Thus, perhaps the

country's only true science specialists are a few freelance journalists, a handful of journalists who write for specialized environmental and medical publications.

The journalists who report science in Ethiopia tend to be interested in the subject, but they have little or no science training and have been covering science for a relatively short time. The lack of specialist science reporters in Ethiopia is a disadvantage because journalists have less time to spend on the subject and they accumulate.

The distinguishing feature of science stories in the Ethiopian media is not only its infrequency but rather that so many stories are short and that so many originate from overseas. This means that news organizations that import stories from the internet may be satisfied that the stories they receive are accurate and do not require further checking. In this study, the majority of surveyed journalists said that a lack of scientific knowledge limited their ability to use a weight of evidence approach and that scientific training for journalists would improve the quality of scientific reporting.

The scientific journals in public understanding of science can be questioned by the concept of accuracy.Various scholars have examined the conflicts between scientists and journalists over the problem of accuracy. However, in the survey analysis and interviews I have noted that they do not see the problem of accuracy as part of the difference in the roles of institutions.

1.3. Objective of the study:

1. Investigate the science communication strategy of Ethiopia comparing it with the strategies of similar organization of developed countries

2 Identify the perception of journalists' who report science

3. Analyze the science articles of newspapers that have science sections.

4 evolve a viable science communication model

1.4. Statements of research questions:

Related to the objectives outlined above this study sets out to answer the following research questions

1. What is the present science popularization model of Ethiopia as a developing country?

2. The perception of science reporters, towards science journalism in Ethiopia?

3. What are the sources, knowledge area and tones of science articles in the major newspapers that have science and technology section?

4. What viable model of science communication is useful for creating public awareness of science in Ethiopia as a developing country?

1.5 Organization of the thesis:

Chapter 2 begins with a literature review, how certain approaches to science communication models became dominant throughout the history of the US and UK, how these popularization activities are related to present situations, and how these reflect and maintain the underlying assumption of 'appreciation of science' or public awareness or public understanding of science. The rationale selecting U.K and U.S is the fact that they are pioneers and a lot of research and models in science communication are set under very well known scientific institutions /organizations of Royal society and American Association for the Advancement of Science (AAAS) respectively.

After analyzing the nature of communication model in the U.S and U.K, then in section two of this chapter, I focused on the theory of historical and importance of science journalism, the interaction between the scientists and journalists with respect to the problems, which arises from the differences in the roles of the two institutions: science and journalism. This part was the tool for examining the survey analysis, the content analysis and the interviews.

Chapter three focuses on the methodology employed in this thesis. Three distinctive research instruments were used to answer the three interrelated research questions.

Chapter 4 focuses on the data presentation and analysis of the four specific sections of this thesis: The first is analysis and evaluation of the communication strategy of science and technology agency with a focus on the popular science radio phonic scripts of past and present situation in Ethiopia in light of the communication models (theories) I have discussed in chapter two. The first part is evaluation of the special characteristics of the first popular science radio program of Ethiopia, "*Science and Life"* and part two focuses on the present situation after the foundation of science and technology agency of Ethiopia.

The other three sections contain pieces of research that together describe the state of science coverage in the Ethiopian media and attempt to understand some of the factors that influence this coverage. Section one of this begins with a survey of Ethiopian journalists to

identify who reports science here and to explore some of their attitudes towards reporting science, and more specifically towards sources they use, backgrounds and verification and the balancing and weight of evidence strategies. These attitudes are then compared to actual media coverage in content analysis of science articles (Chapter 4 section two), and explored in more detail in in-depth interviews with journalists who spend the most time reporting science in Ethiopia (Chapter 4 section three)

The final chapter (Chapter 5) deals with Summary and conclusion. It brings all of these results together in a discussion of the state of science popularization and science journalism in Ethiopia and the factors that have led coverage to be the way it is, as well as looking forward to ways that science reporting here could be improved. This part is evaluation strategy of the scientific popularization (journalism) in Ethiopia of popular science radio phonic scripts, perceptions of journalists, and science articles from science and technology sections of major newspapers.

CHAPTER 2:

LITERATURE REVIEW: SCIENCE POPULARIZATION AND SCIENTIFIC JOURNALISM IN THECONTEMPORARY TIME:

2. Overview:

In this chapter, the author gives an historical account of science popularization in the Western World. The importance of giving an historical account of science popularization is to foster an understanding of the models in the science-public interaction -- how it has changed through time and also stayed partly stable.

In the analyses of the phases of Western Countries, the focus will be on the two pioneer western countries, UK and US. According to Felt in optimizing public understanding of science reports, the phases of science communication models are not clearly distinct. New approaches are always taken as additional to the already existing ones, opening new territories of reflection while not definitely closing the previously ones. The deficit model of communication is a good example. While it was declared “dead” for so many times over

the 25 years of science-technology-society analysis it in a certain way seems to have survived the major shifts through gradual adaptation.[9]

One point, as mentioned above, is the problem of overlapping phases when they are given in chronological order. The other point is the fact that the popularization of science does not start with the different phases of the communication models.

The more systematic reflections on the role, meaning and the impact of science communication on society and on the scientific system began in the second half of the twentieth century.

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[9]Ulrike Felt When science encounters their sciences: conceptualizing the relation between science and the public, cache of http://www.univie.ac.at/virusss/OPUSReport/Introduction/concept.htm as retrieved on 5 Apr 2006 16:23:58 GMT

In addition, the linear communication model in the deficit approach that will be discussed below was taken from communication sciences. (Gregory and Miller, 1998) Nevertheless, the science popularization movement has a much longer history.

According to Gregory Jane and Miller Steve,' popular science is at least as old as science…The first great writer of Western History, Herodotus (484-425 B.C), passed on to his public the Nile priests' explanations of how Egypt had been produced from silt deposited by river-perhaps the oldest surviving popularization of geology. …Copernicus's De revolution bus orbium coelestium, published in 1543 and one of the key texts of the scientific revolution, was arguable written for the general public. Certainly, Galileo's 'crime' according to the Catholic Church, was not that he espoused the heliocentric model of the solar system but that he had popularized it. **(**Gregory and Steve Miller 1998, p.19**)**

Instead of analyzing the science popularization through the ancient times, I will start the analyses of the historical account from the period where the actors became more distinct and apparent. In fact, the distinction between the actors--science and society -- began to be apparent with the institutionalization of science.

The institutionalization of science revealed the social distinction between science and the public (Gregory & Miller, 1998). Therefore, before the analyses of the science communication models and the role of the scientific journalism in UK and US in the 20th

century, the author gives a brief summary of the beginning of institutionalization of science between 17th to the 20th century in order to better understand the changing rules of the actors in the communication models. Later on, the following periods will be discussed in different phases, with the changing rules of the institutions in the communication models. Part two of this chapter will focus on the journalist-scientists- interaction.

2.1 The institutionalization of science (17th-20th centuries).

The separation of scientific community from the public dates back to the 17th century with scientific revolution. (Gregory and Miller, 1998)

The main step towards the institutionalization of science is the foundation of the Royal Society on 28 November 1660 for promoting Physics-Mathematical Experimental Learning. (Royal Society, 'The royal Society and its fellows', 2004)

The Royal Society is the oldest scientific organization in UK and it is also one of the oldest in Europe. In the second charter of 1663, it was referred to as the 'The Royal Society of London for Improving Natural Knowledge' (Gregory and Miller, 1998). By 1799, the primary function of the society was 'improving landlords', in other words the aristocrats, by applying the latest scientific knowledge in modernizing agricultural techniques. Despite the fact that the new institution was for the new intellectual elite, it made important contributions to science popularization during this period. First of all, opening public research labs gave opportunities to scientists who did not have the resources for their own research to work at public labs. Secondly, public lectures, initiated by Sir Humphrey Davy, and developed by Michael Faraday, created curiosity and popularity of the latest scientific developments in the upper and middle-class.

However, at the same time, the scientist-lecturer and the audience separation with the support of the institutionalization planted the first clear distinctions of the actors: scientists and the public.

With the effects of increased industrialization in the 19th century, a new audience—working men – appeared whose efforts were to improve their technical skills to be able to find better jobs and improve their social class. Therefore, compared to the landowners and

entrepreneurs looking for new knowledge about steam engines and the air pumps, the new audience tended to look for 'professionalism'. As a result, the undifferentiated natural philosophy of the 17th and 18th centuries moved towards modern science disciplines. The reflection of these trends is the formation of a magazine called The Athenaeum in London in 1828, which in a few years time changed its content towards the businesslike reporting of burgeoning scientific societies, with the separation of modern disciplines. (Felt, 2003).

The formation of the American Association for the Advancement of Science (AAAS) in 1848 sought the same purpose of bringing the scientific worldview to the broader public and making a clear distinction between professional and the amateur science (Lewnstien, 1992).

The first sustained popular science magazine 'Popular Science Monthly' was published for public in 1872. In 1874, the editor of the 'Popular Science Monthly' claimed that capturing the interest of the non-scientist public and creating a scientific literature taste had cultural meaning and moreover, it was important for the appreciation of science. The connection between the popular science magazines and AAAS is that for many years, the officers at AAAS wrote articles for the 'Popular Science monthly'.

Therefore, the rapid progress in science and technology in US in the nineteenth century was complemented by popularization under the influence of British model. At the end of the nineteenth century; science was a profession in both of the countries. Moreover, it was represented as the most important factor in the progress of the country as well as the social status of the individual.

At the beginning of the **twentieth century,** popular science was well established with the aim of '**public appreciation of science'**. World War I was a technological war, and the growing public interest in the issues of science and technology left the reporting of science and technology issues more and more in the hands of the journalists. (Felt, 2003) Moreover, during World War I, the number of the articles edited by scientists decreased substantially due to war situations, which led to an increase in the number of articles edited by scientific journalists. (Lewenstein, 1992)

With the increase in the population, revealed the need for education of wider audiences. Following the economic boom in the 1920's in the US, three major institutes of American science, the American Association for the Advancement of science (AAAS), the National Academy of Science, and the national research council co-sponsored the founding of science service, a national news agency for science. It was a syndicated news service devoted to disseminations of objective and responsible information about science. (Lewenstein, 1992)

Science service helped newspapers to hire full time science journalists, and by 1934 a dozen science journalists in the United States founded National Association of Science Writers (NASW) (Lewenstein, 1992).

According to Lewenstein, it was believed by the members of the association that the organization provided some legitimacy and recognition as an independent group with independent standards; both within journalism and among the scientific community and it continued to support the appreciation of science and the scientific community. By the time of the World War II, the size of the association had tripled. (Lewenstein,,1992).

During and after World War II, there were more collaborative and systematic efforts to popularize science. Lewenstein, analyzed the period after **World War II in the US with respect to the social and institutional needs of different groups; namely commercial publishers, scientific societies, science journalists and government agencies.** He argued that 'the public understanding of science' was wrongly equated with the 'public appreciation of science', due to the efforts of the parallel interests of these groups. (Lewenstein, 1992) First of all, in terms of the scientific community, AAAS in 1951 adopted a new policy statement, known as the Arden House Statement, which declared its intention 'to increase public understanding and appreciation of the importance and promise of the methods of science in human progress' (Lewenstein, 1992). Secondly, the best known scientific journalists of the 1930's interpreted themselves as missionaries, and committed themselves to science, which gave guidance to correct thinking and appropriate behavior.(Lafolette, 1990) .By the same token, there was no difference in the use of 'understanding and 'support' in the newsletters of National Association of Science Writers (NASW).

In one of the newsletters of NASW, it was explained that 'one of their major goals was to promote scientific writing…to encourage support and understanding of the basic aims of all science' (Nelkin, 1986). Thirdly, commercial publishers wanted to define explicitly the economic value of the demand for the popular science. In 1946, McGraw-Hill, one of the largest technical trade publishers founded *Science Illustrated*. It was a monthly magazine, which targeted the mass consumer audience. It got off to a strong start, selling nearly 150.000 copies of its first issue. However, in the later editions, to attract a wide audience, they changed their content and became a 'gee-whiz' publication, thereby alienating intellectual readers and advertisers. In 1949, they couldn't survive and declared that they were folding. Targeting the mass audience was different than the intellectual elite.

Piel and Flanagan, who targeted an audience of intelligent laymen, made an attempt in the opposite direction 'the scientific professional who is a layman in departments outside his own' (Nelkin, 1986). In 1948, they purchased the 103-year-old Scientific American, and it attracted industrial advertisers. Hence, for the commercial publishers, targeting the well-educated technocratic elite rather than wider audience was a better option in order to become successful.

By the above statements, it can be deduced that there was not an explicit demand for the public understanding of science. On the contrary, it was an additional supply promoted by the policies of different power groups (Lewenstein, 1992). These groups had parallel aims; however the profession of scientific journalism by its nature interacts with its readers and has a reflexive role.

In later periods, I will examine the changing roles of the scientific journalists and their conflicts with other institutions.

Brian Wynne supports Lewenstein argument for the period after the World War II. In his article on 'public understanding of science', he presented the example of the aims of the Association of the Scientific Workers to show the efforts of the legitimization and appreciation of scientific thought in the post-war period.

According to the Association of the Scientific Workers, the efforts for the urgency of improved public understanding were justified in three main statements: a) the future workforce requirements need a technically literate population b) science is crucial part of our cultural understanding c) improved pubic understanding is necessary for modern democracy (Wynne, 1995, p.43). As a result, the shift in the 20th century was more concerned with the wider public.

Although the word 'understanding' was used as 'appreciation' and the authority of science itself was not questioned, the systematic efforts of the institutions like NASW contributed to the 'public understanding of science' debate in the later periods**.** Moreover, the institutionalization of scientific journalists with strong ties to scientific communities has moved towards intensifying the conflicts between the values of these two groups. (Lewenstein, 1995)

The systematic analyses of the communication models with the role of the mediators became an issue in the second decade of the 20th century. Therefore, the following section will cover the following periods with respect to the different phases in the communication models.

2.2. Models of Science Communication (20th century-)

The period after the second half of the 20th century, will be discussed in four phases described by Ulrike Felt in the report of 'Optimizing Public Understanding of Science'. The phases are separated with respect to the changes in the communication models between science society and the public. Therefore, I will use these phases as the distinctive behaviors of their periods and combine the development of the scientific journalism of West and discussions of public understanding of science of different scholars within these phases.

2.2.1.The Deficit Model to science-public relations.

This approach which, lasted until the late 1970's build on a sender receiver model taken from communication sciences. The sender was the scientists and producers of genuine scientific knowledge. This scientific knowledge had to be translated into a simpler and more understandable language and transmitted to the public. In this model, the public is

presented as an undifferentiated ensemble of individuals and no attention is given to the interaction of the public.

Moreover, the hierarchy in the model interprets the scientific knowledge as clearly distinguishable from the folk-knowledge and favors its superiority due to its specific form of rationality. As a result, expert status was only in the hands of the scientists where the emotional and simple character of the public knowledge should be ignored with a unidirectional model of communication. In fact the public, whose knowledge was ignored, was being conceptualized as being ignorant to the scientific knowledge. Moreover, this ignorance and lack of information could cause fear and alienation from science. Therefore, large information and education campaigns were carried out to impose the importance and value of science in society. (Felt, 2003)

Yet, in the end, the deficit approach had two contradictory effects on public communication; the distance of science was (re) constructed by expressing the complexity and its inaccessibility for non-scientists while at the same time giving the impression of people having access to science.

In 1950's, at the heart of the Cold War, the Soviet Union's first satellite --Sputnik--that was launched to orbit the Earth successfully, alarmed the US, as much because of the dangers of the lack of general comprehension of science as for the extraordinary growth of financial needs of science and technology. (Felt, 2003)

(Gregory and Miller, 1998)

2.2.2. The Per formative Character of Communication on Science and Technology:

The late 1970's was a crucial period in terms of growing criticism and skepticism against the classical decision making of the techno-scientific model. Various social movements, such as the environmentalist's movements, peace movements and women's movements all helped to question the conceptualization of the science society and technology interactions, therefore the linear models of communication.

The criticisms helped to clarify the popularization of knowledge from a different perspective, where it was no longer described as a simplification of knowledge, but rather a

'highly complex attempt of constructing both a public as well as their visions of science'. (Felt, 2003)

First of all, the interpretation of the public who had a general lack of understanding of science, but had a positive view combined with ignorance and appreciation, changed considerably in this period. According to Gregory and Miller, the young people who protested in the 1970's did not lack scientific knowledge; on the contrary, with intense education campaigns in schools to increase scientific literacy, they were knowledgeable in science. (Gregory and Miller, 1998)

Accordingly, Felt in the Optimizing Public Understanding of Science Report referred to the following statement of Jacobi and Schiele: 'The discourse on science and technology exists and the framework it offers practitioners became more important than the question whether the information processed was right or wrong'

As a consequence, power relations started to be questioned and more interactive models of popularization models was constructed.

Finally, the public was seen as more diverse and structured, compared to the undifferentiated public interpretation of the deficit model with a potential to play a role in the techno-scientific development.

Similarly, during this period, the 'missionary role' of the scientific journalism was beginning to be criticized by a number of scientific journalists who had captured the spirit of the social criticism. (Nelkin, 1986)

2.2.3. From performing techno-science to attributing meaning to it in the public sphere:

The most important event characterizing this period is the well-known Royal

Society Report with the title of 'Public Understanding of Science' in 1985[10]The main aspect of this report was the public and how to make them understand science and technology. Despite the fact that the public and their understanding were no longer ignored, the report did not question science itself.

[10] Royal Society (1985): The Public Understanding of Science, Report of Ad Hoc Group, London Royal Society

In other words, there were no important changes in the deficit model of the public. However, for the survival of the research system, the support of the larger public seemed prerequisite. Hence, their understanding became an issue to vanquish the unreasonable fear of science and technology (Felt, 2003). The change in the policy level had moved scientific journalism from its critical style of the 1970's to a more promotional style. (Wynne, 1995)

In the first half of the twentieth century, the problem of public understanding was recognized and the legitimization of scientific knowledge was achieved by promoting the appreciation of science in society. However, after the growing criticisms of the 1970's, public understanding was more than just the appreciation of science. It also contextualized scientific knowledge and attributed meaning to it .(Gregory and Miller, 1998)

First of all in this period, the diversification of the public and the target audience was made clearer. In order to understand the target audiences of popularization, let us look at the structural segments of the public, as defined by Miller Jon. D, for science policy making in a pyramidal form..

At the top of the pyramid, there are a small number of **decision makers**. These include the president, relevant executive officers, congressional leaders, relevant committee and subcommittee chairs and members. **The technical persons and the primary representatives of science** are at the second level of the pyramid. These normally define the policy agenda and present policies to the decision makers. At the third level, there is **the attentive public**. The attentive public is described by

Gabriel Almond as people having keen interest in scientific policies and a functional level of knowledge, which barely allows them to discuss the policy issues in that area. According to a survey in the US, two thirds of the attentive public lacks the scientific literacy. It is the most important segment in the public, so educative popularization targets the attentive public. Below the attentive public in the pyramid, comes the **interested public**. The interested public is less educated compared to the attentive public and lack functional knowledge, despite having a relatively high level of interest in science and technology. The **non-attentive public** is at the bottom of the pyramid, making up the majority of the population. In the issues of referendum, or controversies, both the interested and the non-

attentive public become involved in the formulation of science policy (Friedman and Dunwoody, 1986). Durant and Evans criticize this analysis in the later periods.

Secondly, there were quantitative and qualitative types of research. The lines of research to grasp the concept of 'understanding' were done under the heading of measuring 'scientific literacy'. Surveys that became more common after the 1980's in the US and then in Europe measured 'a set of factual knowledge about science which scientists decide upon beforehand'. Their aim was to find the 'best practice' of communication by measuring the attitudes and knowledge of the public about science. Of course, a normative idea about science was the underlying belief of these surveys. These questioners required one correct answer, and were not open to different interpretations

The criticisms of this research were mainly focused on the de-contextualization of knowledge and their understanding when the respondents were taken out of their social environment.

The second line of research embraced more qualitative types of data. Instead of focusing on the factual knowledge in abstract settings, how respondents attributed meanings in particular settings gained importance. The central questions were:

'What do lay-people do with scientific information, how do they interpret it with regard to the existing knowledge structures, what place do they give to scientists and scientific institutions in their decision making?' (Felt, 2003)

There were many contradictory results within the quantitative type of research. First of all, when the questions were asked in a way that let the respondents refer to their existing knowledge structures, then the answers were not *incorrect*. In other words, reframing the questions in the context of the respondents made them understand and answer the questions correctly, though not in technical language. As a result, comprehending the level of public understanding on the part of the scientists became an explicit issue rather than solely problematizing the understanding of the public. (Levy-Leblond, 1992). Despite these facts, the policy makers continued to use the 'hard facts' of the quantitative researches of science-centered words of meaning. (Felt, 2003)

2.2.4. Dialog and participation model:

In most recent times, the advisory and the legitimate role of science was shaken, which led to the growing concerns of the institutions of power. The policy leaders have once more

reshaped the 'Public Understanding of Science' debate, since this time they could not relate the rejection of techno scientific innovations to the lack of information.

The crisis of BSE (Bovine Spongiform Encephalopathy) or in other words, the mad cow disease showed that new techniques could give harm not only to the animals, but also to the human contrary to the statements of the technical persons and policy makers in UK which had an important affect on the change of publics' attitudes toward science. BSE and other crises related with the unexpected risks of technological and scientific developments, led the discussions of ethical and societal dimensions of the research. (Felt, 2003)

Accordingly, Geoffrey Evans and John Durant made analyses to explore the consistency between understanding of science and levels of support for science in

Britain. The analyses indicated that the links between understanding of science and the support for science is weak.

Moreover, according to this research, the informed public is less supportive of the morally contentious areas like human embryology than the less knowledgeable public. (Evans and Durant, 1995) This work is also important for the target audiences of the popularizations. Participation in decision making for sensitive techno scientific issues became central rather than being solely focused on the enlightenment way of communication. (Felt, 2003)

Despite the policy leaders' efforts to make the public participate in the decision-making processes, the underlying idea was still to regain the notion of the superiority of science and technology in society. Therefore, even in the interactive model, we can see the signs of the deficit model.

Logan, in 1991, criticized the authority of science and proposed the 'secularization' model. According to him, in order for science communication to be successful, it must reject the power of scientific institutions and scientific authority; thereby accepting the values and beliefs held by its audience. The model is called secularization since it rejects the religious primacy of science. (Lewenstein, 1995)

When we look at the science in society program of the Royal Society, we see that its main concern is to communicate with the public and enhance public participation in the debate over controversial issues and their ongoing research. In their Internet site, they have a 'talk to us' section, which carries discussions on different topics.

For instance, in a section entitled 'Cyber trust and information security, which way forward?', they stated that 'the Forum brought members of the public, scientist and policy makers together to examine some of the social implications of developments in information and communications technology.[11] Accordingly, the science in society program of the Royal Society aims to gain public support for science by promoting a two way communication, being responsive to the publics concerns and values, and developing effective ways to communicate with the public.[12]

This is clearly consistent with the fourth phase of communication, since the Royal Society takes the leading role in this participative model. Moreover, besides interacting with the public through Internet discussions and public meetings, they are very much aware of the importance of the mediators in the communication model of science. In order to reduce the tension between mediators and scientists, the Royal Society published a report in 2000, giving guidelines for scientists working with the media and comments on a Press code of practice, entitled:

Scientists and the media.[13] I will discuss the content of the article in the following chapter, but for now I want to mention the recognition of the different roles and perspectives of the scientists and the media by the Royal Society. Thereby, at least through this report, the scientific institution formally abolished the acceptance of sender-transmitter model of communication.

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[11]Royal Society (2004):, 'talk to us: Cyber trust and Information Security: Which way forward? ', National Forum, London: Royal Society, 25 April 2004
http://www.royalsoc.ac.uk/templates/talkingpoints/discussions/Forum.cfm?ForumID=24

[12] Royal Society (2004):, 'About SIS, Science in Society Report 2004' London: Royal Society ,2 May 2004 < http://www.royalsoc.ac.uk/scienceinsociety/data/about/index.html>

[13] Royal Society (2004):, ''Scientists and the media: Guidelines for scientist working with the media and comments of a Press Code of Practice' London: Royal Society < http://www.royalsoc.ac.uk>, 2 May 2004

Also, in addition to the report mentioned above, they run communication-training programs for the scientists. They have declared their aim as the following:

'The Royal Society recognizes the importance of providing training to all scientists to ensure they are equipped with the skills needed to communicate with lay audiences, the media and scientists from other disciplines'[14] This communication training program can

also be interpreted as a training to understand the cognitive maps of 'others' in order to better communicate with them.

To sum up, in recent times, the two- way flux of information has also been taken into consideration by the institutions of science. However, contrary to Logan's secularization model, underlying idea of all these efforts is the aim of preserving the power of science and technology in society.

Up to this point, I have presented the historical approach of science popularization, scientific journalism and the science communication models of the West and analyzed how the role of the institutions reflected upon and changed the gap between science and the public in the science communication models.

However, from the beginning of the institutionalization of science with deficit models to more interactive models of science communication, the underlying aim of the popularization as noted before was the 'appreciation of science'. Therefore, as noted in the introduction, science popularization always complemented scientific progress. The following chapter will focus on the interaction and conflict between the scientist and journalist. As pointed out in the introduction, I will use these discussions to analyze the science communication model with respect to the role of scientific journalism in Ethiopia.

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[14] Royal Society (2004):, 'Program of media and communications skill training' London Royal Society <http://www.royalsoc.ac.uk/templates/search/websearch.cfm? Mainpage =/mediatraining/intro.htm>, 2 May 2004

2.3. Science journalism: Science and the media.

In the first part of this chapter, I made an historical approach to science popularization and scientific journalism in the West, mainly in the UK and USA. In this section, I will focus more specifically on the interaction between scientists and journalists.

The interaction of scientists and journalists in the science communication process causes conflicts as well as dependency between these two actors. Before moving to the details of this interaction process, first of all let us look at the three main differences in the rules of the institutions of scientists and journalists, as described by Friedman and Dunwoody (Friedman and Dunwoody: 1986)

The interaction of scientists and journalists in the science communication process causes conflicts as well as dependency between these two actors. Before moving to the details of this interaction process, first of all let us look at the three main differences in the rules of the institutions of scientists and journalists, as described by Friedman and Dunwoody (Friedman and Dunwoody: 1986)

2.3.1. The rules of scientists and journalists:

First of all, scientists exercise a great deal of control over their manuscripts and they negotiate the changes suggested by editors or reviewers. However, they cannot have the same degree of control over the scientific articles written by journalists, since this goes against the independence of journalism. Moreover, the decentralized structure of the mass media leads editors to step in at various stages and take over, making it difficult for the journalist to control the article from interview to print.

Secondly, there is an important difference in the timing concerns of scientists and journalists. Scientists can spend months checking their manuscripts and use the opinions of other scholars to get a journal published. On the contrary, journalists have much less time to produce a journal from raw material to the finished product. Sometimes, this process is done in a matter of hours and hence this inflexible, running agenda of media stories prevents the journalists from checking and rewriting.

Finally, there are considerable differences in the content of the articles. Media stories are shorter, contain less information, and are organized in a different manner. Moreover, in media stories, scientific language is transformed to non-technical language to make it simpler and more understandable. The differences between the rules of the institutions mentioned above exist primarily because they serve two different audiences. According to Friedman and Dunwoody, the articles written by scientists are must-reads for the scientists in the field; on the contrary, journalists have to attract their customers to science, in other words to sell science. (Friedman and Dunwoody, 1986)

2.3.2. The problem of accuracy:

These differences in the rules of the institutions cause the problem of ‘accuracy’, which is the main conflict between scientists and journalists. Although the first two statements affect the differences in the contents of the articles directly, in other words the third

statement, most of the critical analyses made on the notion of 'accuracy' focus on the different interpretations of the contents of the articles written by scientists and journalists.

For instance, Marianne G. Pellechia (1997) stated that scientists often consider inaccuracy to be the most important problem of scientific journalism. However, numerous studies have shown that the scientists' citation of inaccuracies were errors of omission and misplaced emphasis. Therefore, the problem of accuracy according to Pellechia, 'is subjective and more a matter of completeness or comprehensiveness of journalistic accounts rather than one of accuracy.' (Pellechia, 1997)

Friedman and Dunwoody presented the discussion of the 'perfect' science story that took place in the 1982 Annual Meeting of the American Association for the Advancement of Science with a group of scientists and science reporters.

The discussion of the accuracy of science journals can be interpreted as being consistent with the outcome of Pellechia. In both, scientists and scientific journalist agreed on the importance of accuracy, although it was accepted that there might be disagreements between the scientists and journalists on what constitutes of accuracy. Moreover, these disagreements were focused on the level of the details that journalists should give in order to not conflict with the scientist and at the same time sell science. Hence, the solution proposed to the problem of accuracy was mutual professional respect. (Pellechia, 1997) We can interpret this discussion as the acceptance that most of the accuracy concerns of scientists contain some degree of subjectivity and the reconstruction of the notion of the accuracy by negotiation between two actors.

However, from the journalist's point of view, is it possible to have the respect for 'subjective' accuracy in this competitive environment? At that point, I want to turn to the article of Hansen (1994) that analyses journalistic practices in shaping the newspaper coverage of science in Britain. He conducted interviews with journalists specializing in science reporting and found that, regardless of their specialization, they are governed by the rules of journalism. Moreover, although journalists have close connections with their sources --scientist-- the content and the newsworthiness of a scientific event are all shaped in order to sell science.(Hansen,1994) Therefore, although accuracy can be negotiated between the actors, the difference in the rules of the institutions makes the gap and the conflict inevitable.

When we look at accuracy problems in the selection of the news, we see that the selection of topics is not made in a balanced and objective manner. The journalists that Hansen interviewed argued that 'science becomes newsworthy when it sets ties to the wider social and political problems'. Moreover, since the news frequency o press does not match with the event frequency of science, some topics of science like environmental issues are problematized. Science news is more focused on breakthroughs or accidents, which do not consider the past research made on the subject. (Hansen, 1994)

In a related study, Nelkin Dorothy recognizes the importance of scientific journalism in the public understanding of science, and makes her research on the presentation of science in the popular press. She points out the emotional factors that enter scientific journals, to capture the attention of the readers. However, the readers, creating false hopes -- a cure for a disease, for instance -- or unnecessary fears, which could prevent the continuation of research, can sometimes misinterpret these emotional figures.

According to Nelkin, the majority of the public learns about science from the press. Therefore, the role of journalists should be more than that of selling science, but also of being responsive to the social dimensions of their articles. When journalists create false hopes by presenting an ongoing research as almost finished, the disappointment of the public in later periods can prevent the funding of an ongoing research, and thereby future outcomes. However, she also admits that it is not possible to affect the perception of the public by only simplifying the language of the scientific text. On the contrary, in order to capture the perception of the public, or sell science, journalists have to use the already existing beliefs held by the public. In that sense, rather than giving detailed information about the research, journalists foster a feeling either negative or positive about the scientific event. The crucial point, as I mentioned before, is the danger of misinterpreting the public in this kind of situation. (Nelkin, 1986) As I have noted earlier, the selection of topics also targets readers' perception.

Thereby, controversial issues in the press capture great attention from journalists.

The problem of accuracy lies in the presentation of different arguments. In order to balance the controversial issues, the journalists tend to present the ideas of maverick scientists. However, critics argue that with this method, too much space is given to maverick ideas that are generally not accepted by the scientific community, are unlikely to be supported by

empirical evidence, and have low probability of being fully realized. (Dearing, 1995) By the same token, in the discussion presented by Friedman and Dunwoody, scientific journalists were generally criticized for giving too much space to extremists. Moreover, this inaccurate balancing method applied in scientific journals was related to journalist's lack of understanding of scientific methods. (Friedman Dunwoody, 1986)

Finally, the first and second statements of the differences in the rules of the scientists and journalists lead to the conflict of fact checking. Some journalists find fact checking against their 'journalistic independence' in addition to their timing constraints; however, scientists blame journalists for publishing inaccurate journals without sufficient fact checking process. Experienced journalists argue that the best practice for fact checking should be done during the interview with the scientists, rather than sending the finished text to the scientists and letting them check the whole text. (Friedman and Dunwoody, 1986)

Hansen, in his research showed that, contrary to the general belief, scientists are more willing to cooperate with journalists to popularize their work. The suggestions for the solutions of all the conflicts require building a mutual trust relationship where there could be negotiation on the issues that create the conflict.

As a result, the conflicts I have presented in this chapter occur from the interaction of scientists and journalists and the different rules of their institutions. In other words, despite the suggestions requiring negotiations between these actors, these conflicts are somehow inevitable. Therefore, in chapter four I will search the applicability of these conflicts in the Ethiopian science journalism and relate it with the communication model in Ethiopia.

CHAPTER 3: METHODOLOGIES OF THE STUDY.

3.1. Introduction.

This study originates from a need to analyze the communication strategy of science and technology agency in Ethiopia /ESTA/. In particular the study focused on the radio phonic science script that is prepared by the popularization department of ESTA and perceptions of journalists who report science in the Ethiopian mass media, and contents analysis and interview with major newspapers that have science and technology sections in their pages. The rationale in conducting these surveys is from the belief that, the success of the

scientific institution, ESTA, depends on their being informed journalists who can communicate on issues of science and technology in a simple way to the public at a wider level.

Therefore the methodology of this study involves both qualitative and quantitative aspects. The qualitative method used to answer the first research question is based on "focused synthesis"[15] which is dependent on already existing information. The second and third questions are approached by survey and content analysis method that are quantitative approach and the interview with journalists and science scriptwriter is of course qualitative. In what follows is the instruments employed for each research questions.

3.2. Instruments for investigating Science communication strategy of Ethiopia.

3.2.1. Focused synthesis method

Focused synthesis may be very much like literature review by involving selected review of written materials and existing research findings relevant to the particular research question. It discusses information obtained from a variety of sources beyond published stories. It also engages in discussions with experts and stakeholders, anecdotal records, personal past experience of researchers, unpublished documents, staff memoranda, and published materials.

In varying degrees therefore, the following modes of data generation and analysis served to answer the research questions.

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[15] http://etd.unisa.ac.za/ETD-db/ETD-desc/describe?urn=etd-07122004-110440

3.2.2. Interview of the key stakeholders:

This was done through a variety of data generation technique such as talking to science and technology agency staff, radio phonic science scriptwriter, and other stakeholders, talking them in a face-to-face interview.

3.2.3. Review of documents:

The analysis of documentary sources in a key data generation methods used in social sciences research. Essentially, this involves the gathering and analysis of documents produced in the course of everyday events. In some cases the documents are viewed literally as data itself. In other cases they are read and integrated for evidence

For the purposes of the research question the following key documents were collected, collated and integrated for evidence.

1. Secondary official document of national science and technology policy, published December 1993, Addis Ababa.
2. Secondary private document radio listeners' "question letters" (1998-2003)
3. Secondary public document *Yeradio Kescience Mahider Beshuf*, radio phonic science scripts, published, Addis Ababa (1996-2005).
4. Secondary private radio "science and Life" science scripts and books, written by captain Afework , published in Addis Ababa (1964-1974),
5. Secondary public reports. Voice of Ethiopia Newspaper printed (March 7, 1967).

3.2.4. Literature review:

This consisted of a collection and analysis of the body of literature accumulating on local and global contexts within which the phenomenon of science communication has been evolving over the years.

This study originated from a need to investigate the science communication strategy by using popular science radio phonic in Ethiopia. Therefore, the author has evaluated popular radio phonic science scripts with respect to the period of publication (policies of the science popularization), the aim, the founders, the content and the authors. By analyzing the relationship between the content, founders and authors, the method and the scope of popularization was investigated.

However, in order to add meaning to the data I have gathered from the popular

Radio phonic science scripts, I did an extensive literature search to use the theories of the 'science popularization' and 'public understanding of science' debates in an historical perspective. The aim of using historical perspective was to show the underlying differences in the aim, the method and the scope of popularization and science journalism. For example, in developed countries, popularization activities occurred as a complementary aspect of scientific progress and scientific institutions were powerful. However, in Ethiopia the institutionalization of science was established long after developed countries, with the purpose of catching up developed countries

Therefore, the author used the communication models of the developed countries (mainly the UK and US) with respect to the role of their institutions throughout the history of science popularization and scientific journalism. Key questions of: '**Why science should be popularized**?' 'For **whom should it be popularized?**' and '**How should it be popularized** to figure out the differences and the similarities between the science communication model in Ethiopia and the Western models throughout history were used (Ulrik Felt, 2003)

I used the academic literature especially the work of Gregory and Miller, Felt, Wynne and Lewenstein in discussing the science communication models and the work of Nelkin, Friedman and Dunwoody in discussing the scientist-journalist interaction. The second pieces of research in this thesis involved a survey on journalists who 'report science' contents of science stories in newspapers that have science sections in their pages and depth interview with science story writers and radio phonic science script writers.

3.3. Survey of Journalists reporting science in the Ethiopian mass media:

3.3.1 Introduction

Currently, it is quite difficult to know how many journalists are employed in Ethiopia. However, there are number of journalists working for one of the country's two daily newspapers, a smaller number of journalists work for one of the two television networks with national news coverage (ETV and ETV2), or for one of the three radio news providers (Radio Ethiiopia, Radio Fana, and FM Addis) and Few journalists working for the weeklies private news papers.

No previous studies have been conducted to look specifically at journalists who report science for the Ethiopian mass media. This survey was designed to provide background information about who reports science in the Ethiopian mass media and how their individual characteristics may influence the production of science media content here and suggest a workable science communication strategy if there is a problem. For example, if few reporters have rounds with an explicit focus on science, less science news is likely to be produced. Similarly, the amount of time that a reporter spends covering science, as well as their experience reporting science and scientific training, could influence the way that they report science. Journalists were also asked what factors they thought limited their ability to cover science effectively. This survey was also used as a preliminary

investigation into the attitudes that journalists have towards sources, accuracy, balance and the weight of evidence approach.

3.3.2. Methods

A contact was made with the editors of one daily newspaper and three weeklies and national Radio and national news agency. The editors were asked to identify reporters at their news organization who covered science or the six rounds under which it was thought that the majority of science and technology stories would probably be covered: Agriculture, environment, education, health and medicine, computers/ IT and science. The editors were also asked to identify any other reporters who covered science and technology, and they were asked to give their permission for all of the reporters to respond to a survey. Science and technology was defined broadly, including coverage of health, medicine and the environment. A total 28 science reporters were identified from seven media outlets in Addis Ababa. From electronic media: *Radio Ethiopia, Ethiopian news agency*, *Radio Fana*, and from print media, *Addis zemen newspaper Addis Admas*, the *Reporter, and Medical* were identified and they provided the list of reporters who covered one or more of rounds identified above.

The questionnaire developed about this information was modeled from "World apart"[16] how the distance between science and journalism threatens America's future. Therefore the survey was divided into four sections (see Appendix A for the full survey questions). The first section contained four questions about how journalists view the Ethiopian media in general and how media coverage might be improved. Section two included three questions about how journalists gather and verify information for science stories, and section three included five questions about the balance and weight of evidence approaches to reporting science. Finally, section four contained nine questions to provide demographic and background information about the survey participants. The 28 mass media reporters were sent the survey on May 1st, 2006.

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[16] Jim Martz and Rick, (1997): Worlds Apart, how the distance between science and journalism threatens America's future

3.4. Science journalism practices: Case studies of the Ethiopian newspapers with science section

3.4.1. Introduction:

Science journalism reached a high point in some developing countries, in the decade of 1980s with the appearance of new science magazines and allocation of more room to science sections in the daily newspapers and weekly magazines.[17] Science communication activity in Ethiopia has been practiced using the radio medium. Presently many channels are being used to communicate science in the country. One government and three Private newspapers began to open a space for science and technology section into their pages with no assistance from scientific institutions or science services.

[17]SISSA (September 2005), science journalism in Latin America, <http://www.sissa.it >

Looking into the print media landscape, Ethiopia with a large population of 70 million people has a particularly small number of news organizations. In print media there are only two dailies *Addis zemen* and the Ethiopian herald and three fortnight newspapers Al-alem, Beressa, and Bekur that are owned by the state. The regional newspapers include: Woyen and Abiyotawe democracy published every fifteen days are party newspapers

The Private newspapers mushroomed since 1991. But very recently a significant decrease is observed. The current private weeklies include, the *reporter, Addis Admas, Medical, The Monitor, Capital, Fortune, Observer* and the *sub-Saharan. , Sendek, Fika*t(very short lived).

From these, Addis Zemen, Addis Admas, the Reporter and Medical have science and technology sections in their pages. However excepting Addis Zemen which is the government newspaper, others do not have policy guidelines specifically towards to science and technology.

Analysis is made on all science and technology stories from the three newspapers published from May 2005 to May 2006. The objective is to present a panorama of the way in which journalistic coverage of science and technology themes is being carried in Ethiopia as a developing country.

3.4. 2. Methodology

A number of studies of science news have employed content analysis to investigate various aspects of science reporting in newspapers; (Pellechia 1997) defined content analysis as a "research technique for the objective, systematic and quantitative description of the manifest content of communication." Today, it is widely recognized that content analysis is not value-free or objective because arbitrary decisions are made at all stages of the process (Deacon et al. 1999). However, being quantitative, it is replicable and systematic (Hansen et al. 1998), which makes it an effective method for detecting trends, patterns and absences in large amounts of text (Deacon et al. 1999).

3.4.3. Experimental design for this study

The content analysis followed the general rules and assumptions for the analysis of written document content (Deacon et al. 1999).

As a starting point the author used the analysis of newspapers having a science and technology section in their pages and restricted to the materials published by them.

Three newspapers were selected during this study period: These include: the daily newspaper, *Addis zemen*, that presents science stories every Wednesday, *Reporter* a weekly newspaper that gives science and technology stories every Wednesday, and *Addis Admas*, every Saturday. I studied three newspapers, (*Addis zemen., Addis Admas, and the Reporter*) from May 15, 2005 to May15, 2006. The rationale for selecting the three over the *Medical* newspaper is that they have better circulation, and are relatively cheap except the reporter. Moreover Medical is concentrated only in one field of science medicine. This does not go to the definition of science given by this study.

A sample of two weeks was constructed from each month edition in a one- year period (May15, 2005 – May 15, 2006) by randomly selecting a starting date. The random selection uses a simple combination of weeks from the set of weeks {1, 2, 3, 4} as 1&2, 2&3, 3&4, 2&4, 1&3, 1&4 are selected for the first six months and this was repeated for the second six months of the year. Therefore in the year editions, twenty-four articles from the *Addis*

Zemen, 46 articles from the *Addis Adams* (for there are multiple articles in a section) and 81 articles from the *Reporter* altogether I analyzed.151 articles were analyzed. On each sample week, a single coder (the author) read all of the stories of the three of the selected Ethiopian weekly newspapers. The method of analysis combines quantitative and qualitative methods. For quantitative analysis the author used as a starting point of an instrument developed by (Bauer, 1993**),** which has approximately 60 variables'. In this survey I concentrated on a three variables. I chose this instrument because it attended my analytical interests. Therefore variables chosen were knowledge area covered that is which area or field of science (biology, physics/astronomy, human/evolution, agriculture, medical technology) is covered or not, also whether the science sections of the studied newspapers give emphasis to "promises**"** or "concern**"**, related to science and technology and which sources were used for the stories development**?**.

3.5. Interviews with Science writers: *Addis Zemen, the reporter and rdio phonic science script writer* as a scientific journalism practices in Ethiopia and interactions with the scientific community:

After presenting the general structure of newspapers, I conducted Interviews with the journalists of the two newspapers and science writer/radio phonic science script writer/ in Ethiopia.

Considering that the debate of public understanding of science or science popularization is not present in Ethiopia, The interview was planned in such a way as to see the differences between the general ideas regarding scientific journalism and its practices.

Hence, the first question was started with general questions regarding the scientific journalism in Ethiopia. The second was then the interaction between the journalists and their source with respect to the role of the public. The third part, were more specified questions about these conflicts and the journalistic practices and or accuracy problem **.**The questions of the interviews were adapted from Dunwoody Sharon in order to interpret the differences between the West and Ethiopia. Sharon Dunwoody, in the book 'Scientists and Journalist' concentrated her interview on the question of accuracy issue of popular science articles between scientists and journalists. Finally in order not be repetitive in the answers

of the two journalists, I either gave only the answer of Addis zemen or present the differences.

CHAPTER 4: SSCIENCE POPULARIZATION / JOURNALISM IN ETHIOPIA: PRESENTATION AND ANALYSIS OF DATA

4.1. Overview:

In the second chapter, I have presented the development of western science communication models and scientific journalism in the 20th century to make dynamic analyses of the gap and the role of the actors. In the second section of the same chapter, I have focused on the interaction between scientists and journalists in order to understand the conflicts as the consequences of science communication with public. In this part, I used the discussions regarding the science communication models in the developed countries to evaluate the science communication model in Ethiopia with respect to the role of the scientific journalism.

Therefore this chapter consists of four sections. Section one covers the data, results and discussions of the past (historical) and present popularization methods, section two and three are the survey of journalists and content analysis and section four is the interview. The purpose of making an historical account to the communication models in Ethiopia with respect to the role of the scientific journalism is to show the changing roles of the actors throughout the history. In other words, the science communication model in the late 60s was more interactive compared to the present time situation after the institutionalization of science, therefore the gap between the science and public is socially constructed by the actors rather than solely dependent of the development level of the country.

In all of the first section, the author searched out the differences and the similarities with the Western models by considering the key questions '**Why science should be popularized**?' **'For whom should it be popularized**?' and '**How should it be popularized?'** The differences in the answers of these questions in the Western countries and Ethiopia throughout the history change the roles of the actors and hence the structure of the communication models.

Secondly the analysis of the survey, content analysis, and the interviews will be evaluated based on the fixed variables with respect to the theories framed in chapter two.

4.2. Science popularization methods in Ethiopia.

4.2.1 A Historical account (1941-1974)

The main journal of information that caters for the general public, *Addis zemen* newspaper was founded in 1941 a few months following the liberation of Ethiopia from fascist forces. Although modern newspaper were post-1941 phenomenon, the development of journalism goes back to the late 19th century. In 1890 for instance a weekly newspaper known as "La semaine D' ethiopie" was being edited in Amharic and French[16].). This newspaper ceased publication during the outbreak of World War I, when its editor father Bernard was recalled to France (*Ethiopia today, 1973, p 32)*.

In 1892 a weekly newspaper called "Aemiro" (intelligence) was launched in Addis Ababa. This newspaper continued publication on and off until 1924[18.] There were also monthly-illustrated magazines such as Ethiopia mirror and Mennen. Other weeklies and dailies newspapers like the Voice of Ethiopia, Addis -Soir etc had also existed until 1969. The voice of Ethiopia continued from 1956 up to 1967. Nevertheless there had never been popular science magazines in that period. Needless to say, two scientific institutions, Addis Ababa University, science faculty, were established on December 11, 1950 with the general objectives of teaching and specific objectives, "*food quality and quantity improvement, conservation of natural resources and disease and vector control* (*Addis Ababa University 1986 p.3)*

The imperial medical research institutes now called Ethiopian Health and Nutrition Research Institute (EHNRI) was established in 194319 with objectives of, " contributing to the development of health science and technology, conduct *research on infectious and non-infectious disease, nutrition* (*EHNR, 1995-2002, p.43*). Until now scientists did not show an attempt to link their technical media/peer journals/ to popular science writing (newspapers, TV and radio).

The Ethiopian radio was established in 1963[20]. Like any other developing country Ethiopia is bedeviled with the problem of illiteracy. Radio is therefore the most important medium for informing the public. The radio station was assumed to play a vital role in *informing, entertaining and educating* the entire people of Ethiopia. (Ministry of Information, 1973, p.33)

The second half of the 1960s was a period where great importance was given to science to the public. There were lots of efforts made to popularize science and scientific thought throughout the country. Captain *Afework Yohannes* and his colleagues in the public media formed their science and technology policies for the sake of the public rather than a 'few intellectual elites' (*Voice of Ethiopia, 1967).*

The public in general was illiterate and uneducated and the country as a whole was alienated from the latest scientific developments occurring in the Western World. They saw the importance of educating the public with science as a prerequisite for the development of the country.

Therefore in this section I will make the analyses of the first popular science radio phonic scripts, "*Science and Life*" in Ethiopia. The present situation after establishing the science and technology agency follows in the next section.

[18, 20] Ministry of Information, 1973.Ethiopia today communication (p.31-35.) Addis Ababa Ethiopia

The popularization "Science and Life" radio phonic was seen with five dimensions: **the period of publication**, the **founder** and **the authors,** the **aim of the script,** the **content of the radio phonic science scripts**, the **reason for not continuing**. Within these five dimensions, the special characteristics of science popularization in first years of Ethiopian as a developing country will be pointed out.

4.2.2. "Science and Life" popular science radio program (1964-1974)

The first popular science radio program of Ethiopia was '**Science and Life.'** This program was launched in 1964, broadcasted every three days in a week. Tuesday and Thursday's program were narration about general science focusing on profiles of eminent scientist. For example who is Albert Einstein, Newton? Who is the first Biologist? Etc. Also a discovery of scientific phenomenon that occurred and found in the developed world was treated. The Sunday program was entirely devoted to question and answers. Answers were given to questions sent by the audiences through letters. The objective of program was as follows.

> ***The purpose of the program was to bring the latest scientific developments to the listeners / readers/ of our country and to*** **complement what the child learns in schools and the adult knows from experience** ***and make them aware about science by using question and answers, simplifying the language of science and making it understandable and useful to the public***. *(Voice of Ethiopia, 1967, p.14).*

The "Science and Life" program had a great reputation and very high audience rate compared to other programs disseminated in that period. I couldn't find a document that depict about audience rating. However, to the answer of my question, I made an interview with Yohannes, the son of captain Afework a computer specialist by profession. He said that, "audience rating for science and Life was 60%." This result reflected that the vast majority of the listeners liked the program *with reference to the population and the coverage area.* In what follows were excerpts from the newspaper Voice of Ethiopia, March 7, 1967 about the popular science radio program "Science and Life." had a title: **Good Response Indicates Success of Radio Program**. It reads as follows:

> *..By far the most successful has been however, Shambel (captain) Afework's "**Science and Life**" program, popular science item which attempt to answer such moot point questions as: "If God is the creator of our Earth, who created God?" On the whole, the program deals with every conceivable question. "Questions come from everywhere from all sorts of people", said Ato Solomon radio Ethiopia production director. "This lively program comes from the people and goes to the people," said, Mr Glaeser, from radio training center. But it is science alright- at its rudimentary yet fundamental stage. What makes it even livelier is the unsophisticated way of giving the unsophisticated questions, unsophisticated answers. Indeed it is science for all seasons-irrespective of age, educational background. Young students listen attentively and adults grin with assurance when Shamble Afework lists down his answers in a language that might as well come from the rustic farmer or any one on the other side of the seesaw—an affected urban resident.*
>
> *But as one noted journalist indicated there might be danger in trying to answer moot point questions.*
>
> *As it is, "science and life" is not a one-man job- even if he were a scientist, which Sahmbel Afework is not by training. But he is a prolific author covering subjects ranging from mythology to atomic energy. At present his main complaint is reference. He does use the libraries in town but he could not cope up with incredibly new fangled questions – newfangled both in quantity and quality.(Voice of Ethiopia 1967, p.14).*

Captain Afework was twice complemented by the Emperor as a man who contributed to the growth of scientific knowledge in the country.

Afework wrote 18 books he passed away in 1980. Among all three of the books were on science for the public. In fact all the topics and contents of these books were taken from the radio program scripts he used to prepare. The radio format followed narration and Question and answer scripts.

In what follows is the title of topics in each book, for example: "**Tibeb ena Ediget**" meaning "*Wisdom and development"* was published in 1972, and consisted topics like: science and its usage, how did Mathematics started, Euclidian, time concept, the ten commandments of health, etc, "**Big questions and Answers**" was published in 1975 and

consisted one full chapter about question and answers from *"Science and Life"* radio program, (see Appendix..B Sample questions from listeners) "**Alem Yeseratogn Nat**" meaning "This *world is for those who work*" was published in 1978. The entire volume of the book is science and technology with a focus on applied sciences such as: industry, agriculture, environment and engineering.

The main source for the scientifc script development was entirely from developed countries, particularly U.S. For example the United States Information Service, (USIS) library in Addis Ababa, newsletters, radio tapes and science magazines sent to him from abroad were the main sources[21].

Afework's talent and ability turn the references to simple local language translation and presentation with respect to the experiences and folk-knowledge of the public. Keeping the Ethiopian public abreast with the current discoveries of science performed in developed countries was also Afework's effort. For example in time he has introduced about Apollo11, new medical surgery translating it to vernacular as "Kedo hikmina " a technical term, which is now commonly used by the public in the Amharic language. Therefore 'popular science' was dominating unlike the superiority of science as deemed by scientists.

I have made series of interview with Afework's son Yohnnes. What follows is what he said, "My father was a devoted reader and writer, gifted writer to science, poems, journalism, and also I remember when he gave lecture to university students and to his military colleagues in any subject he likes to deliver. He was a fluent speaker and writer of the French, English and Italian language. He completed secondary school but had a lot of experience to the outside world. He was a self taught science journalist".

21-22 Iinterview with Yohannes Afework May, 2006 Addis Ababa

In this research, captain Afework could be announced as the first science popularizer and or science journalist in Ethiopia.

The reason for the discontinuity to the 'Science and Life' program, despite its growing popularity was due to a change of state or a revolution in the country and the capacity of the actors for the program production. The period after this could be taken as the dark period. However between 1983 and 1985 an initiative of science popularization was under taken by government organizations to their target audience who were workers and elites but

not for the public. However, the project was a failure due to its uncoordinated effort and methodologies and choice of contents was not in consonance with the types of audience they supposed to address.

However, science popularization was revitalized in 1992, after two decades when the Ethiopia science and technology agency as a scientific institution took power and strength.

4.2.3. Discussion:

As it is already mentioned, in the late 60s, the producers of "science and Life" radio program devoted all their efforts to popularizing and legitimizing Western scientific thought to the public. It was an urgent situation, which covered up the public as a whole, rather than the few elites, in order to survive and develop.

In sum, the analyses of the "Science and Life" radio program show us the style, type and the level of science popularization. Therefore, although scientific knowledge was explicitly interpreted superior to folk knowledge, the popularizers were successfully using folk knowledge of the public to foster curiosity about science and technology. (See listeners' samples of questions incorporated in the appendix B) Therefore, it was obviously not a deficit model; on the contrary there were some similarities with the 1980's of Europe, where they started to attribute meaning to the public sphere. However, although science was not institutionalized (science and technology agency/institute was not established) and the popularization activities were held by individual efforts therefore could not be continued long.

4. 3. The present situation

4. 3.1.Science and Technology Agency Popularization strategy.

A critical turning point after the dark period is the foundation of the 'The Ethiopian science and technology commission, ESTA in 1975.As will be discussed below; ETSA is the main institution for popularizing scientific activities in Ethiopia. Therefore, in order to understand the present time situation for the communication models of science, I will start by disclosing the functions and aims of ESTA in science popularization and then move to the radio phonic science scripts written by ESTA for popularizing science and technology issues.

4. 3. 2. The Ethiopian Science and Technology Agency (ESTA) duties:

The Ethiopian science and technology agency (ESTA), which is the supreme organization put in charge of promoting, developing, organizing and coordinating research and development in the fields of exact sciences in Ethiopia in line with the national targets of economic development and technical progress, was established in 1975. It functions under the fold of the Prime Ministry with adequate administrative and financial autonomy.

In what follows are the powers and duties of Ethiopian science and technology Agency.

1. Formulate Ethiopia's science and technology policies,
2. Formulate widely applicable science and technology plans and issues for sartorial science and technology policies, plans, programs and projects
3 Supporting, encouraging research and development centers and institutions
4. Provide awards/incentives to individuals and institutions that have contributed to the development of science and technology
5. Develop the capability and the system for searching, selecting negotiating, procuring and importing technologies that are appropriate to the Ethiopian socio economic conditions.
6. Initiate patent law that encourages and supports technology transfer.
7. Assist and encourage the establishment of associations that contribute to science and technology development.
8. Encourage and ensure the application of the studies research and development activities carried out to improve and develop indigenous technology.
9,. Establish a system for the collection of information on science and technology accomplishments research work and results there of.
10. Keep a list of professionals and institutions that engage in research and development activities.[23]

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[23] ESTA (2005), 'ESTA, profile power and duties', December 2005

However, as it is seen above, out of the ten functions listed, not a single function opens the way to the popularization activities by publishing popular scientific magazines and books.

Moreover, aside from this function, the weight is on the promotion of research and development activities.

On the other hand, in the science and society report 2004 of the Royal Society, the president of the Royal Society points out the importance of science and technology communication to the public and declares that science and society communication shares an equal weight with Research and Development issues.[24] It is not my intention here to decide on the accuracy of this statement or to judge the level of success of the Royal Society in its Science and Society program, yet to compare how they introduce themselves.

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24 Royal Society (2004):, 'Science in Society Report 2004' London: Royal Society < http://www.royalsoc.ac.uk/scienceinsociety/data/about/Science_in_Society_rev.pdf>, 5 August,2004 55

The 'why' question, is interpreted differently than by the Royal Society. In its science and society report of 2004, the Royal Society's first reason for promoting public communication is explained as '*to help earn the public confidence in science'*[25]

On the other hand, the aim of the public communication in Ethiopia can be interpreted as promoting and encouraging young people to become scientists. The West popularization also stresses the importance of attracting the young people; their scope also includes the wider audiences considering the funding purposes of the ongoing projects. Therefore, in a way the scope of the popularization of ESTA is lower than the Western countries, since it does not concern the public as a whole.

Besides the differences in the aims of the scientific organizations, as noted before the institutionalization of a scientific organization in Ethiopia with the establishment of popularization department is a turning point in the history of science popularization in Ethiopia.

Nevertheless, regardless of the differences in the policy and strategy of science popularization, the most important initiative of the period after 1992's was Radio program and radio phonic science script popular book production by popularization department of ESTA

The goal of the department is:

> Develop the science and technology awareness, knowledge, and culture of the public, and the specific objective is, popularize useful findings of science and technology through different appropriate media. (ESTA, 2005 popularization services information brochure, Addis Ababa Ethiopia)

This sounds as an objective of maintaining 'appreciation of science" for it supports the research institute activities instead of attempting to foster the public understanding of science.

The radio popular program was launched in 1992 by ESTA in collaboration with the radio Ethiopia. Radio phonic scripts are distributed to school and public libraries for reading interest.

I will try to analyze the five Radio phonic science scripts that are compiled by the department with four dimensions: **the period of publication or production**, the **founder and the authors,** the **aim of and the content**. Within these four dimensions, the special characteristics of the scripts of science popularization in the first six years of the Ethiopian federal republics as a developing country will be pointed out.

4.3 3. Radio phonic science scripts as popular media (1992-2005).

In the present time a popular science radio program is broadcasted to the public in five local languages. The scientific institution, ESTA, in collaboration with radio Ethiopia, produces the programs. The script is written by the staff of the Ethiopian science and technology agency, and it is read by media personnel /journalists/of the radio Ethiopia. This could be called as the second popular science radio phonic of Ethiopia, next to "*Science and Life*" program the public had in the 60s. The present program is called 'Kescience mahider'.meaning from the "*Archives of science*" The radio voice scripts are compiled in book form and are distributed to school and public libraries since 1996. There are 12 editions so far compiled from the radio programs scripts.

The objective of each edition reads the same:

> ***The purpose of the edition is to bring the modern and scientific developments to the listeners/readers in particular with: crop production methods, basic health and sanitation cares, natural phenomenon and environmental problems and control, and general awareness on scientific issue with illustrations to make it understandable and useful to the public*.** **(Yeradio Kesience Mahider Beshuf, 2005, p.2-3)**

The writers of the radio phonic science scripts and "Yeradio Kesience Mahider Beshuf" are engineer and agriculture experts respectively.

The content of the program has definite topics which details on specified fields. Program format is similar to "*Science and Life*" treating questions emanated from the listeners. Some times the script treatment involved scientists and medical doctors.

In what follows, are five topics I took randomly from 1996- 2005 editions? Most of the contents and topics analyzed (99%) are on the field of agricultural science.

For example the topics of each edition are as follows: "General concepts about science and technology" 1996 edition. "What kind of trees should we grow?" 1998 editions "Endod plant and its usage" 2000 editions "Pests and pest control" 2002, edition and "silk worm production" is 2004 edition.

The Author of the scripts and resource persons in the program were graduates and scientists from the 'agricultural and medical School of Ethiopia. Generally the focus on basic sciences compared to applied science is less." Although it is not a report directly from laboratory research It is similar to "technical media" approach or style of writing. Who write plainly for the public the scientist or journalist? Professionally, who is responsible for the public?

It is not by chance that the content of the popular science radio phonic script were dominant on applied sciences. As I have pointed out before, it is not possible to go from the same stages with the Western countries in a globalize world. The research and development expenses set by the third world countries are much lower than the western countries.

I have also scanned 150 question letters from listeners of radio science program from the year 1998-2005. I should explain that the document I found was not properly packed in chronological order. Letters of one year dominates the other. My focus was not to evaluate the radio program or audience analysis. Nor it is a systematic content analysis. But I was interested to see the nature of the questions and educational background of the listeners ***(as*** *a target group****)*** from their letters sent down to the agency.

The results showed that from 150 letters 20 letters do not describe the person's job and educational background. Therefore 130 letters were scanned with the following variables: What field of science do question pinpoint? What educational background / job have the

listeners or target audience just from their letters? It was found that the spectrum of questions range from pure science to applied science. Question on areas of agriculture and agricultural technology stands 6.6%, Technology (Questions about, about tape and cassette recorder, how did radio was invented, does radio finish, how did jet be produced, car, Rocket, Dry cell battery and car battery, milling cars/machines computer language translator machine, who did invent watches, telephone, satellite, nuclear technology Electric wires functions, power using solar energy, radio waves, Airplane inventor, radio transmission waves.) stands 16%, Health questions 35% Natural science questions (Biology, chemistry and Physics) 20% Astronomy areas questions 20% .

So, the interests of the "active listeners" and the areas or fields of science treated in the radio phonic science scripts mismatched. In the analyzed letters the majorities were (98 %) teachers and students. However there is no evident observed from the letters what grade level the students are and as well what level the teachers teach. On the other hand from non-student and teacher groups, there were only one from kebele / village peasant association/who asked to hear about fertilizers and their usage, and two from development office who asked to know about tea and coffee plantation and their production. One unique question found from these letters is the question of approaches or methodology of the radio science program presentation, saying, "Why don't you present the popular science radio program in dramatic form?"

4.3.4. Discussions: The special characteristics of the radio phonic science popular scripts, "*Science and Life" and 'Kescience Mahider" or"From the archives of science*"

Does the establishment of scientific institution (Science and technology agency of Ethiopia) increase the scope of science popularization in Ethiopia**?**

If we compare the two programs, they have similar format and objectives. However, "science and life" was given more air- time (broadcasted three times in a week) than the present one. The program, "From the archive of science." is broadcasted once in a week. In 1960s the population of Ethiopia was about 22 million, but now Ethiopia is 70 million. Ato Tesfahun a senior radio phonic science scriptwriter conveyed his concern about the less attention and cooperation airtime schedule given to the science program by the national media. The Amharic science radio program is broadcasted every Thursday at about 8:30-8:45 AM. This is the rush time in which, target audiences, teachers and students, including

the population at large move to working place. (The Ethiopian Herald, 2004 p.11). The government does not give attention to the science and technology popularization.

On the other hand the scientific institution, ESTA does not have any link with media personnel for example with journalists. The script as well as the compiled edition is written by the staff of the scientific institution themselves. But there has never been a scientific journalist grouping in the radio phonic science scripts. This has been found in agreement with the survey results. But the author of the" Science and Life' script was a journalist but not a scientist by training. As mentioned above the program was very much liked by the audiences.

The AAAS is one example of the many scientific organizations in U.S.A that work closely with reporters. In the need to working with media the AAAS executive officer Wolf, told his board of directors that 'we have chosen to co-operate on 'leverage' projects where we work with the mass media staffs rather than trying to reach the public directly ourselves' (Lewnstein, 1992). *Wolf and the AAAS leaders reasoned that helping professional science writers was more productive than trying to write, produce and distribute material from scratch. But in Ethiopia neither the journalists nor the writer associations are affiliated to the scientific institution*.

The second point of comparison between the two radio popular programs is the content of popularization. Though the objectives of popularizing are considerably similar, the contents of "Science and Life" had a wide spectrum of fields, and include the basic sciences. The "Kesience Mahider" radio program is dominated by agricultural science. On the other hand the science fields identified (from questions of listeners) were not predominantly agriculture. A point to mention here is that, there is a reflection of mismatching between the interest of the listeners' and the overall selected science fields by the popularization department of ESTA as in the case of "Kescience Mahider"

The differences in the fields are most probably related with two important points. First of all the authors of radio scripts and "Yeradio kescience Mhaider Beshuf" are agriculture experts and engineers, specializing in applied sciences, rather than the basic sciences or self taught science journalists. Secondly, the science and technology agency of Ethiopia is

supporting the R&D activities and make long term science and technology policies of the country.

There are two crucial points in this situation. The first thing is that science was seen as guidance to society, it was objective and superior to all cultural norms of the society. When we look at the image of science in the first half of the twentieth century in UK and US, the situation is not different. However, the difference was that science in Ethiopia was not institutionalized and powerful.

Therefore the appreciation of science and its institutions would not be enough, as it was in Western Societies of that period. Thus, despite the image of science as superior to society, the deficit model of communication was not appropriate for the country. There had to be a change in the existing knowledge maps of the people in order to be proactive to change their way of life in this direction, since there was no luxury of being reactive like the industrialized societies of the Western World.

Obviously, it is not correct to conclude that the public is not black boxed at all, but on the other hand it is also not correct to state that the public is perceived as undifferentiated individuals. There are no systematical surveys on the differentiation of public. According to Miller Jon D. ' Communicating scientific information to the public successfully requires the recognition that 'the public' is not a single homogenous entity, but rather a complex structure of segments defined mainly by interests, knowledge and broader life goals(Gregory and Miller 1998)

The third point is that both initiatives do not show a research or survey made on the knowledge map of the public, (qualitatively or quantitatively) before the popular science radio programs were launched. And therefore unlike the developed countries; in which their project is based on researches, the strategy of science communication of ESTA seems to be spontaneous. It is neither exactly "deficit model" nor interactive. On one hand it is similar to the deficit model, for there is a reflection of separating the science from folk knowledge and inclined too more applied sciences. On the other hand the content selection is not based on research finings that is based on the interest and attitudes of the public

towards science and the scientific knowledge map of the public as usually done in developed countries.

The next section is focusing on survey of the Ethiopian media science reporters. The purpose of this section is to identify the journalists' view on science coverage in the Ethiopian media, how journalists get their information for their own science stories, and their experience as a science journalist. Looking into these will lead one to identify the problems of science journalism practice in the country, and judge whether the practice is a viable model or not?

4.4. Results and analysis: Survey of Journalists reporting science in the Ethiopian mass media:

4. 4. 1. Journalist attributes

Of the 28 journalists who were sent a survey, 26 responded, for a response rate of 92.85%. Two journalists responded that they did not report science and technology, but read the science scripts written by ESTA for the radio program broadcast. Thus, a total of 26 completed surveys were received from journalists.

Almost one third of the respondents (34.6%) had been working as a journalist for more than ten years, while 19.2% had been working as a journalist for less than three years (Fig.4.1). Most of the journalists (34.6%) had not studied science beyond secondary school. Only five (19.2%) had completed an undergraduate university degree in science, and an additional four journalists (3.8%) had a postgraduate degree in science (Fig. 4.2).

Table 4.1: The number of years that the surveyed journalists (n = 26) had spent working as a journalist and reporting science.

Years	1-3 yrs	3-5 yrs	5-10 yrs	More than 10 yrs
Percentage	7.6%	19.2%	34.6%	7.6%

Table 4, 2. Educational backgrounds of survey respondents (n=26)

Educational background.	Secondary	Tertiary /under graduate/	Post graduate
Percentage	34.6%	19.2%	3.8%

Also survey respondents (Fig 4.3) were asked questions like, "Do you know science and technology policy?" "Do you have guideline for reporting science?" Does your media organization have a bond with scientific institution?" Only one fourth of the survey respondents (23%) answered, "Yes" and the great majority (65%) responds "NO". When 30.7% survey respondents said, 'We don't have a link' with scientific institution, 76.9% said, there is no guidelines for reporting science in the media organization.

Table 4.3. Survey respondents (n=26) for the questions whether they know the policy or have a link with the science and technology agency

	Yes	No
ESTA Policy	23%	65%
Link with ESTA	30.7%	57%
Guide for Science	11.5%	76.9%

4.4. 2. Media attitudes toward science

Despite the relatively small amount of time the respondents spent covering science stories, 46% of the journalists said they wanted to spend more time reporting science. Only two respondents said they wanted to spend less time covering science.

Most of the journalists surveyed believed that their news organization had either a supportive or neutral attitude toward science news (Fig. 4.4). Only one journalist (3.8%) said that their news organization was not supportive of science coverage and six journalists (23%) respond that they have no idea.

Table 4.4. **How survey respondents rated their news organization's attitude toward science reporting.**

Attitude of organization to Science journalism	Highly Supportive	Supportive	Unsupportive	Neutral	Don't know
Percentage	15.3%	34.6%	3.8%	19.2%	23%

One of the survey questions asked journalists to identify the three scientific fields that their news organization covered most frequently and the three fields that they believed should get the most attention from their organization. The fields that journalists identified as receiving the most attention matched very closely to the fields that they believed should get the most attention, suggesting that they were satisfied with the range of scientific fields currently covered, were agriculture/farming, environment/ecology/, medicine/health computer/technology, and climate/atmospheric. They were rated as the fields that both *did* receive and *should* receive the most media attention. This rating has matched with content analysis survey.

4. 4. 3. The use of scientific sources.

The average number of scientists that journalists said they usually contacted for a science story was 2. Figure 4.5 eleven journalists (42.3%) said that they would contact only one scientist for information, while three journalists (11.5%) said that they would contact none.

Table. 4.5 Survey respondents (n=26) the number of scientists they contact when developing their science stories

	None	1	2	3	4
How many Scientist?	11.5%	42.3%	11.5%	7.6%	7.6%

Figure (4.6) shows that for most of the surveyed journalists, a variety of people initiated their science stories. The mean percent of stories initiated by each source for all of the respondents was calculated by totaling the number of responses per category (0%, 1- 25%, 26-50%, 51-75% and 76-100%) multiplied by the category midpoint (i.e. 0%, 12.5%, 38.5%, 63.5% and 88.5%) and dividing by the total number of responses. Using these rough mean estimates, public relations officers or other sources initiated science stories most often. Scientists, editors and journalists themselves initiated science stories about one-third as many stories.

Table 4.6. The percent of survey respondents who said that they rely on these sources to initiate their science stories at the frequency specified.

Source	0%	1-25%	26-50%	51-75%	76-100%
PR officer	23%	30.7%	15.3%	19.2%	----
Scientist	15.3%	38.5%	7.6%	7.6%	7.6%
Editor	3.8%	53.8%	26.9%	3.8%	-----
Self	38.5%	23%	11.55	11.5%	-------
Other	3.8%	76.9%	11.5%	34.6%	3.8%

Journalists were also asked whether each of six potential changes would improve the quality of science coverage in their news organization: 1) increasing the number of science reporters, 2) increasing the amount of time spent reporting science, 3) cr increasing editorial support for science 4) increasing scientific training for journalists, 5) improving the system of delivering news from scientists to the media, and 6) increasing communication training for scientists.

More than 70 % of respondents thought that all but one of the proposed changes would improve the quality of science coverage either ‘lots’ or ‘some’ (Fig. 4.7). The greatest number of journalists said that the quality of science coverage could be improved 'lots' by increasing scientific training for journalists (53.8%) and improving the system of delivering news from scientists to the media. Journalists also said that, increasing communication

training for scientists (46.15%), Creating a formal science and technology round (34.6.1%) and increasing editorial support for science. improve coverage.

Table 4.7: The percent of respondents that thought that the following changes would improve the quality of science coverage in the Ethiopian mass media 'lots', 'some', 'little', or 'none'.

	Lots	Some	Little	None
No of reporters	26.9%	39.6%	30.7%	7.6%
Time	34.6%	15.3%	30.7%	19.2%
Editorial support	34.6%	30.7%	15.3%	3.8%
Training. for Journalists	53.8%	7.6%	26.9%	7.6%
Better system for delivering stories	53.8%	15.3%	23%	7.65
Training for Scientists	46.15%	19.2%	23%	15.3%

4.5. Data and Results: Science journalism practices: Case studies of the Ethiopian newspapers with science section.

One hundred and fifty-one stories were collected and analyzed with respect to the categories of knowledge area, the tone, a promise or concern and the sources of the articles, whether they emanate from local or overseas,

4. 5.1 Characteristics of the science stories

Figure 4.8 Knowledge areas: The percent of science articles categorized to knowledge areas

Knowledge areas	Biology	Physics	Human	Environment	Agriculture	Medical	Technology
Addis Admas	-	-	34.7%	-	2.17%	10.86%	**52.17 %**
The Reporter	-	3.7%	-	20.9%	-	**41.9%**	33.3%
Addis Zemen	8.3%	-	8.3%	12.5%	**37.5%**	25%	8.3%

With regard to the areas of knowledge covered in the published stories an important variation can be observed from one newspaper to another (figure 4.8) Approximately 52% of the texts published in the *Addis Admas* reflect the emphasis given to technology. This area also has significance presence (33%) in *the Reporter*. In the case of *Addis Zemen* Agricultural sciences make up for 38% of the articles. *The Reporter* (41%) emphasized Medical cases. One must bear in mind that these figures could vary if the analysis had been made in different periods.

Table 4.9: Tone-promise or concern? The percent of science stories and scientific claims that were collected from three Ethiopian newspapers: two private and one national.

Tone - promise or Concern	Promise	Neutral	Concern
Addis Admas	-	60.17%	36%
The Reporter	6%	36%	50%
Addis Zemen	41.6%	20.83%	29.16%

Articles were analyzed to consider a range of answers that included, promise, concern or neutral. As shown in figure (4.9) in almost all the newspapers we observed an important percentage of "neutral" articles. *Addis zemen* however, had a relatively a smaller percentage of "neutral" articles but in compensation had a greater number of "promise". (a promise in this context is scientific story that gives answer to the question or whether scientific articles create hopes in the public. to ongoing research is presented as if it were concluded). This is mostly seen in major newspapers Addis Zemen rather than major

private newspapers. "Concern" (in this context is deemed as scientific stories concerning health or food or environment relevance to the public). In this regard the Reporter in comparison to others was showing high number of stories. However, in all newspapers the extremes presented low values. In all the newspapers analyzed no mention had been made about controversies, and risks related to science and technology.

Table. 4.10 Sources: The number of sources referred to each science stories from the Ethiopian newspapers during the period of study.

Source	Local /national/	International/overseas
Addis Admas	6.52%	93.47%
The Reporter	12.35%	87.65%
Addis Zemen	100%	0%

With regard to the sources, the presence of foreign research is high in the newspapers analyzed especially from the developed countries (figure 4.10). In *Addis Admas* and the *Reporter* the figures were high respectively, 93% and 87% of the articles in the analyzed period referred to issues related to developed countries. On the other hand *Addis Zemen* had highest rate on the national research, following the editorial guidance of overseeing its own local achievement.

An influence of foreign news agencies can be observed and even the publication of the entire articles from foreign newspapers.

4.6. Interviews with ***Addis Zemen newspaper, the Rreporter, and "Kesience mahider radio phonic science script writer*** *as a good practice of science journalism in Ethiopia.*

4.6.1 A general look to the scientific journalism in Ethiopia:

In this part, I asked two general questions about the scientific journalism in Ethiopia. These two questions are linked to each other where the second question should be the cause of the answer of the first question. Therefore, there shouldn't be a conflict between the answers of the two questions in theory.

Q. How do you interpret the scientific journalism in Ethiopia?

Radio phonic script (govt): Scientific Journalism as a profession is not developed in Ethiopia. But in general scientific journalists in Ethiopia do not have scientific literacy. On the other hand science popularization is wide. It is more of educating than informing. It involves science communication. In Ethiopia both science journalism and science popularization are not developed.

Addis Zemen (govt) : Science journalism in our country is not yet developed. There is a lot of research going on. But disseminating the research outputs to the public is weak.

Q. Why do you think it is not developed?

Radio phonic: No one understands this profession as an entity. Science popularization/science journalism is not recognized in Ethiopia. It is a missing link between science communication and the public at large. Media does not give attention to it. Government media is focusing on more of other fields. And also most of the journalists do not have science background.

Addis Zemen: I don't know why? There is no initiative from the scientific community to cover their research by media. It is we who always ask or even beg them to do their activities. From our side we need training. We do our job without having training.

In the answer of the first question, they did not interpret the scientific journalism within the rules of journalism. On the contrary, the dominance of the scientific thought and the scientific community was pointed out. However, in the answer of the second question; the education of scientific journalism was advised as a sub major of journalism, rather than science. Therefore, despite the underlying belief of the superiority of science, they had accepted that the scientific journalism is a job of journalists rather than scientists.

4.6.2 The source of the scientific journalists:

In this part, I posed four questions. The first two questions are about the interactions of journalists-or lack of it- with their source, where the last two questions aims to position the role of the public in this model.

Q. What are your sources for making stories?

Radio phonic: In fact, scientists in Ethiopia generally do not have concerns with popularizing their research. Major sources are domestic literature, journals, and

proceedings personal communication. We also use Internet sites of popular magazines; we get information, which is relevant to the people.

Addis Zemen: As I have mentioned before, it is by me. I have closer contacts with the scientists of agriculture and medical field. Some few scientists call us and give information about their ongoing research

Reporter (private): Our major sources are Internet sites. Considering that the latest scientific and technological developments occur outside this context, our major sources are the Internet sites of the popular science magazines.

Q. Is there a science news agency in Ethiopia?

Addis Zemen: There is no science news agency in Ethiopia. Having a science agency could improve the already existing relations with the universities and also could promote the scientific journalism in the popular newspapers.

Q. Why do you think translations from the articles of the popular science magazines don't become popular in a different country?

Radio phonic: This is very much related with the differences in the education level of the public. They are depth, detailed and sophisticated science to bring it down to the understanding of the public and cultural context of the public. We stick to the applied science. There are books on basic science which are equivalent to school texts which are not good for the public if we use them. However, we never do exact translations. We summarize and simplify the articles to make it understandable to the public. Moreover, we take out the excess information.

Q. However, while I was searching for your archives, I couldn't find cultural references in the translated articles.

Radio phonic scripts: This is probably our missing point. However, we follow the discussions in Ethiopia related with the education and science and technology politics and continue an open referendum for some discussions. Sometimes we incorporate current affairs as for example when locust invasions appear we teach the public about it.

The Reporter: We believe that science from developed countries is also useful to the public. We always follow the latest events. Thereby, despite we do not add the cultural

references to the translations, in the selection of the topics, we consider the cultural interests.

Considering that there is no science news agency in Ethiopia and most of the sources are taken from Internet sites of the popular science magazines, it is inevitable that most of the articles are translations from foreign sources.

Moreover, although they do not modify the translated articles by adding the cultural references to reach the perception of the public, they recognize the importance of the role of public in the science communication model.

4.6.3. Problem of accuracy:

In this part, I question the problem of accuracy between scientists and journalists occurring from the differences in the role of their institutions. The problem of accuracy is not discussed in Ethiopia since the journalists accept the superiority of science and scientific communities. However, below we will see the inconsistencies between the answers when the questions are asked in a more specified form regarding the journalistic practices.

Q. **One of the main concerns for the scientific journalism is the question of accuracy of the articles. Do you see problems of accuracy stemming from the different rules of the scientists and the journalists?**

Addis Zemen:: I did not see so far. I think that the logic of the journalist cannot conflict with the logic of the scientist. On the contrary, they complement each other. A journalist is the person who searches for the news of the 'truth'. By the same token, the scientist works in a systematic way to find out the 'truth'. A journalist makes a bridge between the public and the scientific world. After all they give me interviews. I write what they said and therefore I did not face a problem of accuracy.

Radio phonic script. We, review all of our articles, particularly if a freelancer writes the script. Accuracy is the most important issue in our case. It reflects the quality and trustworthiness of a program or magazine or a newspaper.

As a result the problem of accuracy just like the public understanding of science debate is seen as a luxury for the developing countries, where the primary aim of the scientific journalists should be to support and spread scientific thought.

Moreover, if the journalistic practices that could arose the problem of accuracy serves the appreciation of science without creating false hopes or fears, and then it cannot be regarded as the problem of accuracy.

4.7. **Discussion: Science journalism practices in the Ethiopian media**

As part of this thesis the goal was to describe the current status of science journalism in Ethiopia. Data from a survey of journalists and a content analysis of science stories were used to describe who reports science for the Ethiopian mass media and what type from what source and in what way of science coverage they produce. Also interviews were conducted with journalists focusing on the general look to scientific journalism in Ethiopia, sources of scientific journalism and accuracy. Following is the discussion as a result of these pieces of the study.

4.7.1. Science reporting without the specialists

This survey of Ethiopia mass media journalists indicates that although a relatively large number of reporters cover some science for the Ethiopian mass media, most spend only a small amount of time on the subject. Only four reporters (a private newspaper) had a dedicated science round at the time of the study. This compared to 600-800 science and medical reporters in the United States in the early 1990s (Klaidman 1991), and to about 140 science journalists in Australia in the early 1990s (Metcalfe and Gascoigne 1995) is insignificant.

The small number of science rounds in Ethiopia may partly reflect the fact that science is not a high priority for most news organizations here. After all, business, politics and sport are specialist subjects that receive enormous resources from many organizations. The fact that the *Addis zemen*, the country's largest newspaper, recently appointed a senior journalist to a full-time science round is encouraging; perhaps science reporting may become a higher priority in the future**.**

However, it is important to recognize that the small number of science reporters here is also a reflection of the simple fact that Ethiopia – and hence its media

Organizations – are small. As a result, news organizations have few resources to devote to specialist reporting.

Specialty reporting can be advantageous because dedicated rounds define which events are likely to be covered. Events that fall neatly under a dedicated round will be more likely to be reported than events that are not directly relevant to any dedicated round (Tuchman 1972 cited in Gaunig 1980).

4.7.2 Sources and or services

The result of increasing commercialization is that news organizations attempt to gather news as cheaply as possible, which often means downloading stories from wire services, particularly for specialist subjects like science that take considerable resources to report. This is probably the main reason that 90% of science stories in the content analysis originated from overseas agencies.

Also in several cases the journalists assume a non-critical attitude toward the source of information coming from news agencies and Internet. This information in several cases is republished without enough concern to local reality. I also observe the concern with context and local necessities are insufficient particularly in the private newspapers.

When questioned on the high of foreign research in the newspaper journalists argue that the science and technology produced by developed countries are far greater than what is produced in our country and therefore it would be reasonable to observe the difference. In the *Reporter* newspaper, science stories are written in rounds. They said, "We entirely use the foreign sources, for two reasons. The first is that we believe it is useful to every one. Secondly there are no enough sources in the national scene. Science and technology agency produce its own program and broadcast it by radio. They do not give us any service." This saying is agreed with survey of journalists who reported science. It is also important to mention that these services are not infallible, do not always attend the Ethiopian interest and many times give a first world countries perspective relevance to the issues. This indicates that there may be a room for a similar service to be created within the Ethiopian scope, which would better attend the local agenda and interests**.**

4.7.3. The effects of scientific training

As well as spending little time on science, most of the journalists surveyed also had little or no formal scientific training and little experience reporting science. Only five journalists

had tertiary degrees in science. Again, this may be reflective of a more general trend toward less experienced reporters in Ethiopia. Increasingly, however, science journalists in the United States, Britain and Australia are trained at one of the many tertiary science-writing programs now available in those countries. In the United States, more than 50 degree courses on science writing have now been established (Dunwoody et al, 1999).

In this study, the majority of surveyed journalists said that a lack of scientific knowledge limited their ability to use a weight of evidence approach and that scientific training for journalists would improve the quality of scientific reporting. Three of the interviewee journalists also in this study suggested that a lack of scientific knowledge affected their ability to evaluate scientific claims.

Why might scientific training be an advantage for science journalists? Some authors have suggested that science training may help journalists gain a general sensitivity toward scientific language (e.g. the implications of phrases such as 'statistical significance'), and it may help journalists understand how to evaluate scientific evidence (Dunwoody 2001). Secondly, scientifically trained journalists may instill confidence in scientists who deal with them, regardless of whether their training actually makes a difference in practice (Dunwoody 2001)

However, this survey showed that despite a lack of training in science and time for reporting it, 46% of the Ethiopian journalists surveyed said that they would like to spend more time reporting science. This suggests that working journalists in Ethiopia are interested in covering science more than they currently do, but that they are constrained by other forces – most clearly, limited time and a lack of resources for specialized reporting.

It is also possible that gatekeepers do not share journalists' interest in science, and so they limit science content. In this survey the majority of reporters said that an increase in editorial support would improve science coverage, but on the other hand, almost three-quarters of the journalists said that their news organization was either supportive or neutral, toward science reporting. Future studies should investigate whether editors do in fact constrain science reporting, or whether organizational factors are more important.

4.7.4 Accuracy problems:

First of all, it is obvious that the both senior journalist accept the superiority of science and its methods. In addition, the conflicts with the science and its institutions are seen as luxury for developing countries. Hence, the problem of accuracy is not accepted by nature. However, it would not be correct to simply relate the decreasing conflicts with this situation. Rather, the interaction between the journalists and the source plays a major role. In other words, the journalists do not interact with the scientist like in developed countries, since most of the articles are translations from other sources.

CHAPTER 5: SUMMARY AND CONCLUSIONS.

5.1 Summary:

As I have explained before, after the establishment of Ethiopian science and technology agency in 1975, the target of the popularization had become smaller and the popularization activities clearly distinguished the scientific and non-scientific knowledge**.** However, science popularization was not interpreted as complementary for the scientific progress, but it was rather seen as a tool for catching up policies for the developing countries. Therefore, the science popularizes whether working under the scientific communities or not, devoted themselves like missionaries to spread scientific thought.

However, when we compare this with the scientific journalists of the first radio program "**science and Life'**, we see more discussions regarding the style of the popularization since there was not a scientific institution guiding the popularization activities, but it was due to specific individual efforts.

Moreover, it was shown that especially the emerging private newspapers, *Addis Admas* and the *Reporte*r; on the average 90% have taken the Internet source of the developed countries as models. Despite the fact that there exists the local scientific institution and a scientific community, the private journals depend on the outside contexts (researches out puts of developed countries). There is no evidence whether the material they translate is peer reviewed or not. Anything that comes out from the Internet is not necessarily accurate. On

the other hand the government national newspaper *Addis Zemen* and the radio program scripts of ESTA entirely depended on the national or local scientific research centers as a policy demand but the two organizations never had a link.

Similarly, the increase in the number of subjects to applied sciences particularly technology in the newspapers is related with this modeling foreign source. However, we cannot see the modifications to this modeling to developing countries conditions where the public's relation with the scientific and technological developments is different than the developed countries. Moreover, neither the science popularization science radio scripts nor the newspapers use the articles /scripts/ especially included cultural references, controversies and negatives about science. In Ethiopia, the importance of scientific journalism is not yet recognized.

Within the same line of the top-down communication model, the reporters of major newspapers do not interpret the accuracy problem as a consequence of the different roles of the institutions (journalists and scientists). Moreover, they think that the rules are not different. This situation of course shows that the interaction of journalists with the public and as well with scientists is not present, or so weak that they just work for the appreciation of science.

Despite the importance given to the public perception is weak, and science popularization tries to legitimize scientific thought, scientific institutions are not as powerful as developed countries. Therefore, scientific journalists regard themselves as missionaries, who have no room for criticizing science and scientific developments. In that sense, despite it is a top-down model of communication, I guess it is different from the deficit model. Finally, the level of conflicts between the scientists and journalists is so weak or almost nil related with this model of communication.

As a conclusion, it is important to note that the differences between communication on models of different periods, suggests that the dynamic analyses of the gap does not forecast one model of science communication to a developing country, but instead the changing roles of the actors position themselves differently, thus change the nature of the gap. This means that it is possible to construct more interactive models by giving importance to scientific journalism.

5.2 CONCLUSIONS

5.2.1. The main issues revisited: Implications and concluding observations:

The major thrust of this thesis has been to examine the contribution of the science popularization strategy of Ethiopian science and technology agency and the scientific journalism in constructing a model that creates scientific awareness among the public. In other words, the thrust has been in constructing interactive models of communication with the scientists and the public.

The already existing discussions on the role and the importance of the scientific journalism are evaluated within the communication models of the developed countries. Moreover, in these discussions, the differences in the scientific and journalism rules and the reflexive role of the journalists cause the problem of accuracy which leads to the disagreements for applying journalistic practices in science reporting. In order to show the importance of scientific journalism, and thereby the conflicts, I studied the case of a developing country, Ethiopia where the nature of the gap between the science and public is not the same, considering that most of the scientific and technological developments occur outside the cultural context and the scientific journalism is not very developed. In other words, I aimed to correlate the less interactive model of science communication in Ethiopia by the non-develop ness of the scientific journalism to show the importance of the conflicts between the scientists and journalists.

Although the study focused on the Ethiopian case, in order to analyze the science communication model of Ethiopia with respect to the role of the scientific journalism, the theories of the science communication models and the interaction between the scientists and journalists were discussed by the historical overview of developed countries mainly UK and US. In particular, analyzing science communication model of Ethiopia required a theory or theories that linked science, journalists and public to figure out the differences and the similarities.

The communication models discussed by Felt have informed the changing roles of the actors during the twentieth century. Specifically, instead of simply applying the top-down communication model to Ethiopian case, I have presented the notion of the gap as

historically and culturally produced systems of knowledge and values to understand the motives in the roles of the actors, in order to figure out the differences. Similarly, I have clarified the underlying aim of the science popularization as 'public appreciation of science' in all different communication models in the developed countries promoted by the different institutions of popularization in the cultural system of US by using the work of Lewenstein.

Moreover, Gregory and Miller also contributed the historical overview by mainly expressing the importance of the institutionalization of science for separating the knowledge between scientific and folk knowledge. The science communication model in Ethiopia was analyzed by comparing the key questions, which sought the differences in the aim, target and the way of the popularization with the developed countries in the most important popular science radio programs of the Ethiopia.

Finally, I used the discussions regarding the interaction between the scientists and journalists mainly in the works of Nelkin, Friedman and Dunwoody to show that the conflict between scientists and journalists are inevitable as a consequence of the differences in the roles of the institutions. I used survey of journalists "reporting science", content analysis of three major newspapers that have science and technology sections and the interviews I made with the two journalists of major science newspapers, and relate the results with the way of the science communication model.

5.2.2. The science communication model and scientific journalism in Ethiopia.

The analyses showed that the differences in the aim and the target of the popularization between the developing and developed countries affect the way in which the actors of the science popularization position themselves. In other words, in Ethiopia scientific and technological progress is regarded as the prerequisite for catching up developed countries. In addition, the science popularization activities aim to serve this purpose by fostering curiosity to attract the young people (those who already have scientific knowledge from schools) to become scientists. Although science popularization activities also include this purpose in the developed countries, especially in the last decades, the aim of the popularization focused more to 'public appreciation of science' to support the funding of

the ongoing researches that has enormous budgets. Therefore, targeting wider audiences is more urgent than educating the technically capable personnel. Hence, the science communication model becomes more hierarchal and the scientific journalists' role is weakened.

However, the historical approach on the notion of the gap in Ethiopia showed that although the scientific and technological developments are outside the cultural context, it is not by nature that the science communication model should be hierarchal. On the contrary, the less hierarchal model of communication in the first popularization practice of Ethiopia and the increasing role of the scientific journalists presented that the gap was socially constructed with the roles of the actors in the culture. More specifically, the foundation of ESTA in 1975 played a dual role in the science popularization. It distinguished the scientific and folk knowledge more clearly than the "*Science and Life",* popular program. On the other hand, the scientific journalism / popularization in the first popular was done by specific individual efforts, which did not last long, but gave more importance to the existing values of the public.

On the other hand, in the interviews with the journalists of the two major newspapers and especially with the writer of Kescience Mahider (the popular science radio phonic script owned by the ESTA), I have observed that the level of conflicts between scientists and journalists decreased due to the acceptance of the superiority of science and its institutions. Moreover the journalistic practices in their newspaper and survey made proved that there is no link between the journalist group and science popularizers in the scientific institution despite a journalist in a developing country is supposed to present scientific information using the policy of the science and technology. However, it would not be correct to simply relate the decreasing conflicts with this situation. Rather, the interaction between the journalists and the source plays a major role. In other words, the journalists do not interact with the scientist like in developed countries, since most of the articles are translations from other sources.

Finally, the institutionalization of science did not come after the scientific and technological progress like in the developed countries, but founded for the purpose of

catching up developed countries. Therefore, the scientific journalists regard the critical analyses of the scientific and technological progresses as the luxury of the developed countries, which encounters promoting science and scientific institutions ideologically.

As a result, despite the fact that the differences in the aims of the institutions related with the scientific and technological development levels causes the changes in the roles of the actors in the communication model, the notion of the gap is also socially constructed by the institutions of power in the culture. The conflicts between the scientists and journalists increase when the model becomes more interactive with the public, however in the present time, the top-down hierarchal communication model of science leads to decreasing conflicts between the scientists and journalists. However, promoting journalistic practices in science reporting is very crucial in constructing more interactive models of communication due to the reflexive role of journalists.

To sum up, despite the nature of the gap is not the same with the developed countries; it is not inevitable to have a top-down communication model by nature.

The role of the scientific journalism is very important in constructing more interactive models despite the conflicts occurring from the differences in the rules of the institutions of scientists and journalists.

5.2.3 Recommendations: Importance of promoting scientific journalism.

As I have noted in the introduction, Wynne's description of the reflexive role of the scientific journalism includes taking seriously people's values, indigenous problems in their cultural context. This role is more important in developing countries than the developed countries, since the public's interaction and knowledge with the scientific and technological developments are weaker in the developing countries. Therefore, in order to reach the public and increase the public awareness / understanding of science, the scientific journalists must consider the existing norms and values of the public in the popular science articles. In that case, popularizing would be more than simplifying its technical language, but also the recreating the text by adding the cultural references. However, this situation could cause the problem of accuracy between the scientists and journalists. This conflict is inevitable by nature to a degree that the public is not misinformed or the article does not create false fears and hopes in the public.

As I mentioned before, the primary goal in scientific journalism in developing countries is regarded as spreading the scientific thought in the country. However, when we look at the communication models in the US and UK, constructing more interactive models was always related with the underlying aim of legitimizing the scientific institutions and public appreciation of science, by abolishing the fears and alienation that existed from the top-down models of science communication.

Hence, contrary to the beliefs of the scientific journalists and scientific institutions, the existing knowledge of public is used to make them accept the institutions of science and technology. This in turn cause the attention given to public understanding of science and differentiation of the public, although in this thesis the public understanding of science is discussed within the roles and level of development of the scientific journalism.

This thesis as a result has three components. The first is that the science communication strategy of ESTA, which is a top-down approach, gives superiority to science because the popularization activities clearly distinguished the scientific and non-scientific knowledge. The target audiences selected in the aims and content of popularization is directed to potential non-scientists (students and teachers). The participation of journalist group in the popularization activity is found nil. This leads to black boxing the public which in other words denying the attitude and interest of the public towards science which has been reflected from the archives" Science and Life" radio program and also from questions they posed through letters.

Secondly although the role of the scientific journalism is more important in the developing countries, the supply for science reporting is more difficult due to following reasons: First of all, unlike the developed countries, the public does not have the impact on the ongoing researches; therefore the interest on the topics is lower. On the other hand, according to the survey result journalists are very much interested to report science.

Thirdly, the editors and or the media organization of the major newspapers do not attempt to promote scientific journalism and hire journalists specialized in scientific issues. There is no science news agency. Finally, due to the lack of demand, in the universities, journalism does not have a sub major specialized in scientific journalism.

Hence, instead of waiting for demand for scientific journalism to be realized, a conscious collaborative effort must be made with the scientific institutions, the editors of the popular newspapers, commercial publishers and the universities aiming to create demand of science reporting by applying journalism practices.

Like in the report of the Royal Society titled 'Scientists and the media: Guidelines for scientist working with the media and comments of a Press Code of Practice' which gives guidelines for scientists to work together more effectively with the media, Ethiopian science and technology agency also should encourage the popularization activities of the scientists and guide them to communicate with the journalists. By this method, the agency would teach the differences in the practices of the journalists to the scientists, instead of becoming the mediator it, and accordingly change the science communication model to a more interactive one.

To sum up, despite the nature of the gap is not the same with the developed countries; it is not inevitable to have a top-down communication model by nature. The role of the scientific journalism is very important in constructing more interactive models despite the conflicts occurring from the differences in the rules of the institutions of scientists and journalists.

5.3. Limitations of the research:

Below, I will mention two main limitations to this thesis. These limitations can be considered as occurring due to the time limits to prepare the thesis as well as advices for further researches on this subject.

In this thesis I have focused on the interaction between the scientists and journalists in constructing models of communication. However, I did not black box the public by stressing the importance of scientific journalism to explain the notion that science is not context free. However, I did not focus on understanding the public understanding of science in Ethiopia.

Although, it is not possible to measure how much public understands from science, qualitative types of questionnaires like in the case of the US could be done to a large population sample that could represent the different segments of the public to help policy makers formulating their popularization policies. I was not able to make these surveys to a

large population sample due to the limited time of the thesis and my focus of interaction between the scientists and journalists. However, this can be the topic of another research. Instead of applying quantitative methods that questions the scientific literacy of the population by the facts of science, the qualitative types of researches could help to understand which concepts the public use to understand the science and make reference to their existing knowledge maps.

By this way, the style of the scientific journalism could be better built specifically for the developing countries. The focus of the research could be to find the most appropriate styles and jargon for building up scientific journalism in Ethiopia as a developing country.

Secondly, my archive works in the popular science radio in Ethiopia was a general overview of the popular science programs to find the specific characteristics of the aim, style, and the target of the popularization in different periods. I have looked in to the tone of articles whether they are a promise or a concern, but I haven't searched for the correlation between the tone of the articles and the topic, like if it is more reactive to the topics (whether positive or negative) that is present in the cultural context and more neutral to the topics that is not developed in the country.

Although, this analysis could have helped to see the interaction of journalists with the public in the cultural context better, the aim of the thesis was also to show the social construction of the notion of the gap in different periods, therefore instead of focusing on the topic and tone relation to prove the scientists interaction with the public, I analyzed in more general terms the differences in the roles of the popular science radio program, major newspapers with science sections, perceptions of science reporter, and the scientific institution, Ethiopian science and technology in constructing and altering the notion of the gap and the science communication models in different periods of the Ethiopia

Definitions

Science: Throughout this thesis, **I use the term 'science'** in a broad sense, as most science Communication scholars have, to include "the biological, life and physical sciences but also the social and behavioral sciences and such applied fields as medicine, Environmental sciences, technology and engineering" (Friedman et al. 1986).

The term 'mass media' is typically used to refer to any form of communication that reaches large numbers of people, but here it is used primarily to refer to newspapers, television and radio. Other outlets such as books, magazines, newsletters and electronic media are not discussed in any detail here.

Actors /science providers/: In this context an organization which provides scientific awareness information and engagement to schools and the wider community. This covers science centers and various outreach programs, universities, research agencies, industry organizations professional bodies etc.

Science communication: to cover the gamut of roles including, science writing, science journalism, science popularization, science consultations, science engagement, science information exchange etc.

Science journalism:. It is just journalism, but the distinct character of science journalism is that science correspondents tend to know each other, go to the same press conference and so on.

Public understanding of science: as the name suggests, focuses on *understanding* science; its contents, processes and social factors.

Public awareness of science: aims to stimulate *awareness* of, and positive attitude or opinion towards science.

Abbreviation.

PUS. Public Understanding of Science

AAAS. American Association for the Advancement of Science.

USIS. United States Information Service

ESTA. Ethiopian Science and Technology Agency.

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Interview with Yohannes Afework son of the author and journalist Afework Yohannes.

Interview with Tesfahun Fenta popular radio phonic science scriptwriter and scientist and researcher by training.

Interview with Bekele, science reporter in the reporter newspaper.

Appendix A.

SURVEY OF JOURNALISTS WHO "REPORT SCIENCE"

A. Survey on science coverage in the Ethiopian mass media

This survey focuses on science news /reports, which we define broadly as including research on the physical, biological and chemical sciences, and technology, the environment, medicine and health, and the social sciences. The survey has four short sections that focus on: 1) science reporting in Ethiopia 2) sources for science stories, 3) scientific controversies, and 4) your background in science journalism.

I. Ethiopian science journalism

We would like to begin by asking you a few questions about how you view science coverage in the Ethiopian media (including articles generated overseas as well as within Ethiopia) and how this coverage could be improved.

1. First, we would like to know how you rate the quality of current science news in Ethiopia's mass media. (Please give us your general impression of the **overall** quality of science coverage in the following media by circling one option for **EACH** source).

Major daily newspapers .....**Excellent Good Fair Poor Don't know**
.Major weekly newspapers.....**Excellent Good Fair Poor Don't know**
ETV.....**Excellent Good Fair Poor Don't know**
ETV2.....**Excellent Good Fair Poor Don't know**
Radio Ethiopia .....**Excellent Good Fair Poor Don't know**
Ethiopian science and technology
in collaboration with radio Ethiopia**… Excellent , Good, Fair, Poor, Don't know**
"Yeradio Kescience mahider Betsehuf**"…… Excellent ,Good, Fair, Poor, Don't kn2.** Place a tick in the left hand blank beside the **three** scientific fields that **your news organization covers the most**. Next, place a tick in the right hand blank beside the three topics that you think **should get the most attention** from your news organization**.**

Gets most attention		**Should get most attention**
_____	Agriculture/ Farming/ Horticulture	_____
_____	Astronomy/ Physics	_____
_____	Chemical sciences	_____
_____	Climate and atmospheric studies	_____
_____	Computers and technology	_____
_____	Environment/ Ecology/ Conservation	_____
_____	Geology	_____
_____	Genetics/ Molecular biology	_____
_____	Medicine/ Nutrition/ Health	_____
_____	Science policy	_____
_____	Social sciences	_____

_____ Other: _____ _____

3. How much do you think the following changes would **improve** the quality of science coverage in your news organization? (Circle one option for **EACH** change. In addition, if you think other changes are needed to improve science coverage, please list them below under "other.")

An increase in the number of reporters
responsible for science..... **Lots Some Little None**
An increase in the amount of time spent
reporting science..... **Lots Some Little None**
Creating a formal science and
technology round ..... **Lots Some Little None**
An increase in editorial support for
science news..... **Lots Some Little None**
An increase in scientific training for
journalists..... **Lots Some Little None**
A better system for delivering news from
scientists to the media ..... **Lots Some Little None**
An increase in communication training
for scientists ..... **Lots Some Little None**
Other (Please describe):
_____

4. Do you think that the quantity or the quality of science coverage is a problem in the Ethiopia mass media? In other words, should news organizations cover more science stories and/ or should they focus on covering science stories better? (Circle the number beside the **one** statement that you most agree with).

1. Quantity is the biggest problem.
2. Quality is the biggest problem.
3. Both quantity and quality are equally important problems.
4. Neither quantity nor quality is an important problem.

II. Science sources

The next questions ask about how you get information for your own science stories. We are interested in what types of sources you use and how you verify their information.

5. How often do the following people initiate your science stories? (Circle the estimated percentage of your science stories that are generated by **EACH** source).

Public relations (including
information/ communication
officers/ journalists) **0% 1-25% 26-50% 51-75% 76-100%**
Scientist **0% 1-25% 26-50% 51-75% 76-100%**
Editor **0% 1-25% 26-50% 51-75% 76-100%**
Self-initiated..... **0% 1-25% 26-50% 51-75% 76-100%**
Other **0% 1-25% 26-50% 51-75% 76-100%**
(Please describe): _____

6. In writing a science story, **on average** how many scientists would you try to contact for information? (Circle the number beside your answer). **0** None **1** One **2** Two **3** Three **4** Four **5** More than four

7. When a scientist gives you a statement, how often do you do the following things? (Circle your answer beside **EACH** statement).

Check with the source to be sure you have represented their views
accurately ..... **Always Usually Rarely Never**
Look for another source to provide
a different perspective ..... **Always Usually Rarely Never**
Check with a scientist to test the
reliability of the story ..... **Always Usually Rarely Never**
Check the credentials of the source .....**Always Usually Rarely Never**
Search the internet for information.....**Always Usually Rarely Never**

Search for other information on the topic
through interviews or research ..... A**lways Usually Rarely Never**

8. How often do you attempt to independently verify the truth of science stories before they are printed or broadcasted? Always Sometimes Rarely Never

9. How accessible do you generally find scientists, engineers, and member of allied professions?
Very Somewhat Not at all

III. Scientific controversies

Now we turn to the related topic of how journalists cover scientific controversies. Please circle the number beside your answer to each question.

10. If a scientist or someone representing that scientist approaches you with a story that you believe is controversial, do you think that person would be offended or angry if you sought opposing viewpoints from other scientists? 1 Yes 2 No 3 It depends 4 Don't know

11. If the scientist were angry, would you seek out opposing viewpoints anyway? 1 Yes 2 No 3 It depends 4 Don't know

12. Should science stories give proportional coverage to claims so that a claim that is supported by many scientists is given more weight, time or space than a view that is supported by one or a few scientists? 1 Yes 2 No 3 It depends 4 Don't know

13. In reporting about a scientific claim that is controversial, journalistic conventions would suggest that the reporter should balance the story with other relevant perspectives. Should the journalist also provide details about which claim is supported by the weight of evidence? 1 Always 2 Usually 3 Rarely 4 Never 5 Don't know

14. Do you know the science and technology agency policy? 1 Yes 2 No

15. Does your media organization have a link with the Ethiopian science and technology agency/ popularization department/? 1 Yes 2 No

16. Do you have science reporting guidelines? Yes No

V. Background information

Finally, we would like to ask you a few questions about your own experience as a science journalist in Ethiopia. Circle the number beside your answer to each question.

17.. How would you rank the attitude of your news organization toward science reports? 1. Highly supportive 2. Supportive 3. Neutral 4**.** Unsupportive 5. Highly unsupportive 6 Don't know

18 Which round(s) do you cover science under? (Circle the number beside all that apply.) 1 Agriculture/ farming 2 Educations 3 Environments 4 Health/ medicines 5 Technology/ computers
6. The round system is not used at my news organization

19.. If the round system is used at your organization, are the rounds that include science regularly rotated among staff? 1 Yes 2 No

20. How many hours **per month** do you usually spend covering science stories? 1. Less than 10 hours 2. 10 - 20 hours 3 .21 - 40 hours 4 .41 - 60 hours 5 .No hours

21. How many science stories would you typically produce in a month? 1. Fewer than 5 stories 2. 5– 10 stories 3. 11 - 20 stories 4**.** None

22. Compared to the amount of time you currently spend reporting science, ideally how much time would you like to spend covering science stories in the future? 1 No time 2 Less time than I now spend 3 Same amount of time as I now spend 4 More time than I now spend 5 All of my time

23. How long have you been reporting science news? 1. Less than 1 year 2. 1 - 3 years 3. 3 - 5 years 4. 5 - 10 years 5. Zero

24. How long have you been employed as a journalist? 1. Less than 1 year 2. 1 - 3 years 3. 3 - 5 years 4. 5 - 10 years 5. More than 10 years

25. What is the highest level of schooling at which you studied science? 1. Secondary school 2. Tertiary science courses 3. Undergraduate University degree in science Postgraduate degrees in science

26. If college graduate or higher did you major in science for one or more of your field? Yes No
If 'Yes" what general field of science is that degree in? Biology Chemistry Physics Other

27. Do you have any further comments on any of the topics covered in this survey or on the survey itself that you would like to consider in the development of science journalism/science popularization in our country?

_____

Thank you very much for taking time to complete this survey! If you like to receive the results of this study, please write your name and address on the **return envelope.**

Tenaw Terefe
School of journalism and communication Addis Ababa University
Abune Petros campus

knowledge areas	Biology	Physics	Human	Environment	Agriculture	Medical	Technology
Addis Admas	0%	0%	4%	2%	0%	10.8%	52.17%
The Reporter	19.7%	12.3%	17.28%	20.9%	0%	41%	24.69%
Addis Zemen	8.3%	0%	8.3%	12.5%	37.5%	25%	8.3%

Tone -promise or Concern	Big-promise	promise	Mixed	Neutral	Concern	Great concern
Addis Admas	0%	0%	0%	60.17%	36%	17.3%
The Reporter	-	3.7%	-	20.9%	-	**41.9%**
Addis Zemen	0%	41.6%	0%	20.83%	29.16%	8.3%

Source	Local /natural/	International/overseas/
Addis Admas	Addis Admas	93.47%
The Reporter	12.35%	87.65%
Addis Zemen	100%	0%

APPENDIX B

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   y-ÃqEW SM kG×N yd©Z¥C grs# ÷MßÊs!V

2¾ dr© T¼b@T

3. bKRSèS LdT qN mq$-R kjmRN yqn#N y›mt$N L†nT kyT mÈ

y-ÃqEW SM `¼S§s@ bYN

kxÄ!S xbÆ

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y-Ãq&W SM w¬dR BR¦n# fYú

5. xND HÚN wdz!C xlM BQ s!L XNdmúQ XRR TKN BlÖ y¸ÃlQsW

bMN MKNÃT YmSLã¬L? MKNÃTS b!ñrW ylQî MNŒ ¦zN

mçn#N XNÁT b!rÄW nW?

y-ÃqEW SM xSR xl" g@¬nH dMs@

6. y÷î TL y¸mÈW XR_B SU bmB§T nWÝÝ Xn@ GN XR_B

SU Sb§ MNM xYnT ÷î xL¬y"MÝÝ lMNDnW?

y-ÃqEW SM w¬dR tD§ gbyh#

7. DFrTN y¸g"bTN zÁÂ sWN xKBÊ XNÄLf‰W MN ¥DrG xlB"?

y-ÃqEW SM w¼¶T x@Lúb@_ xbb

Xt&g@ mnN 2¾ dr© T¼b@T

8 yqND kBèCÂ yU¥ kBT L†n¬cW MNDnW?

y-ÃqEW SM ›l¥yh# w¼g!×Rg!S

9 lmjm¶Ã g!z@ yÆb#RN /Ä!D yflsfW sW ¥nW? yyT xgR

tw§J nW? yÆb#R /Ä!D byT¾W K¼zmN tmSRè b_QM §Y êl

y-"qEW SM w¼¶T s›Ä ›l!

kxÄ!S xbÆ

10 TNÍ> byT nW y¸wÈW? däS MN s!çN nW m_æ "Â y¸wÈW?

y-ÃqEW SM znbC zlq

k199; XSk 1998 ›.M yÊÄ!× kúYNS ¥HdR yxD¥ôC ÂÑÂ Ãq&ãC

1. - yxF m_æ -rN XNÁT Yf-‰L mk§kÃWS MNDnW?

y-ÃqEW SM m/mD x¥N

xg„ M¼wlU

2. ykBT b>¬ lMúl@ yg#bT½ yk#§l!T XNÁT Yks¬L?

y-ÃqEW SM TGSt$ kDR

kú¶S

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T§L?

y-ÃqEW SM släN g¼DNGL

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y-ÃqEW SM xè nU µúh#N

xg„ s»N åä øN

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y-ÃqEW SM x#mR xl!Â x#S¥N xdM

xg„ kdb#B wlÖ ÆtE

6. ß§n@T ¥lT MN ¥lT nW? BR¦N µ§cW W` x§cW?

W` µ§cW tKL mBqL YC§L?

y-ÃqEW SM µœh#N dgÍ

xg„ xRÆMN+

7. SlKêKBT nW? XNd ÷kB yTŷÄlC? S‰ê MNDnW?

b¥N ts‰C? y-ÃqEW SM xMúl#

xg„ ÄNG§

8. n!WKlR mœ¶ÃN lmS‰T y¸ÃSClW N_r ngéC

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xgR z@U nW? l@§W dGä ìé yMT_lW XNq$§L _ÊWN

b_Bõ m-ÈT HIV l!ÃSt§LF YC§LÝÝ

y-ÃqEW SM KBéM zWÇ

kmRµè

9. Sl "x@Ln!×" btÒl xQM x-R Ãl {/#F §k#L"

y-ÃqEW SM UšW ¬ds

xg„ xs§

10. b#Â kšYQ-L UR s!m²zN lµðN Yzt$N b¥n””T y7¾W
YbLÈL µl#T yšYQ-lÖC y7¾W bµðN Yzt$N ¼b¥n””T¼
YbLÈL? y-ÃqEW SM b#‰= b#R”
xg„ s!Ä¥

Declaration

I, the undersigned, declare that this thesis is my original work and all the sources of materials used for the thesis have been duly acknowledged.

Student	Advisor
Name: **Tenaw Terefe**	Name:_____
Signature: _____	Signature: _____
Date of submission **August 1st 2006**	Date _____
Place of submission **A.A.U SJC**	Place of submission _____