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RESEARCH ARTICLE

STAKING OUT CULTURE IN WRITING HISTORY OF SCIENCE: ANALYSIS BASED ON GEORGE SARTON'S WORK, INTRODUCTION TO THE HISTORY OF SCIENCE

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Abstract

This article aims to analyze George Sarton's postulate in the writing of history of science, based on his famous work named, "Introduction to the History of Science." It tends to provide histographical debate concerning Sarton's work on the involvement of various cultural and scientific activities from every civilization (ancient times to the 14th century A.D as well as the scholars involved). Qualitative research approach is used to investigate and is analyzed through histographical debate. The findings of this article say that George Sarton's history of science was written in relation to a particular race as different racial cultures produce different sciences. Hence, writing history of science needs to be discussed in the context of a particular race. The article concludes that science and culture are mutually related. This relationship causes the existence of science to be greatly significant in a culture, and vice versa.

Introduction:-

The issue of culture in science is more easily understood if it wererephrased as the issue of values in science. Since the 1930s,Einstein (1930; 1939; 1941; 1948) had raised this matter when he expressed that "science without religion is lame, religion without science is blind". Even though this view is more towards science and religion,it is still included in the issue of values in science. Specific discussion about the influence of culture in science was already put forwardsince the year 1932 by Spengler (1932: 59) in his book,The Decline of the West. Shaharir and Abdul Latif (1989: 60) also expressed similar ideas when they touched on the influence of group culture on mathematics. Sardar (1985: 15) also held a similar view in this issue when he raised the point that the policy of science and technology ought to reflect the culture of a particular race. In his other writings, Sardar (1985: 12 & 54) associated the close relationship between Chinese and Islamic sciences with their respective cultures. Ford (1991: 41, 44 & 47) was also no exception in supporting this idea when he submitted his view on the existence of integration between science and culture in his article.

Introduction to the History of Scienceis Sarton's famous work comprising of three volumes, in which he described the involvement of various cultural and scientific activities from every civilization,from ancient times to the 14th century A.D. as well as the scholars involved.The first volume involved the ancient Greek and Persian civilizations,

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the times of Thales and Phytagoras, Hippocrates, Plato, Aristotle, Euclid, Archimedes, Cato the Censor,Hipparchos, Lucretius, Virgil, Celcus, Pliny, Ptolemy, Galen, Alexander Aphrodisias, Diophantos, Iamblichos, Oribasios, Fa-hsien, Proclos, Philoponos, Alexander Trallers, Hsuan Tsang, I-Ching, Bede, Jabir Ibn Haiyyan, al-Khwarizmi, al-Razi, Mas'udi, Abu al-Wafa, al-Biruniand finally of Umar al-Khayyam (Sarton, 1927).

The second volume consists of two books. The first book contains two sections. The first section describes the times of William of Conches, Abraham Ibn Ezra and Ibn Zuhr. The second section relates the times ofGerard of Cremona, Ibn Rushd and Maimonides (Sarton, 1931). The third volume consists of two sections. The first section has two parts. The first part describes the times of Abu al-Fida', Levi ben Gerson, and William of Occam while the second part is about Geoffrey Chaucer, Ibn Khaldun andHasdaiCrescas (Sarton, 1947). This article contributes towards academic discipline by suggesting that history of science as an academic discipline should be a new item added to the classical university curriculum. This usefulness could be perceived from the vantage point of an extensive cultural building process and particularly as an effective way of safeguarding a sound and critical evaluation and assessment of science as a human activity. From this point, history of science is to be promoted as an invaluable contribution towards intellectual culture and enlightment. Also, it is important that history of science should be considered or organized as an independent academic discipline if it is to make new and significant contribution towards culture and enlightment. This will be of much use to form views related to nature of science with the support of judgements developed with the help of data gained from history of science itself, and to some extent it is already being done in today's time.

Therefore, this article aims to analyze George Sarton's postulate in the writing of history of science, based on his famous work named, "Introduction to the History of Science." Based on the aim, this article provideshistographical debate concerning Sarton's work on the involvement of various cultural and scientific activities from every civilization. Further more it also explores Sartons's view on the existence of integration between science and culture in, "Introduction to the History of Science" which consist of 3 volumes however, this article is only focused on the first volume.

Historical literature:-

According to Stimson, (1957)efforts to establish History of Science Society (HSS) was started by Lynn Thorndike and her friends, in order to support Sarton's main interest in this field. Some years after its existence, this society (HSS) introduced the journal named Isis. Sarton's work had its own identity, it was a compilation of bibliographies culminating as Introduction to the History ofScience, which became an invaluable reference in terms of bibliography material. In all his intellectual activities, Sarton assertively defended his basic thesis, namely, the unity of all knowledge and the value of history of science as the bridge or link between science and humanism. His writing evidently influenced many scholars. Thus, it is not surprising to say that thewide spread of the field of history of science is greatly indebted to Sarton's endeavour.

Cohen (1957), highlighted Sarton's life since small, beginning with his birth, the education throughout his life, family and career, including Sarton's jovial personality and his interest in arts. Cohen also focused on Sarton's writings, Introduction to the History of Science and Isis. Introduction to the History of Sciencecontains scientific research in two aspects, namely scientific advancement from creative investigation and humanity.His significant contribution is interpretation of Greek science and his narration on medieval science. This work was compiled over a period of half a century for each and contains the accounts of all important figures who significantly contributed to science. Thus, the information collected by him covered all time periods of activity from most ancient to most modern.Cohen also revealed that history of science increasingly showed its light when Sarton first gained a place at George Washington University, Harvard University and Carnegie Institution of Washington. The latter institute sponsored the publication ofIntroduction to theHistory of Science and Isis. As one witnessed the transmission of science from one culture to another, it was quite apparent that for Sarton the history of science was not merely a filiation of ideas or the recording of facts, but a moral discipline. The subject was science and its development, but the message was always humanitarianism, the "new humanism".Sarton was responsible for firmly establishingthe subject of the history of science as a feature of the academic landscape.

Conant (1957) as President of Harvard University highlighted Sarton's relationship with the university. He showed both official and unofficial relationshipbetween the two parties. The unofficial relationship began when Conant was at the start of his academic career in the winter of 1916-1917. At the time Conant became aware ofSarton's interest in history of science either through his lectures or his writings. He remembered Sarton saying that history of science

could not be written by historians but by a person with scientific training. Knowing that Sarton studied chemistry, Conant then suggested that chemistry was a good discipline to be explored by a science historian due to its association with biology and physics. Sarton never gave up hope to develop the field of history of science at Harvard.

Sarton's focus on history of science was seen as less relevant to the United States in mid-20th century.Moreover, Sarton failed to gather the support of the educated class toward the concept of history of science that he brought.However, Sarton himselfwas quite satisfied that at least his efforts of many years were proven with the rise in interest toward this field. Even though its development was rather slow at Harvard University, he was optimistic that intellectual seeds can germinate anywhere not only in the place where they are sown.Reseach by Singer (1957) was more towards Sarton and the field of history of science. Sarton's original purpose for studying history of science was to deal with only the history of pure science. But it became difficult to draw a line separating pure science from its applications. Sometimes the applications were discovered first and the principles deduced from them. At other times it was the other way round, but in any case the pure and applied sciences grew together.Sarton realized the loss to the culture of civilized man caused by mutual dislike and ignorance of one another's philosophy that characterized the entrenched humanist scholars and on the other hand, many men of science. His key thought at the time was that knowlegde is a union. Segregating knowledge into categories such as scientific, literary, religious, aesthetic, etc. is to mistake its purpose. Thus, Sarton held the view that the main function in studying history of science is to eliminate this mutual dislike and ignorance and to open to humanity a glorious vision of integrated thought, a unifying complex of man's activities upon earth, actual and potential. In his view, study of history of science may not be done separately from other fields.Hence, Sarton is considered as the pioneer who took into accountthe socio-economic setting of an era in the development of early science. This was followed by a masterly exposition of the interaction between science and other forms of cultural activity.

In spite of Sarton's eminence, he could not attract more graduate students to do research in history of science. Nonetheless,he was one of the most distinguished intellectual influences of our time, for he defined, illustrated and developed as a new discipline, the study of history, principles and methods of science. In fact,his contribution is very impressive in terms of prolificacy and quality of his works.His work,Introduction to the History of Scienceis the main reference for anyone who writes on ancient or medieval science. Fulton (1957) who studied about Sarton and history of medicine, touched on the misunderstanding between Sarton and a renowned figure in the history of medicine, namely Henry E. Siderist. Sarton actually wrote much on the history of medicine. In fact, he published several noteworthy papers about the history of medicine in the journal Isis.However, he held the view that research on history of medicine mostly done by scholars of other disciplines resulted in poorer quality, than if it were written appropriately by one trained in medicine with a historical sense and the promptings of a good conscience and a sincere heart. In Sigerist's view, the study done was not only without quality, it constituted a crimeas each discipline had its own research methodology. He disagreed with Sarton that medicine was an art. Instead, it would be suitable to call medicine a service, an institution, or a social function. Sideristargued for using doctor's information to take care of his friends so as to be socially adjusted or to readjust them if necessary. In order to do this, he would have to prevent and to cure diseases and all this was done by applying scientific methods. However this does not mean that medicine may be categorized as applied science. When a doctor needs to use scientific methods, then a historian of medicine needs to also study the history of these methods. That is the reason why we have so many subjects in common. But we cannot conclude that history of medicine is essentially a history of science.Nevertheless both figures agreed that there was much overlapping between history of medicine and history of science.

Another article examined in the George Sarton Memorial Issue was Clagett's (1957) article relating to Sarton as a historian of medieval science. In addition to his treatment of the full spectrum of medieval Latin learning, we find that he also considered contemporary figures and intellectual movements in the Near East and Far East. The classification used by Sarton in gathering and presenting data showed his positivistic faith in science as a continuously growing accumulation of facts and ideas about nature. Thus, he developed modern categories of science and thought, and organized his information on medieval science around these arbitrary categories. Some categories used were quite anachronistic oroutdatedwhen associated with the medieval century, such as sociology. From another standpoint, this work does not refer to manuscripts whereas many insights of the thoughts of medieval figures could be obtained by doing so. However, if Sarton had gone beyond the monographs to the manuscripts, his work would not have reached its completion date of 1400. In comparison to research done by two medieval figures of America on history of science, namely, Charles Homer Haskins and Lynn Thorndike, Sarton's work should be considered as complementary to their works, and not as their substitute. Sarton's focus was more toward philosophy

of history and what he did was directly related to the continuous development of science itself. In fact, he generally was accurate in citations and up-to-date in reporting and using monographs.Mâlik's (1957) article discussed Sarton's endeavor in learning Arabic language from Charles Habib Malik. During this period of study, Sarton had read and written hundreds of pages of text and letters, thus not taking a long time to master the language. He showed a deep interest in the problems happening in the Near East. In fact, through Introduction to the History of Science, he seemed to make every effort to show and describe the real contribution of Arabs and Muslim scholars, along with other scholars in the Islamic empire, to medieval science. Mey (1984) wrote her article entitled,Sarton's Earliest Ambitions at the University of Ghent,whichfor example focused more on Sarton's life background, especially the education he attained.

Garfield (1985a; 1985b) wrote two articles about Sarton. Both articles discussed Sarton's background and work,Introduction to the History of Science.The excellence of his work was reflected in citations of Science Citation Index (SCI), Social Sciences Citation Index (SSCI) andThe Arts and Humanities Citation Index^{TM}(A&HCI^{TM}) more than 150 times in the 29 year period 1955 to 1984. Pyenson's(2004)article published in Astrophysics and Space Sciencetouched on how a difficult situation can encourage someone to innovate. PyensontookSarton as an example of a person who faced difficulty in life and this situation enhanced his emotions and intellectual ability to change his pattern of thinking and he finally succeeded in developing history of science as a discipline of knowledge in the United States of America.

Holton (2009a) who wrote George Sarton, His Isis, and the Aftermath, showed that the journal became his proud achievement when it reached the hundredth volume and also maintained its intellectual rank. He perceived the main factor that contributed to this achievement was the timing of its founding, when there had grown up a small but critical mass of contributors and readers for such a journal, and that its founder was George Sarton, a person of wide-ranging interests, passionate scholarship, and huge ambition.

A close study of the early decades in the publication of Isisshowed Sarton's legendary energy at work, feeding his ever-larger project and resulting in the founding of the History of Science Society, which eventually gave Isis its institutional base. However, a close study of several issues for some decades showed that the grand overarching and motivating vision of Sarton and his peers had not been fulfilled. Isisseemed to adopt a more pluralistic guiding philosophy. In another article, Holton (2009b) focused on Sarton's role as the founder of Isispublished byThe University of Chicago Press. Its development followed after it was first published in the year1913. Ead's (2011) research was more focused on a summary ofIntroduction to theHistory of Science. Eaddivided the book into time periods.This historical literature shows that the scientific research by Sarton constantly attracted the attention of many parties.Most probably, Sarton's eminence as the pioneer of the field/discipline of history of science had encouraged scientific studies relating to him.As long as the independent discipline of history of science exists, studies about Sarton will continue.

History of Science in Introduction to the History of Science:-

History of science prevails thoughout the whole discussion inIntroduction to the History of Science. It covers the background of sciences and biography of scholars involved in various fields of science. Every chapter is verified according to division of timeline.The fields found in each chapter depend on those which existed in the century covered, including medicine, mathematics, astronomy, religion and chemistry.Every chapter was named after a particular scholar(s) such as follows:

Chapter	
3	Time of Thales and Pythagoras
7	Time of Euclid
21	Time of Fa-Hsein
33	Time of al-Biruni

No explanation was given by Sarton regarding the reason for selecting the name for each chapter. However, the writer holds the view that Sarton selected the name of afamous scholar(s) of a particular timespan to be used as the title of the chapter. In order to facilitate understanding of his work, the writer analyzed it based on 12 themes. The writer first listed down the sub-topics for 34 chapters in volume 1 of the book, before categorizing them into themes. There are 106 sub-topics as listed in Table 1 below:

Table 1:-List of 106 sub-topics for 34 chapters in volume 1 of Introduction to the History of Science.

Chapter	**Subtopic**

1	i. Summary ii. Field
2	i. Summary ii. Field
3	i. Summary ii. Field
4	i. Summary of Science Survey ii. Field
5	i. Science Survey ii. Figures iii. FIeld
6	i. Science Survey ii. Figures iii. Field
7	i. Science Survey ii. Development of Jewish Scripture iii. Field
8	i. Science Survey ii. Religious Development iii. Unification of China iv. Field
9	i. Science Survey ii. Development of Jewish Scripture iii. Field
10	i. Science Survey ii. Field
11	i. Science Survey ii. Background of Philosophy iii. Field
12	i. Science Surevy ii. CulturalBackground iii. Field
13	i. Science Survey ii. Religious Background iii. Field
14	i. Science Survey ii. Religious Background iii. Cultural and Philosophical Background iv. Field
15	i. Science Survey ii. Religious Background iii. Field
16	i. Science Survey ii. Religious Background iii. Field
17	i. Survey of Scientific Research ii. Religious Background iii. Field
18	i. Science Survey ii. Religious Background iii. Field
19	i. Science Survey ii. Religious Background iii. Field
20	i. Science Survey

	ii. Religious Background iii. Field
21	i. Science Survey ii. Religious Background iii. Field
22	i. Science Survey ii. Religious Background iii. Field
23	i. Science Survey ii. Religious Background iii. Field
24	i. Science Survey ii. Religious Background iii. Field
25	i. Science Survey ii. Religious Background iii. Philosophers and Patrons of Learning iv. Field
26	i. Science Survey ii. Religious Background iii. Field
27	i. Science Survey ii. Religious Background iii. Philosophical Background iv. Field
28	i. Science Survey ii. Religious Background iii. Cultural Background iv. Field
29	i. Science Survey ii. Religious Background iii. Cultural Background iv. Field
30	i. Science Survey ii. Religious Background iii. Philosophical Background iv. Field
31	i. Science Survey ii. Religious Background iii. Cultural Background iv. Field
32	i. Science Survey ii. Religious Background iii. Cultural Background iv. Field
33	i Science Survey ii Phislosophical and Religious Background iii Field
34	i Science Survey ii Philosophical and Religious Background iii Field

As shown in Table 1, the writer categorized sub-topics according to certain themes. The purpose is to group the same sub-topicsmentioned in different chapters. For a sub-topic which is repeated in different chapters, the writer combined them under only one theme. For example, the sub-topic Summary and Field are found in chapters one,

two and three. Therefore, the writer combined the sub-topics as one theme, namely, Summary and Field, represented by chapters one, two and three. Another example, Science Survey, Religious Background and Field are found in chapters 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 and 26. Hence, the writer combined all the said sub-topics to form one theme, namely, Science Survey, Religious Background and Field represented by chapters 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 and 26.

By using this method, the writer categorized the contents of volume one of Introduction to the History of Scienceinto 12 themes. The said themes are in Table 2 below:

Table 2:- Categorization of 34 chapters in volume 1 of Introduction to the History of Scienceinto 12 themes.

No.	Theme	Chapter
1	Summary and Field	1, 2 and 3
2	Science Survey and Field	4 and 10
3	Science Survey, Figures and Field	5 and 6
4	Science Survey, Development of Jewish Scripture and Field.	7 and 9
5	Science Survey, Religious Development, Unification of China and Field	8
6	Science Survey, Philosophical Background and Field	11
7	Science Survey, Cultural Background and Field	12
8	Science Survey, Religious Background and Field	13,15, 16, 17, 18, 19, 20, 21, 22, 23, 24 and 26
9	Science Survey, Religious Background, Cultural and Philosophical Background and Field	14, 29, 31 and 32
10	Science Survey, Religious Background, Philosophers and Patrons of Learning as well as Field	25
11	Science Survey, Religious Background, Cultural Background and Field	28
12	Science Survey, Religious Background, Philosophical Background and Field	27, 30, 33 and 34

In the first theme,Summary and Field, Sarton explained regarding all records of knowledge that existed in the early age of Babylon, Egypt and China. He began with Homer (Greek),because this theme covers the 9^{th} to 6^{th} Centuries B.C. The 7^{th} Century B.C. is said to be the preparatory period and transition forPersia (Iran) and Assyria while the 6^{th} Century B.C. greatly contributed to knowledge activity and explosion all over the world, including Greece, Judah, Babylon, India and China. This theme covers the fields of literature, oracle, laws, erudition, music, learning, history, astronomy, natural philosophy, technicals, medicine and geography.

Regarding the second theme, Science Review and Field, the writer finds that Sarton discussed the intensity of intellectual activity. Much intellectual effort was made by theologians/priests of religion and specialists of natural philosophy.As a result of this intensity, the 5^{th} Century B.C. is said to be a premature (precursor) period.Information regarding the existence of three intellectual centres, namely, Alexandria, Rome and Pergamum,was also inserted.This information is consistent with this theme which discusses intellectual activity. In fact, the past existence of these three intellectual centres proves intensity of activity in the East. Furthermore, silk routes between China and the Roman Empire became more important. The fields involved in this theme are philosophy, mathematics, astronomy, technicians or technicals, medicine, exploration,mining, historiography, laws, philology,physics, technology, geography and botany.The third theme is Science Survey, Figures and Field. Through this theme, the writer finds that Sarton wrote in detail the intensity of science activity according to century. A bright and exciting time of scientific acitivity was the year 450 B.C. (in the second half of the 4^{th} Century).The prominent figures in this theme were Plato, Aristotle and Alexander. They contributed to establishing great schools of philosophy, such as the Academy, and PeripateticSchool at Lyceum, Athens.In addition, Alexander founded the city of Alexandria which was anoutstanding center for dissemination of culture in the year 332 B.C. The fields covered in this theme are mathematics, astronomy, physics, technology, medicine, historiography, sociology, filology, philosophy, anatomy, physiology, laws and history of science.

The fourth theme is Science Survey, Development of Jewish Scripture and Field. Through Science Survey, Sarton highlighted Athens as the world'sgreat intellectual centre then, which later shifted to Alexandria in early 3rd Century B.C. With regard to Development of Jewish Scripture, Sarton explained that it was merely a religious book, but also a record of annual history and legal code. Translation into Greek language began under the directive of Philadelphos. In the first half of 2nd Century B.C., Sarton explained the development of two Jewish scriptures, namely Ecclesiastes andEcclesiasticus. These became very valuableliterature since the ancient age. The Book of Danielwas written in the year 165 B.C. With regard to the fields covered, Sarton listed the fields of philosophy, mathematics, astronomy, physics, anatomy, physiology, biology, medicine, technology, historiography, geography, agriculture, laws and philology. The fifth theme involves Science Survey, Religious Development, Unification of China and Field. This theme involved only chapter eight, namely, the time of Archimedes. In Science Survey, Sarton filled in information about scientific activity of this time in two territories,namely Syracuse and Alexandria. As regards Religious Development, Sarton highlighted the development of Buddhism in India. He found that the earliest missionaries received great encouragement during the rule of King Asoka. In the context of Unification of China by Shih Huang-Ti as First Emperor in his own manner, he succeeded in ending chaos in society and created a group of Chinese society. He was also credited with building the Great Wall of China and establishing various administrative forms. The fields involved in the context of this time period were philosophy, mathematics, astronomy, physics, medicine, technology, historiography and writing.

The sixth theme involves Science Survey, Philosophical Background and Field. The chapter relevant to this theme is chapter 11, namely the time period of Lucretius (first half of 1st Century B.C.). In discussing Science Survey, Sarton mentioned the conflict between Greece and Rome which ended at that time.In the context of Philosophical background, Sarton discussed Andronicos of Rhodes as the tenth successor to administration ofLyceum,as well as the first scientific editor for Aristotle's works. Sarton also mentioned the Stoic School introduced by the great scientist namedPosidonios. In this time period in the context of Field, Sarton discussed the fields of mathematics, astronomy, physics, technology, botany, medicine, historiography and writing.

The seventh theme involves Science Survey, Cultural Background and Field.This theme involves 12 chapters, namely the time period of Virgil (second half of 1st century B.C.). In Science Survey, Sarton did not deny Virgil wasan invaluable symbol of pride at that time, especially during the golden age of Rome. In Cultural Background, Sarton highlighted Virgil who clearly dominated this time period as a legend, as was Aristotle. In the context of Field, Sarton discussed mathematics, astronomy, physics, technology, agriculture, botany, geography, geology, medicine, historiography and philology.

The eighth theme covers Science Survey, Religious Background and Field. This theme involves 12 chapters, namely chapter 13, chapters 15 to 24, as well as chapter 26.In the context of Science Survey, Sarton discussed scientific activity which occurred in each century covered by the said chapters. Sarton also submitted the names of famous scholars for each century covered by this theme.Among the scholars stated were Celsus (first half of 1st century A.D.), Alexander of Aphrodisias (first half of 3rd century A.D), Diophantos (second half of 3rd Century A.D.), Oribasios (second half of 4th Century A.D.), Fa-Hsien (first half of 5th Century A.D.)and Alexander of Tralles (second half of 6th Century A.D).

In terms of Religious Background, Sarton highlighted Buddhism, Christianity, establishment of Christian monasticism, translation of the Bible from Hebrew into Latin, and from Greek into Gothic as well into Ethiopian, Armenian and Georgian languages, religious figures such as Epiphanios and St. Augustine, translation of Buddhist works from Sanskrit into Chinese, introduction of Buddhism into Korea into Japan, the spread of Budddhism in China, Japan and India, and the discovery of the earliest Muslim group by Ibn 'Ibadin the year 680 A.D.The fields involved in the eighth theme are astronomy, chemistry, geography, medicine, historiography, philosophy, mathematics, physics, technology, laws, philology, philosophy, natural history,agriculture, botany, biology, pedagogy, lexicography and education.

Next, the ninth theme involves Science Survey, Religious Background, Cultural and Philosophical Background and Field. The chapters involved are chapters 14, 29, 31 and 32.In Science Survey, Sarton mentioned about the revival of intellectual spirit in each field, the strong position of Muslim scholars including al-Kindi, al-Khwarizmi and al-Farghaniand the position of the Muslim culture. In Religious Background, Sarton touched on one of the pioneer missionaries of Christianity, namely, St. Paul, the founder of the Shafi'ischool of jurisprudence, al-Shafi'iand the

founder of the Hanbali school of jurisprudence, namely Ibn Hanbal, the decline of Chinese Buddhism, the emergence of Tendai and Shinon groups in Japan, the publication of Hebrew Scripture text by Ben Asher of Tiberiasand exegesis of al-Quran by al-Tabari. In terms of Cultural and Philosophical Background, Sarton discussed works produced, includingNatural Historywhich isan encyclopedia covering a variety of fields, various works in Greek language produced by Plutarch and by Chinese philosophers, "heterodox" by WangCh'ung, introduction to Islamic philosophy by Yahya ibn Batriqwho translated various books of Plato and Aristotle into Arabic language. In this context, Sarton also surveyed Jewish philosophers who were inclined to write in Arabic language in comparison to Hebrew language, compilation of encyclopedia under the patronage of the ruler, namely, Emperor Costantinos VII Porphyrogennetos, the writing of the book, al-Fihristby Ibn al-Nadim, a Chinese encyclopedia compiled by Shih Lei Fuconsisting of thirty volumes,T'ai-P'ing Yu-Lanwhich contains thousands of quotes from 1690 works. The fields involved in the ninth theme are mathematics, astronomy, physics, technology, botany, geography, medicine, historiography, philology, natural history, geology, laws, education, chemistry, and sociology.

The tenth theme highlights Science Survey, Religious Background, Philosophers and Patrons of Learning as well as Field. Only chapter 25 is involved. In Science Survey, Sarton stated that this period was the golden age of four states, namely, Arab, Tibet, China and Japan. In Reigious Background, Sarton touched on the birth and explosion of Islamic Development including compilation of al-Quran for the first time in the year 633 A.D. and finally in the year 650 A.D., the spread of Buddhism to East Asia and Central Asia as well as the building of Japanese temples such asHoryujiwhich was discovered in the year 607 A.D. by PrinceShotoku. In the context of Philosophers and Patrons of Learning, Sarton discussed the Jewish centres of learning of that time, namely, Sura Academy at Sura, Babylonia and Pumbedita, introduction of the idea of Dionysios the Areopagite which influenced the mystic development of Greek Christianity, Israel and Islam, and Latin learning centresand Byzantium. The fields involved in the tenth theme are mathematics, astronomy, geography, medicine, historiography, laws and philology.

The tenth theme is Science Survey, Religious Background, Cultural Background and Field. The chapter involved is chapter 28. In Science Survey, Sarton discussed usage of Arabic names in naming a time period. The reason for it at the time was the regression of intellectual activity in Europe. This naming in Arabic indicated the beginning of Islamic science in the second half of theighth century A.D.In Religious Background, Sarton wrote in detail religious division into four parts, namely the emergence of an anti-Rabbinical movement called Karaism (in Hebrew) or Qaraism (in Arabic) or Scriptualists (who believe in the Torah but not in the Talmud) founded by Anan ben David (Persian Jew), the prominence of Muslim scholars through great figures such as Abu Yusuf and Malik ibn Anas, Tibetan Buddhism which included figures such as Song-tsen Gam-po, Ti-song De-tsen and Guru Padma-sambhava, and Buddhism amongthe Chinese which involved a figure named Wu K'ung.

In Cultural Background, Sarton touched on the word east, which referred to the Abbasid Caliphate and the word west which referred to Christian Europe, and the Japanese Civilization. In the context of East, Sarton highlighted two Abbasid rulers, namely, al-Mansur and Harun al-Rashid. For The West, Sarton submitted the figures Charlemagne, Alcuin and EmpressShotoku-Tenno. The Fields involved in the tenth theme are mathematics, astronomy, chemistry, technology, natural history, geography, medicine, historiography and philology. The last theme is the twelfth which involves Science Survey, Religious Background, Philosophical Background and Field.It involves chapters 27,30, 33 and 34. In Science Survey, Sarton informed about the stagnation of intellectual activity due to the increasing decline of Latin Science, and Islamic science had not begun, prominent works produced in Arabic language, scholars' contribution to lslamic civilization, the golden age of Islamic science and the decline of Islamic science. In Religious background, Sarton discussed Christians efforts to spread their influence in the West and Near East (referring to South-west Asia, particularly Turkey, Lebanon, Syria, Iraq, Israel, Jordan, Saudi Arabia and other states in the Arabian peninsula),emergence of the Hanafi school of law in Islam, spread of Buddhism in China, the beginning of the golden age of Japan, development of Islamic civilization, particularly involving translation activity, and spread of Ismailiyyahteachings among the Shi'ites. In the context of Philosophical Background, Sarton discussed the activity of absorbingChinese culture in Japan as well as introduction of philosophy including Jewish, Islamic Hindu and Chinese philosophy. The fields involved in the twelfth theme are mathematics, astronomy, chemistry, technology, geography, historiography, laws, philology, physics, travel, adventure, medicine, natural history, exploration, minerology, geology and sociology (Sarton 1927)

Cultural highlights in Introduction to the History of Science:-

According toOxford Dictionary of English (2010), the termcultureconnotes ideas, customs and all social behaviour of a community or society. Advanced Dictionary of English (2013) defines the word culture as any activity, such as

involving art or philosophy, which is important for development of civilization and human thought. It also relates to belief, lifestyle or arts of a society or civilization. According toReese (1980), the word culture orginates from the Latin word "colere" which means to prepare and cultivate land or planting. Europeans selected the word "culture" to reflect their thoughts, one of the meanings of which was associated withtheir agriculture-based livelihood at the time(Wagner, 1975).

The Arabic word for culture is al-thaqafahwhich originates from the root word thaqifa, yathqafuandthaqafan. In Lisan al-'Arab, Ibn Manzur (1990) statedthaqafa al-shay' thaqfanwathiqafanwathuqufatanwhich meansto understand in-depth. He also mentioned rajulthaqfunwathaqifunwathaqufunwhich means a clever man who is quick to understand.Based on the said definition, the word culture is frequently associated with progress or civilization, and the way of life of a society because culture symbolizes progress and emergence of a civilization.

Scholars had submitted various definitions of culture.Malik Bennabi for example, concluded that culture is a set of moral attributes and social values which affects the individual since birth and without him realizing it, becomes the rope which binds individual behaviour to the life system of the society where he lives. Haji Abdul Malik Karim Amrullahor, better known as,Hamka (1966) elaborated on culture as a human endeavour and its outcome to fulfill his needs to live in his environment. Koentjaraningrat (1974) defined culture differently from sociologists, historians and anthropologists. For sociologists, culture consists of the entire skills/proficiency (customs, morals, arts, knowledge and so on). For historians, culture is heritage or tradition. And anthropologists view culture as a term for rules and way of life, and behaviour.Aziz Deraman (1975) explained that the term culture refers to a way of life which encompasses all fields of life, the simplicity or complexity of which are determined by the degree of developmental progress and changes the society itself has undergone.

According to al-Faruqi's interpretation (1992), culture isthe consciousness of values in the whole realm of life, reflecting at the lowestlevel, an intuitive awareness (intuition) of their respective identities and their proper ranking, as well as individual commitment toward an activity.Suparlan (1981/1982) defined culture as the whole knowledge of humans as social creatures, used to interpret and understand the environment faced, and to create as well as encourage a behaviour. Zainal Kling (1985) concluded that culture encompasses everything found in society including all ideas, tools and forms of speech. Simply put, culture is all creation and heritage of community life. According toSa'idHawa (1988), culture does not mean merely knowledge but includes ideas (tasawwurat), thoughts, behaviour, etiquette and anything not included in the category of material(al-maddi). Muhammad 'Uthman el-Muhammady (1989) defined this word as the whole way of life and thinking as well as values and individual attitude.

HashimAwang A.R. (1998) defined culture as all forms of practice and behaviour based on principles, philosophy, values and so on. Based on this definition, the word culture will definitely be associated with science because a civilization is built through various advancements and development. Thus, progress in a civilization willnecessarily be followed by development in science and technology.The writer's research on Introduction to the History of Scienceconcludes that Sarton's discussion of history of science is associated with race. This conclusion may be seen in Table 3 below:

Table3:- Compilation of Field according to Race.

Chapter	Field according to Race
1	Egyptian Laws
2	Greek Music
	Greek Laws
	Assyrian Learning
	Hebrew Laws and History
	Hebrew Oracle
3	Chinese and Hebrew Oracles
	Babylonian Astronomy
	Greek Technicians
	Greek Medicine
	Egyptian and Greek Geography
	Greek, Hebrew and Chinese Historians

	Greek, Roman and ChineseLaws
4	Greek, Hebrew and Chinese Philosophies
	Greek Mathematics
	Greek Astronomy
	Greek, Persian and Chinese, Technicians
	Greekand Chinese Medicine
	Carthaginian and Greek Exploration
	Greek and Hebrew Mining
	Greek and Hebrew Historiography
	Greek, Hebrew and Roman Laws
	Greek, Sanskrit and Chinese Philology
5	Greek Mathematics
	Greek Astronomy
	Greek Physics and Technology
	Medical Art Process in Greece and China
	Greek Historiology and Sociology
	Sanskrit Philology
6	Other Greek and Chinese Philosophers
	Greek Mathematics
	Greek Astronomy
	Greek Physics
	Greek and Roman Technology
	Greek Botany
	Greek Geography, Geology and Meteorology
	Greek Anatomy, Phyisiology and Medicine
	Greek Historiography
	Roman Sociology and Laws
7	Greek and Chinese Philosophy
	Greek Mathematics, Astronomy
	Greek Anatomy, Physiology, Biologyand Medicine
	Greek Technology
	Greek, Hebrew and Chinese Historiography
	Greek Philology
8	Greek and Chinese Philosophy
	Greek Mathematics, Astronomy and Physics
	Introduction of Greek Medicine in Rome
	Greek and Chinese Technology
	Greek and Roman Historiography
	Chinese Writing
9	Greek, Roman and Chinese Philosophy
	Greek and Chinese Mathematics
	Greek Astronomy
	Greek Physics and Technology
	Greek Geography
	Roman Agriculture
	Greek, Roman and Chinese Medicine
	Greek and Roman Historiography
	Roman Laws
10	Greek and Chinese Philosophy
	Greek and Chinese Mathematics and Astronomy
	Greek and Chinese Physics and Technology
	Greek and Chinese Geography
	Greek, Roman, Carthaginian and Chinese Botany

	Greek Medicine
	Greek and Chinese Historiography
	Greekand Sanskrit Philology
11	Greek and Chinese Mathematics
	Greek Astronomy
	Greek Physics and Technology
	Greek Botany Botani
	Greek Geography andGeology
	Greek Medicine
	Greek and Roman Historiography
	Roman Writing
12	Greek, Roman and Chinese Mathematicsand Astronomy
	Roman Physics and Technology
	Greekand Roman Agriculture and Botany
	Greek, Roman and Chinese Geography and Geology
	Greek and Roman Medicine
	Roman, Greek and Chinese Historiography
	Greek and LatinPhilology
13	Roman and Greek Astronomy
	Greek Chemistry
	Roman Geography
	Greek and Roman Medicine
	Roman Historiography
14	Greek Mathematics
	Greek and Chinese Astronomy
	Greek and Roman Physics and Technology
	Greek and Roman Botany
	Greek, Roman and Chinese Geography
	Greek Medicine
	Roman, Jewish and Chinese Historiography
	Greek and Latin Philology
15	Greek Philosophy
	Greek and Roman Mathematics
	Greek and Chinese Astronomy
	Greek, Roman and Chinese Physics and Technology
	Greek Geography
	Greek and Roman Medicine
	Greek and RomanHistoriography
	Roman Laws
	Greek and Chinese Philology
16	Greek, Roman and Chinese Philosophy
	Roman and Chinese Mathematics
	Syrian and Chinese Astronomy
	Greek Natural History
	Greek and Roman Geography
	Greek and Chinese Medicine
	Greek, Roman and Chinese Historiography
	Roman Laws
	Greek Philology
17	Greek and Chinese Philosophy
	Greek and Chinese Mathematics
	Greek, Roman , Chinese and Jewish Astronomy
	Greek and Roman Natural History

	Roman and Chinese Geography
	Greek, Roman, Chinese and Jewish Medicine
	Greek Historiography
	Roman and Jewish Laws
18	Greek and Chinese Philosophies
	Greek and Chinese Mathematics
	Greek and Chinese Chemistry and Physics
	Greek, Roman and Chinese Natural History
	Greek, Roman and Chinees Geography
	Chinese Medicine
	Chinese Historiography
	Roman Laws
	Greek and Chinese Philology
19	Hindu, Greek, Latin and Chinese Philosophies
	Greek and Roman Mathematics and Astronomy
	Greek and Chinese Physics and Chemistry
	Roman Agriculture
	Greek and Chinese Medicine
	Greek Historiography
	Roman Laws
	Chinese, Gothic, Latin and Egyptian Philology
20	Greek Philosophy
	Greek, Roman, Jewish and Chinese Mathematics and Astronomy
	Roman and Chinese Technology
	Greek and Roman Natural History and Agriculture
	Greek and Roman Geography
	Greek and Roman Medicine
	Roman Historiography
	Roman Laws
21	Greek and Roman Philosophy
	Greek and Chinese Mathematics and Astronomy
	Greek and Chinese Chemistry, Physics and Technology
	Chinese and Armenian Geography
	Greek, Roman and Korean Medicine (including botany and biology)
	Greek, Roman, Armenian and Chinese Historiography
	Roman and Berber Laws
	Armenian and Greek Philology
22	Greek, Syrian and Latin Philosophies
	Latin and Greek Mathematics
	Latin, Greek and Chinese Astronomy
	Chinese Geography
	Latin and Singhalese Historiography
	Roman and Berber Laws
	Chinese Philology
23	Byzantium, Syrian and Latin Philosophies
	Byzantium and Latin Mathematics
	Chinese, Byzantium and Latin Astronomy
	Byzantium Physics and Technology
	Byzantium and Latin Botany and Chinese Agriculture
	Chinese and Byzantium Geography
	Latin, Byzantium, Syrian, Persian and Chinese Medicine
	Byzantium, Latin, Syrian and Chinese Historiography
	Roman and Berber Laws

	Byzantium, Latin and Chinese Philology and Pedagogy
24	Persian Philosophy
	Byzantium and Chinese Mathematics
	Chinese Technology and its Dissemination in East and West
	Byzantium Agriculture
	Byzantium Geography
	Byzantium, Korean and Japanese Medicine
	Byzantium, Latin, Syrian, Persian and Chinese Historiography
	Sanskrit and Chinese Lexicography
25	Philosophers and Latin Learning Centres in Byzantium world, India, Japan and China
	Chinese Mathematics
	Byzantium, Islamic, Chinese and Japanese Astronomy
	Chinese Geography
	Byzantium, Chinese and Japanese Medicine
	Byzantium, Persian, Chinese and Japanese Historiography
	Berber and Japanese Laws
	Arabic, Tibetan and Chinese Philology
26	Latin, Syrian and Muslim Philosophies
	Syrian and Chinese Mathematicsand Astronomy
	Byzantium and MuslimChemsitry
	Byzantium, Latin, Syrian and Chinese Geography
	Byzantium, Latin and Chinese Medicine
	Latin and Syrian Historiography
	Berber , Muslim and Japanese Laws
	Latin, Syrian, Arabic and Japanese Philology
27	Latin and Chinese Mathematics and Astronomy
	Byzantium and Muslim Chemistry and Japanese Technology
	Japanese, Chinese and Latin Geography
	Japanese and LatinHistriography
	Berber, Byzantium, Muslim, Chinese and Japanese Laws
	Arabic and Japanese Philology
28	Muslim and Latin Mathematics and Astronomy
	Muslim and Latin Chemistry and Japanese Technology
	Muslim, Chinese and Japanese Natural History
	Latin and Chinese Geography
	Latin, Syrian, Muslim, Tibetan, Chinese and Japanese Medicine
	Latin, Muslim and Japanese Historiography
	Muslim Philology
29	Muslim, Latin and Byzantium Mathematics and Astronomy
	Muslim and Latin Natural History
	Latin, Muslim and Chinese Geography and Geology
	Byzantium, Arabic and Japanese Medicine
	Latin, Byzantium, Syrian, Muslim and Japanese Historiography
	Berber, Chinese and Japanese Laws
	Latin, Semitic and Japanese Philology and Education
30	Arabic and Latin Mathematics and Astronomy,
	Muslim Chemistry and Physics and Chinese Technology
	French and ScandinavianTravel and Adventure, as well as Englishand Muslim Geography
	Latin, Byzantium, Muslim or Arabic, Jewishand Coptic Medicine
	Latin, English, Byzantium, Syrian, Muslim and Japanese Historiography
	Byzantium and JapaneseLaws
	Latin, English, Byzantium, Slavonic, Syrian and Arabic Philology
31	Muslim, Byzantium and Chinese Mathematics and Astronomy

	Byzantium, Muslim and Chinese Physics, Chemistryand Technology
	English and Muslim Botany
	Muslim and Japanese Geography
	English, Byzantium and Arabic Medicine
	Latin, Arab and Chinese Historiography
	Latin, Berberand Japanese Laws and Muslim Sociology
	Hebrew and Arabic Philology
32	Muslim, Latin, Chinese and Japanese Mathematics and Astronomy
	Latin and Muslim Chemistry and Technology
	Byzantium, Muslim and Chinese Natural History
	Muslim, Jewish, Scandinavian and Chinese Geography
	Muslim, Persian, Jewish, Byzantium and Japanese Medicine
	Latin, Byzantium, Jewish, Muslim and Chinese Historiography
33	Latin, English, Muslim and Hindu Mathematics and Astronomy
	Latin, English, Syrian, Muslim and Chinese Physics, Chemistry and Technology
	Muslim Natural History
	Discovery of Icelandic of America, Latin Geography, Muslim Geography, Minerology and Geology
	Latin, Byzantium, Muslim or Arab and Chinese Medicine
	Latin, Muslim, Armenian and Syrian Historiography
	German, Hebrew, Syrian and Chinese Philology
34	Latin, Byzantium, Muslim and Chinese Mathematics and Astronomy
	Latin, Persian and Chinese Physics and Technology
	Latin, Byzantium, Muslim and Chinese Natural History
	Latin and Muslim Geography
	Latin, Byzantium, Muslim and Chinese Medicine
	French, Latin, Byzantium, Jewish, Muslim, Chinese and Japanese Historiography
	Lombard, English, Byzantium, Muslim and Chinese Laws and Sociology
	French, Latin, Greek, Hebrew, Arabic, Persian, Chinese and Japanese Philology

Table 3 shows that Sarton analysed 41 fields of science for 35 races. Greek scholars were listed, among whom were Theodoros, Democritos, Socrates, Theodoros, Hippocrates, Theophrastos, Archimedes andApollonios. The Chinese scholars listed were, among others, Confucius, Huai Nan Tzu, KengShou-Ch'ang, Liu Hsin, Chang Chung-Ching, Chang Heng, Chia Ssu-Hsieh, P'ang An-Shih and Wang An-Shih. Among the Roman scholars listed were Papirius, Claudius Caecus, and Alimentus, Cato the Censor, Attalos, Caesar, Vitruvius, C. Julius Hyginus, Macer, Sallust andManilius. Scholars such as Artachaees, Paul the Persian, Burzuya, Ahmad al-Tabari, Abu Mansur Muwaffaq, 'Umar al-Khayyam andAsadi were among Persian scholars listed. Many Jewish scholars were also listed, among them, Josephus, Abba Arika, Mar Samuel, Asaph Judaeus, Ibrahim ibn Ya'qub, Abu Sahl al-Masihi, Donnolo, Sahl ben Mazliah, MahanembenSaruq, David ben Abraham andDunash ben Labrat. In addition, among the Japanese scholars listed were ShotokuTaishi, Kwanroku, SakaibeIwazumi, Wu Ching, Shotoku-Tenno, FukuyoshiOmura, ImubeHironari, Yoshimine Yasuko, Sugawara Kiyogimi and Abe Seimei.

Among Arabic scholars listed were Salmawayh ibn Bunan, Ibn Masawaih, Thabit ibn Qurra, Qusta ibn Luqa', al-Battani, Hunayn ibn Ishaq, Al-Dinawari and Sinan ibn Thabit. Sarton also listed French scholars such as Alfred the Great, Bernard the Wise, Rashi and Chanson the Roland. And among English scholars he listed were Alfred the Great, Aelfric, NotkerLabeo, Byrhtferth, Bernelinus, Adelbold, Guido of Arezzo and Oliver of Malmesbury. The writer holds the view that Sarton did this because science cannot be discussed across race as its development is influenced by anything found within a race. This means that if a race has a certain culture, then science for that race is influenced by the culture practised by that race. This was also argued by Sardar (1985) in his book, Arguments for Islamic Science, namely, that different racial cultures produce different sciences. This is a strong argument that science needs to be discussed in the context of a particular race.

This argument becomes increasinglyconvincing when it is linked to the issue of indigenization of science. Indigenization of science means a process of integrating science with the culture of a race or state (Shaharir, 2004). The underlying philosophy for indigenization of science is to make science as part of the natural elements for a particular race. Therefore, each individual within the society of a particular race needs to realize the importance of building his own civilization based on science and technology advancements. Another definition of indigenization of

science put forward byShaharir (2004) is"a transfer process of contemporary science from another culture to another state or nation and simultaneously re-digging the old science heritage of the other nation or nations nearest to the transferee state or nation (such as Greek for Europe)". Both definitions of indigenization of science show that discussing science needs to be done in the context of a race.

The transfer process of science mentioned in the definition of indigenization of science clearly shows that science is closely related to culture. The reason for this is that transfer of science from one race to another may only take place through language. In other words, the transfer process of science involves translation activity of scientific works from one language into another. During the transfer of science from the Greek, Persian and Indian civilizations to the Islamic civilization, it involved translation of scientific works into Arabic language. This similarly occurred in the transfer of science to Europe. Shaharir (2004) revealed translation of works from Latin into Greman, French and, finally, English languages in the 19th Century CE. It is clear here that arace took the initiative to translate scientific works from another race to enable scientific information to be easily understood in the language of their own society.This language is part of the culture owned by the racial group.On the whole, the writer may conclude that Sarton did not marginalize the cultural element in writing his work on the history of science. The above discussion clearly proves this matter when Sarton intentionally and consciously compiled discussion of science fields according to race. Each race has its own culture which influences the development of its civilization, including the development of science.

Concept of Science as Culturally Bound

In terms of the relationship between science and culture, the writer finds that many scholars have analysed this matter. Spengler (1932),for example, asserted that any method or way the field of mathematics came depends wholly on its culture of origin. He gave the argument that the meaning of number depends on culture, in the sense that the meaning of one, two and other numbers change or differ from one culture to another with a different sytem of values. In addition, scholarsShaharir and Abdul Latif (1989) also put forward the existence of cultural influence on mathematics.Mathematics is said to be a sub-culture of a people or race, similar to design, apparel, belief, customs, technology, laws and so on. Like other sub-cultures, mathematics is part of the total culture of a society.

According to Glyn Ford (1991), science is determined by culture just as other intellectual disciplines.This means that science has a relationship with culture. Thus, science develops according to its own mould. Shaharir (1991) stated that since the 1960s, scholars began their endeavor to show that mathematics is indeed laden with values (influence of culture and value system of the science community and society). The view that science is culturally bound is further strengthened by ZiauddinSardar's(1985) opinion which did not deny that every civilization has its own unique science ideas characterized by the culture and values structure of itsworldview. As example, Western science has its own culture.

Furthermore, Western culture and science are actually universal. Thus, Western science would appropriately give priority to its own society and the whole of its culture. The writer finds that the definition given by Sardaris very clear about the relationship between science and culture, namely that they are intertwined and mutually influencing each other. The reason is that cultural characteristics and values are also found in science, including Western science. Although Western science is said to be universal, the significance of culture is not marginalized. Thus, it is reasonable to assert that science and culture have a strong relationship. MohdYusof (1999) submitted his view that socio-cultural conditions directly affect development of science and a person's way of thinking. In addition, Shaharir (2000) stated his view that different civilizations (tasawwur or worldviewand values system) produce different sciences.Ithnin (2001) expressed the view that the lack of business culture is an important factor which inhibits and restricts the development of science in a society. From Shaharir's and Ithnin's views, the writer finds that science is determined by a civilization. This means that different civilizations will produce different sciences, according to the needs for science at the time. Mohd. Hazim Shah (2003) supported the above by submitting the fact that science and technology were transferred not only through and across geographical boundaries, but also cultural, racial and religious boundaries. This is a factor which raised the notion that science is universal because of its capacity to be transferred in this way and, ultimately led to acceptance of the concept and phenomenon of globalization itself based on modern science and technology, as global and universal.

Conclusion:-

Upon analyzing Sarton's work, it could be said that his opinions about scientific method were in tune with cultural, traditional and classical views. They might be described as conventional with the feelings and beliefs concerning scientific spirit and research procedures as practised or idealized by people of science themselves. His observation

has two significant consequences. The history of histography of science had its own flukes and the generations of historians and philosophers between us and the historical thinkers had their idiosyncratic criteria of selection after they read historical thinkers. It is not clear that the intermediate generations selected the important aspects of historical ideas. Sarton points out that novel problems can make to forget highly valuable ideas. He was well aware of the increasing specialization in science and other fundamental changes that scientific thinking had gone through in history. His work reflects that he has good understanding about historical essence of human life and activities. Inspite of this, for many other reasons, Sarton's thinking which is reflected through his work shows that history of science can be seen as a unified development through history. There is no doubt that science has changed but so as human cultures and societies.

Sarton did not consider this changing nature of science as challenging for its historical unity. Rather he saw the changes taking place in terms of knowledge growth and development and the development of cultures and societies, it is therefore natural that science does not remain the same in the phase of development. His work shows the relationship between science and civilization, religion and culture, arts and technology. Discussion in his work revolves around the role of various aspects of culture and society in development of knowledge which makes today's readers wonder if there is any space for fundamental reordering of knowledge. But this impression should not mislead us as when we see Sarton thinks that developments in philosophy are of great importance in the history of science. But the big picture remains similar. The history of science comprises of developments and progress in systematic knowledge which are interconnected.

The article concludes that science and cuture are mutually related. This relationship causes the existence of science to be greatly significant in a culture, and vice versa.Although both are universal, they are mutually influencing, yet keep their own importance. George Sarton's writing on the history of science in Introduction to the History of Scienceclearly propounds the cultural element throughout the whole discussion. That being the case, the writer finds justification for the conclusion that any writing about science, including the history of science, should be done without separating it from cultural values.

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