EDGAR ALLAN POE AND SCIENCE

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THESIS

This is to certify that the

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EDGAR ALLAN POE AND SCIENCE

by

Jack Ricketts Gibson

A THESIS

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PREFACE

Too often the casual reader looks upon Edgar Allan Poe as a romantic who delved only in the melancholy and the abnormal or the musical and the poetic. However, this Southern author was influenced by the ordered, the balanced, the scientific. Characteristics of reason and logic vein his tales, reviews and "marginalia". Poe's journalistic training may account to some extent for his literary clarity, but his works also reflect his interest in science, intensified by an affinity for mathematics and astronomy and the experimentation of Galvani and Mesmer.

The object of this thesis is twofold: to prove that Poe was not only interested in science, but that this attraction influenced the thought content of many of his works, causing him to apply analytical methods to aesthetic problems; to point out that Poe was not as remote from the America of his day as such a critic as Brownell believed, but rather that he observed life accurately, incorporating the findings in his literary work.

Dr. Russel Nye's lectures first focused my attention on Poe. I should like to thank Dr. Nye for his aid, both as instructor and friend, in preparing this study, for

the time he spent in reading the manuscript and for his suggestions which presented new views and opened more profound approaches to the problem of Edgar Allan Poe and Science.

CHRONOLOGICAL TABLE

1809. On January 19, Edgar Allan Poe was born in Boston to David and Elizabeth Poe, actors.

1811. The family was settled in Richmond, Virginia and Poe's mother died on 3 December. The three children were separated, Poe being taken into the Allan family of that city.

1811-15. Young Poe became the adopted son of the Allans, a family of means and social position. Summers were spent at White Sulphur Springs.

1815-20. In England with the Allans where he attended several schools finishing his education abroad at Dr. Bransby's Manor House School at Stoke Newington near London.

1820-25. Having returned to the States, Poe continued his schooling at Richmond. At fifteen began his military career as lieutenant of the Richmond Junior Volunteers. According to a schoolmate, Andrew Jahnson, Edgar Allan was said to be one of the foremost in athletic exercises.

1826. He entered the University of Virginia on 14 February 1826 enrolling in the schools of ancient and modern languages.

1827. Mr. John Allan withdrew his financial support and Poe failed to return to the university. Ran away to Boston where he enlisted in the army on 26 May 1827 under an assumed name, Edgar A. Perry. In the autumn, he was transferred to Fort Moultrie, Charleston, South Carolina.

1828-29. Now stationed at Fortress Monroe, Virginia. Mrs. Allan died on the 28 February 1829. Poe was honorably discharged in April for appointment to West Point. Published "To Science" and "Al Aaraaf" in 1829.

1830-31. July 1, 1830, Poe became a cadet. Dismissed on March 6, 1831 for direct disobedience to an officer.

1831-33. Poe settled in Baltimore, Maryland.

1835. Connected with the Southern Literary Messenger. His tale "Hans Pfaall" appeared in this periodical in June. Became editor near the year's end.

1836. Married his cousin Virginia Clemm on may 16, 1836. Produced "Maelzel's Chess-Player" and "A Chapter Autography."

1837-38. Published the Narrative of Arthur Gordon Pym in July 1838. Now in New York City. "Ligeia" and "How to Write a Blackwood Article" appeared in The American Museum.

1839. His The Conchologist's First Book issued in 1839 caused plagiarism charges to be leveled at Poe. "The Fall of the House of Usher" and "The Conversation of Eiros and Charmion" appeared in Burton's Gentleman's Magazine.

1841. Had been in Philadelphia since 1838. In this year Poe contributed "The Murders in the Rue Morgue" to the April issue of Graham's Magazine and in May "A Descent into the Maestrom" was published, followed in August by "The Colloquy of Monos and Una."

1843. Won first prize of one hundred dollars with his tale "The Gold Bug" which appeared in the contest sponsoring publication, The Philadelphia Dollar Newspaper. The prospectus of The Stylus, Poe's literary venture appeared.

1844. Left Philadelphia to settle at Fordham, New York City where the author remained for the remainder of his life. "A Tale of The Ragged Mountain's" was sold to Godey's Lady's Book. "The Balloon Hoax" caused a stir when published in The New York Sun in April and the short story "Mesmeric Revelation" appeared.

1845. His most important work of the year, "The Raven" was published in January while "The System of Dr. Tarr and Prof. Fether" appeared in Graham's Magazine. In the February issue of Godey's, "The Thousand and Second Tale" was published. "Some Words With a Mummy" also appeared in this year as did "The Power of Words" and "The Case of M. Valdemar."

1846. "The Philosophy of Composition" was published in Graham's Magazine in April. Some consider this critical essay to be a super-rationalization of the poem "The Raven."

1847. His wife died on January 30, 1847. Supposedly working on Eureka. Lectured on the "Cosmogony of the Universe" in an attempt to refinance The Stylus.

1848. Eureka: A Prose Poem was published by G. P. Putnam, 155 Broadway, New York City. Delivered the lecture

which later was published as "The Poetic Principle" in October of 1850.

1849. Poe wrote "Annabel Lee" and "The Bells." He died at about five o'clock in the morning of October 7, 1849 at the Washington Hospital, Baltimore. On the 8th. he was buried in a cemetery in that city, age forty years.

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CHAPTER ONE

SCIENTIFIC BACKGROUND

In the study of the history of literature, students have become more and more aware of the importance of the scientific background in determining the direction of currents of literature and have been increasingly conscious of the extent to which writers have felt the cold pressure of contemporary scientific conceptions.

Literature of the seventeenth and eighteenth century reflects the imaginative flights of authors as they peered through the telescope, "Galileo's tube", into the newly opened heavens. "We may date the beginning of modern thought from the night of January 7, 1610, when Galileo... actually perceived new planets and new worlds;"[1] John Milton in Paradise Lost pictured the infinity of the new telescopic vastness as an "immeasureable Abyss, Outrageous as a sea, dark, wasteful, wild."[2] And George Herbert (1593-1633), the Anglican clergyman, invokes God of the "Eureka-like" infinity in "The Temper":

> O rack me not to such a vast extent;
> Those distances belong to Thee
> The world's too little for Thy tent,
> A grave too big for me.[3]

In the eighteenth and nineteenth centuries Newton, Franklin, Laplace and others in America and Europe added

[1] Marjorie Nicolson, "The Telescope and the Imagination," Modern Phiology, 32, (1935) p.235.
[2] Harris F. Fletcher ed., The Complete Works of John Milton, The Riverside Press, Cambridge, Massachusetts, 1941, p.281.
[3] Robert Coffin and Alexander Witherspoon ed., Seventeenth-Century Prose and Poetry, Harcourt, Brace and Company, New York, 1946, p.110.

more concrete information concerning man and his environment, both material and spiritual. Writers such as Poe, Paine and O. W. Holmes, were familiar with Newton and with the inventions which led many materialists of the nineteenth century to believe that the golden age of the United States was then in existence. Fulton's steamboat (1807) churned the rivers, McCormack's reaper (1834) multiplied the man power of the farmer twenty times, and in manufacturing New England the textile industry profited from Yankee and English ingenuity, (1790).[1]

Just as America felt the repurcussions of economic, political and religious movements in England and the continent, so the American mind was influenced by the ideas of those workers in science in the Old World.

During the 18th century science and literature intermingled in France, "and in the early 19th century this connection between science and literature was maintained on a lofty and dignified plane, largely owing to the constitution of the Academie as part of the Institut."[2] Paris was the scientific center of the 1700's, maintaining this enviable position until the French Revolution when Lavoisier, Cousin and Bailly were guillotined.[3] Later the new government lifted the suspension on the Academie des Sciences and observational and experimental scientific endeavor continued.

[1] See Harold Faulkner, American Economic History, Harper and Brothers Publishers, New York, 1943, pp.220, 251, 252, 284.
[2] William Dampier, A History of Science, The MacMillan Company, New York, 1944, p.310.
[3] Ibid., p.309.

By the 1800's the Baconian method had captured most of science. Francis Bacon (1516-1626) laid the groundwork for modern research and the scientific approach. Though he wrote, "I have taken all knowledge to be my province," he wished simply to investigate the means and methods, not the mass, of all knowledge. Helping to dispel the mists of medieval "authoritarianism", Bacon paved the highway of scientific investigation by the use of inductive reasoning, which proceeded from the part to the whole, from the specific case to the general law.

Baconianism employed the objective method; according to one authority, his "separation of religion and knowledge, his hostility to the scholastic and humanistic tradition, his positive scientific, empirical, utilitarian, and humanitarian ideals were translated into practical terms."[1] It was in technical schools that Sir Francis felt the human spirit could best be nourished.

His The Novum Organum (1620) contained a criticism of past science and a program for the future. This monumental work stressed the importance of an objective attitude toward nature, of the need for controlled investigation of phenomena. He struck out against such supposed "facts" as: "Crystal is nothing else but Ice strongly congealed; a diamond is softened or broken by the blood of a goat; an Elephant hath no joints."[2] However, Bacon's knowledge of the exact

[1] Douglas Bush, English Literature in the Earlier Seventeenth Century, The Claredon Press, Oxford, 1946, p.20.
[2] E. Legouis and L. Cazamian, A History of English Literature, The MacMillan Company, New York, 1935, p.540.

sciences was deficient and "he was not untouched by the pseudo-scientific attitudes he condemned."[1] In his survey of knowledge Bacon leaves gaps which are difficult to explain unless the magnamity of his work is considered. For example in the field of medicine he did not seem to be aware of the work of his own physician Harvey, though Harvey was cognizant of his patient's work in natural philosophy. The author of Organum wished to teach the proper method of delving into nature which he considered to be "a combination of the empirical and the rational."[2] He expected too much of the inductive method (synthesis) for human observers were fallible and receptive to error. Undervaluing the deductive or analytical method which is essential for verification, Bacon fell short of the scientific ideal.

A contemporary of Sir Francis Bacon, Thomas Hobbes (1588-1679), also emphasized the rational, the materialistic which later characterized the eighteenth century, the Age of Reason. Like Bacon, Hobbes hoped to find in science the key to truth; he saw as the ends of knowledge, utility, and power. In paying tribute to Galileo, Hobbes called him "the first that opened to us the gate of Natural Philosophy Universal, which is the knowledge of the Nature of Motion."[3] In this world of mechanical motion in which bodies infinitesimally small or infinitely large are governed by natural laws, Hobbes found himself to be pgymy size. "Nor was there much room for God, except as the First Cause of motion and only

1 Douglas Bush, op.cit., p.263.
2 Ibid., p.262.
3 Ibid., pp.286-287.

the initial cause."[1] God swung the universal pendulum, then stepped aside to become the impersonal, mechanistic Deity.

The ancient and medieval view that the heavenly bodies were of divine origin had been partially refuted by Galileo's searching of the heavens. Newton added further refutation by his employment of mathematical calculations to predict accurately the path these bodies would follow. It was now known after Newton and Galileo and others, that the planets, instead of following mysterious, unknown, and possibly capricious paths, moved in carefully ordered patterns according to natural law. Since the God who planned these patterns was reflected in His, astronomy postulated a rational, orderly, supremely reasonable Architect. His nature, thus exemplified in natural law, was calculable by man and capable of being discovered partially, if not wholly. This rationalistic picture of God, induced and supplemented by science and particularly by physics and astronomy, tended in religion to cause a shift in spirit from miracle to reason, from heart to head, from fear of a capricious and unknowable Deity to a respect for and trust in a rational and knowable Deity. Science became one method of understanding God by penetrating the secrets of His work, and discovering the laws of nature through man's use of his own reason, which paralleled God's own Reason--an attitude best exemplified by the deists, both British and American, of the later eigthteenth century.

[1] Douglas Bush, English Literature in the Earlier Seventeenth Century, p.290.

In Great Britain the individualistic spirit was the guiding light in science and the experimenters were men from the practical field laboratory rather than the university, men not steeped in academic tradition. In the middle of the eighteenth century Oxford and Cambridge[1] opened their doors to the new knowledge and made way for a renewed interest in science in the Isles.

Early in America, the Puritans began the study of natural phenomena to glorify God and to honor His handiwork. Perry Miller, in The Puritans, writes that they "gathered data on earthquakes, thunderstorms, comets; on farming and the natural history of New England."[2] Though John Cotton, afraid that his followers might forget their main purpose in life, the salvation of their souls, advised that "the study of these natural things, is not available to the attainment of true happinesse,"[3] men of his faith such as John Winthrop Jr. (1606-1676), Cotton Mather (1663-1728) and Sammuel Danforth (1624-1674) observed, discussed and recorded as they lived in their "Taskmaster's eye." Mather it was who defied a crowd outside his door which came to protest his support of innoculation against small pox.[4]

A third generation Puritan, the precocious Jonathan Edwards (1704-1758) wrote "Of Insects"[5] at the age of eleven.

1 William Dampier, A History of Science, p.311.
2 Perry Miller and Thomas Johnson, The Puritans, The American Book Company, New York, 1938, p.823.
3 Ibid., p.729.
4 See Bernard Jaffe, Men of Science in America, Simon and Schuster, New York, 1944, p.16.
5 Clarence Faust and Thomas Johnson ed., Jonathan Edwards, American Book Company, New York, 1935, pp.3,417.

Some of his observations, such as that of the habitat of the spider and the method of spinning a web illustrated by a rough diagram, are acute and lucidly set down in this analytical-theistic essay. As did the early Puritans, Edwards saw the hand of God in all things and in praise of Him reminds his readers:

> Admire also the Creator in so nicely and mathematically adjusting their (the spiders) multiplying nature that Notwithstanding their Destruction by this means (as he believed by drowning at sea)...they Do not Decrease and so little by little come to nothing, and in so adjusting their Destruction to their multiplication that they Do neither increase but taking one year with another there is alwaies Just an equall number of them.[1]

In another early work the moving spirit of the religious Great Awakening in America (1734) explained the rainbow and its properties, after first pointing out that this account:

> ...if Well understood will be satisfactory to Anybody If they Are fully satisfied Of Sir Issac Newtons Different Reflexibility and Refrangibility of the Rays of light and If he be not we Refer him to (what) he has said about it...[2]

Certainly it is evident that the Puritans did not discourage the study of natural phenomena for God's Omnipotent hand was evident in all things.

With the coming to America of Joseph Priestly (1733-1804), the discoverer of oxygen, and Thomas Cooper (1759-1839) who according to Jefferson was "'the man who is acknowledged by every enlightened man...to be the greatest... in America in the powers of the mind and...acquired informa-

1 Ibid., p.10.
See also Clarence H. Faust, "Jonathan Edwards as a Scientist", American Literature, 1, (1930) pp.393-404.
2 Ibid., pp.13, 417.

tion,'"[1] the arc of science had sparked from Europe to the New World, contact was complete. Cooper, the chemist, became in time president of the University of South Carolina and it was he who introduced such names as Watt, Cavendish, Lavoisier to the South.[2]

The gifted, practical Franklin also did much to draw America and Europe scientifically closer. He was attracted by those essentials of Newtonianism which paralleled his deistic belief that the universe was constructed by a mechanistic God and motivated by immutable, natural laws which allowed for the perfect balance of a harmonious system.[3] It is in "A Dissertation on Liberty and Necessity, Pleasure and Pain" (1725) that the inventor-scientist-philosopher praised the thought and physics of Newton.[4] When in France as ambassador, Franklin was appointed on a committee with Lavoisier to observe and report upon the hypnotic methods of Mesmer.[5]

Though busy with affairs of state and local politics, Franklin found time to correspond with men of science throughout the world. His letters to Joseph Priestly[6] are especially interesting for their comments on the science of the times; in a note sent from France in February of 1770 he wrote:

> 'I am glad my little Paper on the Aurora Borealis pleased. If it should occasion further enquiry, and so produce a better Hypothesis, it will not be wholly useless.'[7]

1 Bernard Jaffe, Men of Science in America, p.78.
2 Ibid., p.98.
3 Frank Mott and Chester Jorgenson, Benjamin Franklin, American Book Company, New York, 1936, p.cxxv.
4 Ibid., pp.114-128.
5 Bernard Jaffe, op. cit., p.46.
6 Frank Mott and Chester Jorgenson, Benjamin Franklin, pp348, 420, 443.
7 Ibid., p.421.

Contemporaries of the great Philadelphain were the famous Bartrams, father (1699-1777) and son (1739-1823), the Quaker botanists. Linnaeus called William, "'the greatest natural botanist in the world'"[1] while his son John gained world wide prominence with the publication of his Travels in 1791. Some of his botanical descriptions were said to have been used as exotic background material by Coleridge in his poems. In his wanderings J. Bartram came across a "new species of plant which he named Franklinia in honor of his friend Franklin."[2]

Jefferson, in his Notes on Virginia, written in the winter of 1781-1782, described not only the government of that state but mentioned the topography in "A notice of its Mountains", and added some anthropological data on the natives in "A Description of the Indians...."[3] He became president not only of the United States, but also of the American Philosophical Society. Both Washington and Jefferson were agricultural experimentalists, the former being described as "the greatest agriculturalist of the period." He was also the founder of the mule raising industry in this country,[4] developing the Kentucky strain.

Another president, John Quincy Adams (1767-1848), helped to found the American Academy of Arts and Sciences in 1780. Priestly, while still in England, was made an honorary member

[1] Bernard Jaffe, Men of Science in America, p.14.
[2] Ibid., p.13.
[3] Frederick Prescott, Alexander Hamilton and Thomas Jefferson, American Book Company, New York, 1934, pp.216-246.
[4] Harold Faulkner, American Economic History, pp.222-223.

and on this occasion (1782) wrote:

> 'I rejoice that after so noble and successful a struggle for your liberties, you are now attending to matters of science.'[1]

A publication which undoubtedly was read by Edgar Allan Poe, The American Journal of Science[2] originated in 1798, the child of Benjamin Silliman of Yale.[3] This journal became the most powerful scientific research organ in the United States. In it Samuel Guthrie explained the process whereby he produced the compound chloroform[4] by treating chloride of lime ($CaCl_2$) with grain alcohol (C_2H_5OH).

By the time of Edgar Allan Poe most of science was captured by the Baconian method. There was a greater development of the natural rather than the biological studies. During the eighteenth century, the imagination was distrusted and only that phenomenon explained by the five senses was wholeheartedly accepted. Power over nature was the theme, power to be utilized through logic, restraint and reason. Prose style became as polished and symmetrical as a chemical retort. Even the poets, Dryden and Pope for example, were didactic in their verse and James Thomson in "To The Memory of Sir Issac Newton" exactly described the universe as "an harmonious system--all combined / And ruled unerring by that single power / Which draws the stone projected to the ground."[5]

1 Bernard Jaffe, op.cit., p.73.
2 Margaret Alterton and Hardin Craig, Edgar Allan Poe, American Book Company, New York, 1935, pp.549-500.
3 Bernard Jaffe, op.cit., p.100.
4 Ibid., p.167.
5 Louis Bredvold et al., Eighteenth Century Prose and Poetry, Ronald Press, New York, 1939, pp.450-451.
See also Alexander Pope's "An Essay on Man" in which he writes in rhyme of the marvelous existence of order in the universe and discusses 17th century science as well as man's "erring reason."

Reason supplemented by observation produced literature which expressed truth in a rational, scientific manner. Newton's law of motion helped to explain the orderliness, the oneness of the universe. Literary men in his century and in the eighteenth attempted to translate this feeling of balance, proportion and truth into their written work. Writers like John Dryden, Addison and Steele and Jonathan Swift employed the formula of reason to explain and interpret life.

Scientific deism sprang from the geometric world of Newton; Benjamin Franklin became,as he wrote, a "thorough Deist"[1] after reading Boyle's Lectures. Newton's physics aided many of the Boyle speakers to strengthen scriptural theology. Richard Bentley[2] referred to gravity as "'the powerful cement which holds together this magnificent structure,'"[3] the universe. Here science instead of clashing with the Divine, walked hand in hand with God.

Science had revealed to man that the immutable universe of Ptolemy was in reality the ever-changing world of Copernicus (1473-1543) and that the earth instead of being the geocentric core was instead a mere planet. Then Newton and his gravitation law proved that natural laws controlled the motions of bodies in space. In 1859 Charles Darwin published his Origin of the Species and the theory of the "survival of

[1] Frank Mott and Chester Jorgenson, Benjamin Franklin, p.cxvi.
[2] One of the Boyle Lectureres.
[3] Frank Mott and Chester Jorgenson, op.cit., p.cxvii.
See also William Dampier, A History of Science, (pp.188-189) for further information on Bentley.

the fittest" wedged itself into the well oiled mechanism of the balanced, ordered universe. This caused a major shift in emphasis from the study of natural science to the biological.

Through the centuries religion was forced by science to accept the beliefs that the earth was no longer the pivot point of the universe--man shrank in stature--that natural, not divine law controlled the orbital paths of celestial bodies--God was not all powerful and fear provoking-- and that man was not divine but connected by the chain of evolution with the monkey.

CHAPTER TWO

THE PRE EUREKA PERIOD

Poe was born into a nation which, though not the leader in the scientific movement, was well aware of recent discoveries in the world of science. Having reviewed scientific books, Poe probably consulted the pages of The American Journal of Science, which during the 1830's were saturated with current discussions of the relation between deduction (the method of Aristotle) and induction (the school of Francis Bacon), to strengthen his literary arguments.[1] He, however, was attracted to Kepler and his intuitional insight though he did accept the prevailing American investigational method--" a combination of induction with deduction, having also a provident use of the hypothesis, whose verification is a sine qua non."[2] In Eureka Poe communed with Kepler, "with his soul," which assimilated things intuitively and felt the throbbing of "the machinery of the Universe."

His educational background may give some insight into his attitude toward the use of reason and may partially reveal his interest in things scientific as having sprung from an affinity for the well-proportioned, the orderly.

1 See Joseph Henry, "Explanations and Illustrations of the Plan of the Smithsonian Institute," The American Journal of Science, Second Series, 6, pp.288-292.

2 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.550.

In 1815 Poe accompanied his foster-father, John Allan, to Great Britain, where he entered a grammar school while Allan engaged in business transactions. Two or three educational changes occurred, then Poe enrolled in Manor House School at Stoke Newington, in July, 1818.[1] Here he remained until the family returned to Virginia in 1820. While abroad he studied languages, French and Latin, and read in Fresnoy's Geography.[2] At this time, 1818, John Allan wrote his Richmond business partner that Edgar could read Latin "pretty sharply."[3] Though only nine, Poe proved an apt student, causing one of his instructors to remark that when he (Poe) left Manor House he was extraordinarily proficient in two foreign languages. His personal observation of the people and countryside about him probably stimulated his active, imaginative mind more than did his books, or schoolmasters like the Reverend John Bransby of Manor House. At any rate Hervey Allen believes that this period of education in Britain did much to quicken Poe's feeling for the ivy covered and romantic, for the traditional cloaked in a Gothic gown. Allen is supported by Margaret Alterton and Hardin Craig, for the early overly imaginative Poe fits well their thesis that the writer shifted from an immature romantic to a literary man guided by reason and logic in later years.

The University of Virginia, founded by Jefferson and

1 Arthur Quinn, Edgar Allan Poe, D. Appleton-Century Company, New York, 1941, p.17.
2 Ibid., p.69.
3 Killis Campbell, The Mind of Poe, Harvard University Press, Cambridge, Massachusetts, 1933, p.7.

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2 Ibid., p.69.
3 Killis Campbell, The Mind of Poe, Harvard University Press, Cambridge, Massachusetts, 1933, p.7.

later the possessor of his fine library, was in its second year when Poe entered in February, 1826. Here languages again occupied the young student; he did well in Latin and in the Romance tongues, Italian and French.[1] Possibly the classical rules necessary for a successful study of language gave Poe a scientific bent, the interest in logic which found expression in the ratiocinative tale, such as "The Murders in Rue Morgue." While in attendance at Charlottesville, Virginia, he drew few volumes from the library, but this may be explained by the fact that the books were then being catalogued and strict withdrawal rules were in effect. Bruce in his History of the University of Virginia says:

> In February 1826, a box was placed outside of the library door, in which the petitions for books were to be dropped the day before the library opened; and on the latter day, the volumes were handed out like loaves of charity through the iron bars of a monastery.[2]

For a year Poe remained at the university until John Allan withdrew his financial support, cutting short Poe's collegiate career. Not however, before he had gained a respect for advanced study, note-taking and the collecting of miscellaneous data. Therefore early in life (he was now seventeen) the hand of classical study had perhaps already begun to guide him along the road of reason which finally led to the intellectual peak of Eureka.

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.xxiii.

2 Phillip Bruce, History of the University of Virginia, The MacMillan Company, New York, 1920, II, p.202.

Entering West Point, July 1, 1830, Poe was again in an academic atmosphere though a much more ordered one than that at the University of Virginia. Mathematics now engaged his interest, rather it was forced upon him since there was no election of subjects for cadets. However, Poe found the study of figures so stimulating that he placed seventeenth in a class of eighty-seven.[1] Later in "Hans Pfaal" he employed his knowledge of geometry in fiction as he did again in "The Balloon Hoax", while in Eureka he displayed further his great ability to manipulate figures in support of his astronomical theories.

Though the Virginia cadet rebelled against strict discipline and the militaristic regime of the school on the Hudson, his army training, both as an enlisted man (from May 1827-1829) and as an embryo officer, aided in crystallizing out the vein of reason by means of discipline and emotional curbing. With his dismissal from the Military Academy "for disobedience of orders and neglect of military duty, sentence to take effect March 6, 1831,"[2] his formal education was complete.

His study of foreign languages, both in America and abroad, his military service, and his attraction to mathematics which in turn drew him to astronomy, may have done much to influence his gravitation to science, to his reading of the deductive-inductive methods of Aristotle and

[1] Killis Campbell, The Mind Of Poe, p.16.
[2] Margaret Alterton and Hardin Craig, op.cit., p.cxxxiv.

Bacon, and to his interest in experimentation and pseudo-science.

Poe possessed an immense intellectual curiosity and an extroardinarily large stock of general information which served him well in the years from 1833 on when he reviewed books, tracts and poems by his contemporaries in America as well as on the continent. That Poe was related to his times is evidenced by the fact that he knew of contemporary inventions and employed them in his pseudo-scientific tales (the balloon in "Hans Pfaal" and "The Balloon Hoax", the screw principle in "The Balloon Hoax" etc.) even though W. C. Brownell wrote that "he never travelled, and in this respect he inevitably seems limited, even boyish, in comparison with many of his contemporaries."[1] It is difficult to accept Brownell's remark at full value. Poe certainly knew much of contemporary science, was fully aware of current scientific development, and recognized the importance of science in the life about him. In an early review Poe dwells on the duty of our nation "'to remunerate scientific research'" and to add "'to the aggregate of human knowledge.'"[2]

His early reviewing was done in Maryland, just following his return from West Point in 1831. It was Poe's acquaintance with things in general, his mine of fact and figure, that served him well in his capacity as reviewer.

1 W.C. Brownell, American Prose Masters, Charles Scribner's Sons, New York, 1923, pp.207 ff.
2 Killis Campbell, op.cit., p.25.

Aided by "' a faculty of vigorous yet minute analysis and a wonderful fecundity of imagination,'"[1] as James Lowell wrote of him, he digested such a book as A New Theoretical and Practical Treatise on Navigation, (1836) and was "'pleased to see that science was gaining votaries from the Navy's ranks.'"[2] Continuing in the logical vein, Poe analyzed Maelzel's chess player, supposedly a perfect mechanism, in the April 1836 issue of the Southern Literary Messenger. By crystal reasoning and clear cut observation Edgar Allan proved conclusively that an attendant secreted himself within the figure and manipulated the chess man during play. "He pursued his usual method of selecting the unusual elements in the problem, among others that the Turk always used his left hand,"[3] and proved beyond a doubt that the figure was not a miracle of European workmanship. Margaret Alterton feels that "Review of New Views of the Solar System" and "New View of the Tides" published in the Messenger are possibly of Poe authorship, for at this date, 1838, he was busy revising "Hans Pfaal." and was in a flux of scientific investigation.[4] Preparing for the research for "Hans Pfaal's" flight to the moon, the writer read Ferguson's Astronomy, and as usual adopting the material in his literary condensor, mentions the phosphorescence of the lunar body as discussed by Ferguson.[5] To add authenticity and verisimili-

[1] Killis Campbell, The Mind of Poe, p.52.
[2] Bernard Jaffe, Men of Science in America, p.214.
[3] Arthur Quinn, Edgar Allan Poe, p.248.
[4] Margaret Alterton, Origins of Poe's Critical Theory, p.145.
[5] Ibid., p.142.

tude to this tale of Dutch setting, Edgar Allan perused the Philosophical Transactions of the Royal Society of London,[1] papers of a scientific nature dating from the year 1665. His revision of "Hans Pfaal" based on notes from the learned journal of the Royal Society, appeared in the edition of 1840. Also Miss Alterton points out the fact that these reviews fit the arch, beginning with "Hans Pfaal" and ending with Eureka, which Poe was so earnestly constructing.[2] Again a supposition--that Poe may also have had some hand in preparing a treatise on natural history. His review as associate editor of A Synopsis of Natural History, supposedly the work of Thomas Wyatt which was published in Burton's Gentleman's Magazine for July, 1839, may throw some light on this subject.[3]

While editing Graham's Magazine a sequence of brief write-ups unified under the title "A Chapter on Science and Art" appeared in the magazine (from March to May of 1840); in one issue they were signed "Eds. G.M." Evidently Poe had a hand in them, writing descussions of steam engines, improved methods of daguereotyping, balloons[4] and similar subjects of a popular mechanics nature which appeared in the magazine at sporadic intervals.

A year later (1841), while editing the same periodical, Poe renewed his challenge of several months before to amateur cryptologists, confident that by logic and reason alone he could break any legitimate garbled code. He went so far

[1] George Woodberry, The Life of Edgar Allan Poe, The Houghton Mifflin Company, Boston, 1909, II, p.134.
[2] Margaret Alterton, op.cit., p.147.
[3] Killis Campbell, op.cit., p.19.
[4] Arthur Quinn, op.cit., pp.295-296.

as to enlarge the working field of his opponents so that:

> 'Anyone who will take the trouble, may address us a note, in the same manner as here proposed, and the key-phrase may be either in French, Italian, Spanish, German, Latin, or Greek (or in any of the dialects of these languages) and we pledge ourselves for the solution. The experiment may afford our readers some amusement--let them try it.'[1]

The July and August issues (1841) of Graham's Magazine contained the article, "A Few Words on Secret Writing"[2] by Poe. His interest in cryptography caused him to devote some space to a mysterious cipher in "The Gold Bug" which was published in The Philadelphia Dollar Newspaper for June 21-28, 1843. Poe in the revision (printed in 1845) altered the tale's cryptogram, but forgot to recount the symbols in the new version. The majority of today's collections contain this Poe oversight, the revamped cryptogram of 1845 and the 1843 summation of its characters.[3]

Though Wm. F. Friedman, an employee of the Office of Chief Signal Officer, Washington, D.D., in his article "Edgar Allan Poe, Cryptographer" looks on Poe as "only a dabbler" and points out that the "basic principles for solving the tupe of ciphers" Poe "discusses were in existence before the sixteenth century," he readily admits that had the author of the "Gold Bug" taken a professional interest in cryptography, he would have become better than average in this field.[4] In the same article Friedman also states

[1] Arthur Quinn, Edgar Allan Poe, p.327.
[2] See William Trent et al., The Cambridge History of American Literature, G.P. Putnam's Sons, New York, 1921, II, pp.452-468, for an excellent bibliography.
[3] R.F. Ford, "Crytogram in 'The Gold Bug'", The New York Times, Section VII, 2, (August 4, 1946) p.2.
[4] William Friedman, "Edgar Allan Poe, Cryptographer", American Literature, 8, (1936) pp.266-280. See also Arthur Quinn, Edgar Allan Poe, pp.327-328.

that a cryptogram described by Poe as difficult, was solved in thirty-five minutes by persons who had been schooled in decoding for only ten days. However, Friedman judges Poe by modern standards, which is an unfair as attempting to interpret Eureka by employing the theories of Einstein, or using recent atomic research to prove that he knew little of the physics and astronomy of the mid-twentieth century.

Poe's cipher challenge in the December 1839 issue of Alexander's Weekly Messenger[1] evidently kept him well occupied, for is a letter to the Tennessee poet, Tomlin, written at Philadelphia in August of 1843 he advised him:

> 'My Dear Sir--I have just received your letter, enclosing one in Hieroglyhpical writing from Mr. Meek, and hasten to reply, since you desire it; although some months ago I was obliged to make a vow that I would engage in the solution of no more cryptographs. The reason of my making this vow will be readily understood. Much curiosity was excited throughout the country by my solution of these cyphers, and a great number of persons felt a desire to test my powers individually--so that I was at one time absolutely overwhelmed.'[2]

In July 1841, Graham's Magazine carried another article by Poe on secret writing, entitled "Cryptography."[3] Poe, because of his logical, analytical mind, took pride in fencing with his readers. So obvious was this trait that a critic in Blackwood's Magazine found that "the bent of Mr. Poe's mind seems rather to have been towards reasoning than sentiment...."[4]

1 William Friedman, op.cit., p.326.
2 George Woodberry, The Life of Edgar Allan Poe, II, p.39.
3 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, Charles Scribner's Sons, New York, 1914, pp.260-278.
4 Fred Pattee, The First Century of American Literature, D. Appleton Century, New York, 1935, p.511.

The pseudo-science of craniology or phrenology attracted Poe, whose intense interest in the subject may well date from his reviews of Mrs. L. Miles' book Phrenology, and the Moral Influence of Phrenology,[1] (in the Southern Literary Messenger for March of 1836). In the review itself Poe is enthusiastic in his support of cranioscopy, writing:

> 'Phrenology is no longer to be laughed at. It has assumed the majesty of a science, and as a science ranks among the most important which can engage the attention of thinking beings--'[2]

Mrs. Miles discusses the abuses of Ideality (oversensitivity), wild imaginative soarings, eccentricity, on page eighty-five of Phrenology and it is believed that Poe used these characteristics to delineate the crumbling Roderick Usher in "The Fall of the House of Usher."

On the stable parts of F.J. Gall's (1758-1828) work with the structure of the brain, modern neurology is based. It was his dismissed assistant, Spurzheim, who misapplied Gall's principles and built upon them the follies of phrenology.[3] According to phrenology the brain was divided into such areas as combativeness, cautiousness, and so on, which enclosed the primary activities of that organ. If one area were more powerful than another, it would, according to phrenologists, expand and occupy a prominent place within the skull, causing a swelling or bump on the head in that particular region. By feeling of the expanded area and using

1 Edward Hungerford, "Poe and Phrenology", American Literature, 12, (1930) p.212.
2 Ibid., p.213.
3 William Dampier, A History of Science, pp.274-275.

it as an index, the personality traits of the person being "phreno-analyzed" could be scientifically determined,[1] since the outer contours of the skull revealed the exact outline of the brain within. Phrenology was employed to provide "accurate vocational guidance..., to revolutionize...education...to provide...information upon the advisability of marriages."[2] It permeated the life of the early decades of nineteenth century America, and throughout his writing, at least after 1836, Poe made frequent references to this subject. Concerning N.P Willis, Poe was of the opinion that his forehead "would puzzle phrenology"[3] while Evert A. Duyckinck's "forehead, phrenologically, is a good one."[4] In a review published in the Southern Literary Messenger for April 1836 Poe employed phrenological terms in discussing the poets Drake and Halleck.[5] The phrenologists defined Ideality as consisting "in a taste for the graceful, the beautiful, the sublime" and Poe used in this critical essay the "'faculty of Ideality--which is the sentiment of Poesy; this sentiment is the sense of the beautiful, of the sublime, and of the mystical."[6] It is an inborn faculty, one of the primary activities, which allows for the appreciation of beauty in the orderly universe. Drake was raked over the literary coals because his "The Culprit Fay" while possessing "a very moderate endowment of the faculty of Comparison (phrenological phraseology) which is the chief constitutent of Fancy or

1 Edward Hungerford, op.cit., p.211.
2 Ibid., p.210.
3 The Works of Edgar Allan Poe, Bigelow, Smith and Company, New York, V, p.55.
4 Ibid., p.102.
5 Margaret Alterton and Hardin Craig, Edgar Allan Poe, pp.249-282.
6 Ibid., p.254.

the powers of combination"[1] lacked completely Ideality or "the creative ability." To further vanquish Drake, Poe presented two blocks of lines from the Shelley poem, "Queen Mab" in which "the Faculty of mere Comparison is but little exercised--that of Ideality in a wonderful degree."[2] Early in the review Poe the critic writes what might be called a thumbnail sketch describing this pseudo science:

> We find certain faculties planted within us... in some this disposition is to be recognized with difficulty...In others again it (the reverence for superiority) forms a prominent and distinctive feature, and is rendered palpably evident in its excesses....It has been, therefore, justly considered a primitive sentiment.[3]

Poe's description of Roderick in "The Fall of the House of Usher" (1839, Graham's Magazine) relied on phrenological terminology for Usher had "an inordinate expansion about regions of the temple"[4] which according to Hungerford is the area in which Ideality was located. Later Usher revealed to be a painter "of pure abstractions, of phantasmagonic conceptions,"[5] a sensitive soul, the possessor of artistic talents. Again in the tale "Ligeia", (1838 in The American Museum) the influence of this pseudo-science is evident. The narrator in picturing Ligeia says:

> 'I have tried in vain to detect the irregularity and to trace home my own perception of 'the strange' (in Ligeia). I examined the contour of the lofty and pale forehead: it was faultless...the commanding extent and repose, the gentle prominence of the regions about the temples.'[6]

1 Margaret Alterton and Hardin Craig, op.cit., p.263.
2 Ibid., p.267.
3 Ibid., p.253.
4 Stedman and Woodberry, The Works of Edgar Allan Poe, I, p.137.
5 Ibid., p.141.
6 Ibid., p.184.

Some eight years later he ridiculed phrenology or rather the pretentions of phrenology in "Some Words With a Mummy" (1845, American Whig Review). The mummy having been brought to life and regaled with "the assumptions of phrenology and the marvels of animal magnetism..., "it (or he) proceeded to relate a few anecdotes which rendered it evident that prototypes of Gall and Sphrzheim had flourished and faded in Egypt so long ago as to have been nearly forgotten...."[1] Earlier in the story a Mr. Silk Buckingham is observed to glance "at the occiput (back part of the skull) and then at the sinciput (the forehead) of Allamistakeo."[2]

Toward the close of Edgar Allan Poe's career, in 1846, he wrote in describing William Cullen Bryant, that "the forehead is broad, with prominent organs of ideality."[3] Evidently Bryant was high in Poe's esteem for the artistic bulge caused by ideality is observed to be prominent.

Poe may be excused for his unrestrained praise of phrenology since the science of the skull commanded as much attention in the 1830's and 1840's as does modern day psychology, which also demands acceptance as a science. Nor should he not be ridiculed because of his interest in this false study of Spurzheim which cloaked itself in scientific terms and in its high flown, though low brow medical phraseology. In his day phrenology had attained the status of a minor science,

1 Stedman and Woodberry, The Works of Edgar Allan Poe, II, p.302.
2 Ibid., p.301.
3 Edward Hungerford, "Poe and Phrenology", p.209.

and many well-read and intelligent men believed in it.

Poe employed pseudo-scientific studies other than phrenology to interpret the personalities of his contemporaries as well as those of the characters in his tales. "A Chapter on Autography" appearing in the November, December and January numbers of Graham's Magazine[1] (1841-1842) attracted quite some attention.

> The principle feature of this autograph article... was that of the editorial comment upon the supposed manuscripts, regarding them as indicative of character. In these comments the design was never more than semi-serious....But that a strong analogy does generally and naturally exist between every man's chirography and character will be denied by none but the unreflecting. [2]

Poe then analyzed Washington Irving's signature, adding that:

> Mr. Irving has travelled much, has seen many vicissitudes, and has been so thoroughly satiated with fame as to grow slovenly in the performance of his literary tasks. This slovenliness has affected his handwriting. [3]

In interpreting Longfellow, he is of the opinion that "the man who writes thus may not accomplish much, but what he does will always be thoroughly done."[4]

Of the writer who referred to him as that "jingle man", Poe believed that:

> Mr. Ralph Waldo Emerson belongs to a class of gentlemen with whom we have no patience whatever--the mystics for mysticisms sake....His manuscript is bad, sprawling, illegible, and irregular--although sufficiently bold. This latter trait may be, and no doubt is, only a portion of his general affectation. [5]

1 See also Edgar Allan Poe, "Autography", Southern Literary Messenger, (February, August, 1836).
2 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, IX, pp.135-186.
3 Ibid., p.190.
4 Ibid., p.199.
5 Ibid., p.259.

Though he devoted several magazine articles to the study of the art of handwriting analysis and character interpretation from 1836 on, Poe did not incorporate autographic data in his tales. Like any other journalist, he was concerned with keeping circulation up, and a magazine piece displaying numerous cuts of signatures of contemporary literary men was always good for a boost in sales.

"Animal magnetism" (or hypnotism) as practiced by Mesmer (1733-1815) was mentioned by Poe in "Some Words With a Mummy." Jaffe informs us that "some doctors, in Paris, Edinburg, and Calcutta used hypnotism...to produce temporary anesthetic effects."[1] So realistic was Poe's tale based on the principles of Mesmer, "The Case of M. Valdemar", American Whig Review, December 1845, that Elizabeth B. Barrett wrote the author:

> 'There is a tale of yours ("M. Valdemar")...which is going the round of the newspapers about mesmerism, throwing us all into 'most admired disorder' and dreadful doubts as to whether 'it can be true' as the children say of ghost stories.'[2]

Later this story appeared abroad in The Popular Record of Modern Science,[3] published in London. Just a year before "Valdemar", its companion piece "Mesmeric Revelation" (Columbia Magazine, August 1844) was published. In it Poe presents the case of a Mr. Vankirk, a man who wishes to discover what "results might ensue from a series of well-directed questions propounded to me while mesmerized."[4] In the conversation which takes place during the hypnosis Vankirk, (possibly speak-

[1] Bernard Jaffe, Men of Science in America, p.162.
[2] George Woodberry, The Life of Edgar Allan Poe, II, pp.164-165.
[3] Ibid., p.408.
[4] Ibid., p.311.

ing for Poe) expresses his concept of the soul's immortality when he replies "'Our present incarnation is progressive, preparatory, temporary. Our future is perfected, ultimate, immortal. The ultimate life is the full design.'"[1] And as John Donne in the seventeenth century believed that the body is the soul's prison,[2] so Vankirk in the nineteenth discovered that "to rudimental beings, organs are the cages necessary to confine them until fledged."[3]

From the evidence of such stories, it is clear that their author had more than a weak faith in the powers of hypnotism, and possibly looked upon mesmerism as that condition in which man came closest to immortality while still remaining in contact with the material universe. With the death of Vankirk Poe concludes the tale and speculates: "'Had the sleep-walker, indeed, during the latter portion of his discourse, been addressing me from out the region of shadows?'"[4] Poe himself might well have asked that self-same question at the conclusion of his masterpiece, Eureka.

Both Brownell and V.L. Parrington consider Poe to be a writer apart from his generation, stranded in, but untouched, by the mainstream of American life. "In a world given over to bumptious middle-class enthusiasms,...(there)... would be scant sympathy for the craftsman and dreamer."[5] However, though the fable that Poe had little touch with

1 Ibid., p.317.
2 John Donne, "The Ecstasy", l.68.
3 Edmund Stedmen and George Woodberry, The Works of Edgar Allan Poe, II, p.319.
4 Ibid., p.321.
5 Vernon Parrington, Main Currents in American Thought, Harcourt, Brace and Company, New York, 1931, II, p.58.

his America of the 1830's and 40's is still prevalent, his interest in current events and in those inventions produced by "middle-class enthusiasms" is evidenced by at least half of his tales, many of them directly channeled in science. Throughout his published works he uses material from contemporary scientific journals and learned books to add authenticity and verisimilitude to his literary productions. He mentions mechanical devises (the air condenser in "Hans Pfaal"), methods of communication (the electro-telegraph in "The Thousand and Second Tale"), electrical devices (Franklin and his key-kite and the Voltaic pile in "The Thousand and Second Tale" and "Some Words With a Mummy") and modern means of transportation (the balloon in "The Balloon Hoax" and "Hans Pfaal"). In six tales, "Hans Pfaal", "The Man Who Was Used Up", "The Balloon Hoax",..."The Angel of the Odd",... "The Thousand and Second Tale", "Mellanta Tauta", the author uses material of an aeronautical nature.[1] Even though Edgar Allan at times takes the reader to the Old World of Amontillado, he returns always to the America of his day, experimenting on his characters with the galvanic battery, putting them under the influence of hypnosis, charting their cranial bumps, sending them up in amazing balloons.

The Southern Literary Messenger published his pseudo-scientific tale, "Hans Pfaal" in June of 1835 and before the end of that year Poe was editor of the Messenger. Poe had begun the study of astronomy[2] and he might well be considered

[1] Killis Campbell, The Mind of Poe, pp.103-104.
[2] Margaret Alterton, Origins of Poe's Critical Theory, p.133.

a promising novice in that field. Hans, in explaining his attraction to a study of astronomy, confesses:

> 'The longer I meditated upon these, (astronomical tracts) the more intense grew the interest which had been excited within me. The limited nature of my education in general, and more especially my ignorance on subjects connected with natural philosophy...merely served as a farther stimulus to whether those crude ideas which, arising in ill-regulated minds...may not after in effect possess all the force, the reality, and other inherent properties of instinct or intuition.'[1]

Poe probably obtained some of the material for "Hans Pfaal" from "A Voyage to the Moon", which appeared in the American Quarterly Review of March 1828. In both lunar tales the same gear is taken abroad, the trip is begun very early in the morning, an air condenser is included in the basket of both balloons, and in both stories the flying machine passes through a bouleversement[2] or turnabout due to the entrance into the new gravitional field, found in the vicinity of the moon. Sir John F.S. Herschel's A Treatise on Astronomy also supplied valuable information, as the parallel columns below indicate:

Herschel's Treatise	Poe's "Han's Pfaal"
...The convex surface of a spherical segment is to the whole surface of the sphere to which it belongs as the versed sine or thickness of the segment is to the diameter of the sphere; and further, that, this thickness...is almost exactly equal to the perpendicular elevation of the point of sight above the surface, the	The convex surface of any segment of a sphere is, to the entire surface of the sphere itself, as the versed sine of the segment to the diameter of the sphere. Now in my case, the versed sine,...the thickness of the segment beneath me--was about equal to my elevation, or the elevation of the point of sight above

1 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, II, p.141.

2 M. M. Posey, "Notes on Poe's 'Hans Pfaal'", Modern Language Notes, 45, (1930) p.501.

proportion, therefore, of the visible area, in this case to the earth's surface, is that of five miles to 8,000 or 1 to 1600.[1]

the surface. 'as five miles then to eight thousand', would express the proportion of the earth's area seen by me. In other words, I beheld as much as a sixteen-Hundredth of the whole surface of the globe.[2]

Poe, though adopting large blocks of other writers' material, knew enough about the subjects he was dealing with to fit the "borrowings" into the context of his tales in such a manner as to make them ring true. In this particular story Poe employed simple geometric relationships to set the picture before the reader's eyes, giving depth and perspective to his work and strengthening it with simple mathematical calculations which impress and convince the reader.

As the gondola and balloon ascended, the atmosphere became less dense. "I lay down in the bottom of the car (suffering from lack of oxygen), and endeavored to collect my faculties," said Hans. "In this I so far succeeded as to determine upon the experiment of losing blood....By the time I had lost about half a moderate basin-full, most of the worst symptoms had abandoned me...."[3] Blood-letting was a common practice in the 1700 and 1800's and most doctors engaged in it; Benjamin Rush, a medical professor at the College of Philadelphia and prominent 19th century physician proclaimed it to be the sovereign remedy and was

[1] Ibid., p.502.
[2] Edmund Stedman and George Woodberry, op.cit., II, p.160.
[3] Ibid., p.163.

himself bled to death in 1813.[1] Therefore Poe's Hans Pfaal was absolutely in the medical right when he lanced his arm. However, instead of becoming light headed and weak, he gained strength and continued on his lunar journey--Poe probably felt that he had saved him by standard medical treatment. Later, Poe goes to some length to explain mathematically why the earth (and the ocean) even at a great altitude, "still retained its apparent concavity." Evidently this pat explanation intrigued the author, for in "The Balloon Hoax" he explains this concavity phenomenon again, this time in a footnote of more than one hundred and eighty words.[2]

Poe miscues, of course, when he allows Hans to make use of a water clock[3] at a height of more than twenty-five miles--where water would freeze instantly. However, he oftentimes has his tongue in his cheek while telling this tale, admitting in a note that it is produced in a tone of banter.[4] Still, its authenticity is maintained by the inclusion of much scientific data as Hans' balloon leaves the earth far below and later far above. Furthermore, the story's vocabulary is carefully geared to the nature of the adventure. Such terms as "varnish of caoutchouc" (a coating containing India rubber) on p.142; "lenticular-shaped" (having the form of a double convex lens; shaped somewhat like a football), page 155; "apsides" (in an orbit,

[1] Bernard Jaffe, Men of Science in America, pp.154-155.
[2] Edmund Stedman and George Woodberry, op.cit., II, p.219.
[3] Ibid., p.177.
[4] Ibid., p.195.

the points at which the distance of the body from the center of attraction is either greatest or least), p.183; "speculum" (a reflector in an optical instrument) p.199; lend it an air of scientific authority. The lone navigator, Hans, is always scientifically observant, saying for example, "as I left the earth, the barometer stood at thirty inches, and the centigrade thermometer at 19°."[1] The statement has a laboratory finality about it that invites belief. Even as early as this, (1835) the mathematical reasoning, later brought into focus in Eureka, is in action. Thus Hans explains that as he rises "the force of gravitation would be constantly diminishing, in proportion to the squares of the distances,"[2] endeavoring to discover the answer to the balloon's increasing velocity.

Some may argue that in this story Poe presents only rehashed facts and frames them on a fantastic theme, a journey to the moon. This may be partially true, but it must be admitted that the author in his perusal of old texts and writers sifted out the best and most appropriate data, and that at no time did he allow an exotic imagination to distort or falsify his interpretation of the actual scientific material. His research on "Hans Pfaal" must have been extensive,[3] for Poe spoke enthusiastically to John H.B. Latrobe (one of the committee of three which awarded the hundred dollar prize to "M S Found in a Bottle") and entered into "'a somewhat learned disquistion upon the

1 Ibid., p.147.
2 Ibid., p.158.
3 See pages 18-19 of this thesis for further information concerning Poe's research for "Hans Pfaal".

laws of gravity, the height of the earth's atmosphere, and the capacity....Presently...he (Poe) began the voyage, after describing the preliminary arrangements, as you will find them set forth in one of his tales, called 'The Adventures of Hans Phaal (sic)....'"[1]

His scientific inclinations may be further observed in "The Conversation of Eiros and Charmion," which appeared in Burton's Gentleman's Magazine, December, 1839. In this celestial conversation, Edgar Allan pictures the destruction of the world, explaining chemically that with the "total extraction of the nitrogen" from the atmosphere (resulting in an increased oxygen content) "a combustion irresistable...immediate" rages, "the entire fulfilment, in all their minute and terrible details, of the fiery and horror denunciations of the prophecies of the Holy Book."[2] He is familiar with the properties of these two principal gases of the atmosphere, explaining that "oxygen, which was the principle of combustion, and the vehicle of heat was the absolutely necessary to the support of animal life....Nitrogen, on the contrary, was incapable of supporting either animal life or flame." Evidently Poe possessed a background of elementary chemistry, for not only in "Conversation" does he deal with the physical properties of common elements, but also in "Some Words With a Mummy" he makes use of mercuric chloride (HgCl2) while in

1 Margaret Alterton, The Origins of Poe's Critical Theory, p.134.

2 Edmund Stedman and George Woodberry, The Work of Edgar Allan Poe, I, p.234.

"The Thousand and Second Tale" Poe explains, in Sunday magazine fashion, how to produce ice using intense heat and sulphuric acid, H_2SO_4.

At times Poe was sidetracked in his scientific reasoning. Thus he writes in "Conversation" that as the destructive comet approaches the earth and as the nitrogen in the earth's vicinity is exhausted, "a wild luxuriance of foliage, utterly unknown before, burst out upon every vegetable thing."[1] Botanically speaking the plant life on earth should have withered since the life giving nitrogen cycle, so essential for vegetable growth, was interrupted. Possibly the observers were intoxicated by an excess of oxygen and "felt an unusual...vivacity of mind"[2] which magnified the world about them, allowing them to see a palm tree where only a blade of grass grew.

Alterton believes that Dr. Dick's experiment with nitrogen (N_2) and oxygen (O_2) in "The Christian Philosopher" provided Poe with the conflagration idea.[3] And for his masterly narrative of the terror which gripped the people as the all consuming comet approached the earth of "Eiros and Charmion", it is thought that Poe's observation of a rain of meteors over Baltimore, Maryland on the 13th of November 1833[4] and the panic of some of those present, supplied the realistic touches.

The ratiocinative story, "Murders in the Rue Morgue"

1 Ibid., p.233.
2 Ibid., p.233.
3 Margaret Alterton, Origins of Poe's Critical Theory, p.140.
4 Arthur Quinn, Edgar Allan Poe, p.287.

(Graham's Magazine, May, 1841) illustrates Poe at his scientific best. In it he uses the laboratory method--problem, selection of data, hypothesis, verification and conclusion--to solve the mystery through the skillful manueverings of Dupin. Poe's story reflects his fondness for reason and analysis which complemented his interest in things scientific. In the opening paragraph of his tale of detection and logic he says:

> 'as the strong man exults in his physical ability, delighting in such physical ability as call his muscles into action, so glories the analyst in that moral activity which disentangles ....He is fond of enigmas, of conundrums, of hieroglyphics; exhibiting in his solutions of each a degree of acumen which appears to the ordinary apprehension pretenatural. His results, brought about by the very soul and essence of method, have, in truth, the whole air of intimition.'[1]

Poe elaborates further, placing himself in the class of the true analysts, for "'it will be found...that the ingenious are always fanciful (that is they possess memory or combining power) and the...imaginative never otherwise than analytic.'"[2]

In the review of Dickens' Barnaby Rudge[3] the author mentions that he solved this English mystery, after having read only seven of the volume's three hundred and twenty-three pages. Poe published the identity of the murderer, Barnaby Rudge, senior, in the May 1st.,1841, issue of the Philadelphia Saturday Evening Post, the tale having then only begun.[4] Thus Dupin, the literary detective, becomes Poe

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.123.
2 Ibid., p.126.
3 Ibid., p.322ff.
4 Ibid., p.332.

the analyst, in the Rudge review. My opinion of "Murders in the Rue Morgue" advanced considerably, since the author practiced what he wrote and disentangled an equally baffling case one month later when his French detective apprehended the Ourang-Outang from data furnished by the Dickens book itself.

Charles C. Walcutt finds fault with Poe in "The Murders" because he allows the murderer to tear from the victim's scalp "half a million hairs"--when actually no human head contains more than one hundred thousand.[1] Though the figure may be exaggerated, Poe used a large number to impress upon the reader the tremenduous strength possessed by the killer, for earlier he wrote "you are aware of the great force necessary in tearing...from the head even twenty or thirty hairs together."[2] Dupin, by collecting the data which revealed the killer to be a being of tremendous strength, who spoke gibberish, and was athletic, arrived at the fifth step in the circle of the scientific approach, concluding correctly that the search would reveal the criminal to be an ape.

Poe has never been excelled in the writing of tales of ratiocination.[3] His background and interest in science, in the logical approach, in analysis aided in his literary production of works which posessed a "beginning, a middle and an end" all fused into the complete circle of unity.

1 Charles Walcutt, "The Logic of Poe", College English, 2, (1941) p.444.
2 Margaret Alterton and Hardin Craig, op.cit., pp.149-150.
3 James Harrison, Life and Letters of Edgar Allan Poe, T.Y. Crowell and Company, New York, 1903, I, p.172.

Sixteen years before Edgar Allan Poe was born in Boston in 1809, a Frenchman, Jean P. Blanchard, made the first balloon hop in America, flying from the capital at Philadelphia fifteen miles south to the Jersey shore.[1] Poe's "The Balloon Hoax" appeared fifty-one years later, creating more hub-bub than did Blanchard. Published in The New York Sun of April 13, 1844, in "double leaded columns"[2] was the news that an aerial balloon had just landed in South Carolina and that an extra with full particulars ("The Balloon Hoax") would hit the streets at ten o'clock. Poe prefixed an ironic note to the story in which he asserted that, "if the 'Victoria' (the steering balloon alleged to have crossed the Atlantic) did not absolutely accomplish the voyage recorded, it will be difficult to assign a reason why she should not have accomplished it."[3] Since this flight encountered none of the improbabilities which had to be ascended in Hans' lunar journey, many were taken in by this journalistic narrative. Combining realistic detail with scientific accuracy, Poe described a model of the Victoria with engineer's skill from "the screw (which) consists of an axis of hollow brass tube eighteen inches in length" to "the rudder (by which means) the machine was readily turned in any direction."[4]

Thus he brings the model to life, and then, when plaus-

1 Bernard Jaffe, Men of Science in America, p.342.
2 George Woodberry, The Life of Edgar Allan Poe, II, p.69.
3 Edmund Stedman and George Woodberry, Works of Edgar Allan Poe, II, p.204.
4 Ibid., II, p.207.

ibility has been established, he launches into the impromptu flight across the "broad Atlantic (which) becomes a mere lake." Poe at this point sounds like a modern geopolitician referring to the water barrier separating the United States base from the European peninsula. Correct nautical usage attests to Poe's accuracy in recording "that this morning the gale...had subsided to an eight or nine knot (not knots per hour as many laymen express sea speed) breeze ...and bears us, perhaps thirty miles per hour, or more."[1] Like Pfaal's balloon, the Victoria was also "varnished with the liquid gum caoutchou" though the lifting power is supplied by coal gas (CO or carbon monoxide, which is very active) instead of the non-existent gas some thirty times less dense than hydrogen which furnished the lifting power in the former flight. In this recital Poe stays within the confines of scientific reality, drumming up a gale to hasten the passage from Britain to America.

Poe again refers to chemistry in"The Balloon Hoax",for among the ballast and supplies is discovered "a coffee-warmer, contrived for warming coffee by means of slake lime, so as to dispense altogether with fire."[2] No open flame, which might cause combustion of the coal gas, is needed; when water is added to lime, Ca O or calcium oxide, an exothermic reaction occurs, producing great amounts of heat.

As he pointed out in the discussion of "Hans Pfaal ", Edgar Allan explains that even at an altitude of 25,000

[1] Ibid., p.217.
[2] Ibid., p.110.

feet the sea still appears to be concave because:

> ...the base and the hypothenuse (or line of sight from the observer in the balloon to the visible horizon) of the supposed triangle would be so long, when compared with the perpendicular, that the two former may be regarded as nearly parallel. In this manner the horizon of the aeronaut would appear to be on a level with the car. But, as the point immediately beneath him seems, and is, at a great (actual) distance below him, it seems of course also at a great distance below the horizon. Hence the impression of concavity....[1]

By means of simple trignometric or geometric functions, Poe proves mathematically why the concavity illusion occurs. His preoccupation with such a trifle is probably explained by the fact that he was much intrigued by the novelty of this pptical illusion and wished to pass his findings along to his readers.

Godey's Lady's Book of February, 1845, contained another Poe pseudo-science story, "The Thousand-and-Second Tale of Scheherazade." Using as a backdrop a setting from the Arabian Nights, Poe modernizes the original story, showing Sinbad the world of modern invention and science from the deck of an armored cruiser manned by beings much like those in Swift's Gulliver's Travels. To lend credence to Scheherazade's recital concerning life in an 1840 garb, Edgar Allan substantiates each imaginative Oriental phrase with an Anglo-Saxon footnote. Scheherazade relates: "'There flowed immense rivers as black as ebony, and swarming with fish that had no eyes!" which Poe locates as "The Mammoth Cave of Kentucky."[2]

[1] Edmund Stedman and George Woodberry, op.cit., II, p.219.
[2] Ibid., p.272.

And continuing the fabulous adventures of Sinbad, Scheherazade told of:

> 'One of this nation of mighty conjurers created a man out of brass and wood and leather and endowed him with such ingenuity that he would have beaten at chess all the race of mankind....'

Poe indentifies this wonder as "Maelzel's Automaton Chess-player."[1] Of this "mechanical" wonder Poe was well informed, since he solved the problem of the chess man to his own satisfaction in an article entitled "Maelzel's Chess-Player,"[2] published in the Southern Literary Messenger, April, 1836. Volta's electric pile[3], invented in 1800 and profoundly influential in the early years of the nineteenth century, also attracted the attention of Poe, for in "The Thousand-and-Second Tale" he wrote:

> 'Another of these magicians, by means of a fluid that nobody every yet saw, could make the corpses of his friends brandish their arms, kick out their legs, etc....'[4]

As for Poe's interest in the world about him, C. Varner presents evidence to the effect that the "Eccaleobion" or incubator found in the "Tale" may very well have had its origin in the following article printed in the Ledger (The Philadelphia Public Ledger) on May 23, 1839:

> "' Hatching Eggs -- A London Notice.'"
>
> A London paper states that a curious exhibition under the name of the 'Eccalebion' is about to be opened in Pall-Mall. It is a machine heated by steam, and divided into various compartments for the hatching of birds by artificial heat. There

1 Ibid., p.279.
2 Edmund Stedman and George Woodberry, op.cit., IX, pp.141-173.
3 William Dampier, A History of Science, p.232.
4 Edmund Stedman and George Woodberry, Works of Edgar Allan Poe, II, p.281.

> is another machine, in which eggs of every date from the time of their being laid until twenty-one days old, are so placed, that by means of a strong artificial light they are rendered transparent, so that the spectator can observe the progress of hatching, from the origin of life in the chicken until its complete formation.... The contrivance is an improvement on the Egyptian mode of artificial heating in ovens, and is said to be well worthy the visits of the naturalist or the curious.[1]

It is also possible that Poe's knowledge of the Epidendrum (a plant subsisting in air, not soil) may have sprung from a similar account in the Ledger for July 22, 1839.[2] Poe like Emerson[3] was familiar with Newton, and in a footnote in this tale he mentions that this English scientist "demonstrated that the retina, beneath the influence of the violet ray of the spectrum vibrated 900,000,000 of times in a second."[4]

It is evident from this semi-scientific work that Edgar Allan Poe was conversant with a number of sources of a technical nature. He knew where to ferret out information, employing books on geography (William Kennedy's Texas[5] and Hugh Murray's Encyclopaedia of Geography[6]); on plant life (the Reverand P. Keith's System of Physiological Botany);

1 Cornelia Varner, "The Use of Contemporary Material in Poe's Stories", Journal of English and German Philology, 32, (1933) p.78.
2 Ibid., p.78.
3 See Harry H. Clark, "Emerson and Science", Philological Quarterly, 10, (1931) pp.225-260.
4 Edmund Stedman and George Woodberry, op.cit., II, p.281.
5 From Sabin's Dictionary it was discovered that William Kennedy's book, Texas: its Geography, Natural History, and Topography was published by Benjamin and Young in 1844.
6 Hugh Murray, An Encyclopaedia of Geography: Comprising a Complete Description of the Earth, Physical, Statistical Civil, and Political, Thomas G. Bradford, Philadelphia, 1837.

on physiology (Wyatt's Physiology) to add the tincture of organized knowledge to his tale. He was not a profound investigator, but he was clearly aware of the tools necessary for success in systematic verification, and oftentimes made use of his great miscellaneous store of facts and figures.

In "The System of Dr. Tarr and Professor Fether" (Graham's Magazine, November, 1845), the author seems to present at times a picture of life in one of today's mental hospitals where modern therapy is practiced. Though it is one of Poe's more trivial tales, based on a"turn-about" theme, Edgar Allan satirically presents the story's action in an ideal asylum run by the patients who have forced the guards to exchange places with the one-time inmates. Poe's description of the work-play pattern in the French asylum might well be discovered in the pages of today's The American Journal of Psychiatry:

> 'We put much faith in amusements of a simple kind, such as music, dancing, gymnastic exercises generally, cards, certain classes of books, and so forth. We affected to treat each individual as if for some ordinary physical disorder.'
> 'And you had no punishments of any kind?
> None.
> And you never confined your patients?
> Very rarely.'[1]

This Utopian picture, though over a century old, still has not been attained in public mental institutions throughout the United States.

That Poe knew medical journals is evident, for he praises the "'high authority and merit'" of the Chirugical

[1] Edmund Stedman and George Woodberry, op.cit., III, pp.305-306.

Journal of Leipsic and considers the London Lancet[1] (volume two in the Broadway Journal) to be the most authoritative medical serial in existence. Poe also is known to have studied the files of Blackwood's Edinburgh Magazine, for in November of 1838 he published "The Psyche Zenobia", later entitled "How To Write a Blackwood Article". Undoubtedly much of his medical phraseology and diagnoses were gleaned from such a series of articles as "Passages from the Diary of a Late Physician", published in this magazine.[2]

In "Some Words With a Mummy", the author resorts to the language of the physician to flavor with scientific authority. As the small group in Dr. Ponnouner's study examined the mummy, "the orbs were...so far covered by the lids, that only a small portion of the tunica albuginea remained visible."[3] The Egyptian is prepared for the application of the Voltaic Pile, and

> ...operations were now directed against the great toe of the right foot. We made incision over the outside of the exterior os sesamoideum pollicis pedis, and then got at the root of the abductor muscle.[4]

These Poe characters are only exhibiting a natural interest in electric current, for the scientific journals of the time (the first half of the nineteenth century) were filled with the marvels of the new discoveries by Volta and Galvani, paralleling the recent intense international research in the field of atomic science.

1 Margaret Alterton, Origins of Poe's Critical Theory, p.18.
2 Ibid., p.38.
3 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, II, p.290.

The mummy, in discussing Egyptian embalming methods, mentions that "we employed scarcely anything else than the bichloride of mercury."[1] Mercuric Chloride, $HgCl_2$, is a virulent poison and powerful antiseptic, employed in dilute solution in modern biological laboratories. Again Poe demonstrates his knowledge of elementary chemistry. While in "Some Words With a Mummy" Poe speaks his mind in regard to the charlatans who frequent the "sciences" of Gall and Mesmer, allowing the inquisitive Americans in the doctor's study to be taken to task by an Egyptian whose ancestors some four or five thousand years before had equalled if not surpassed the latest scientific discoveries of the 1840's.

Poe, in "The Facts in the Case of M. Valdemar", continues to employ the scientific method, this time in regard to mesmerism. Posing problems not yet investigated, "it remained to be seen, first, whether in such condition, (in a state of hypnosis) there existed in the patient any susceptibility to the magnetic influence; secondly, whether, if any existed, it was impaired or increased by the condition, thirdly to what extent, or for how long a period, the encroachments of Death might be arrested by the process."[2] Poe the writer-physician describes and diagnoses medically for M. Valdemar is declared to be "'in a confirmed phthisis" (a wasting or consumption of the tissue; tuberculosis).

> (His) left lung had been for eighteen months in a semi-osseous or carti-loginous state, and was,

[1] Ibid., p.296.
[2] Ibid., pp.322-323.

> of course, entirely useless for all purposes of vitality. The right, in its upper portion, was also partially, if not thoroughly, ossified, while the lower region was merely a mass of purulent (consisting of pus) tubercles, running one into another. Several extensive perforations existed; and at one point, permanent adhesion to the ribs had taken place...[1]

However, much of the realism of the story is obscured by its impossible, un-scientific ending. When Death finally claims M. Valdemar, after almost seven months in a state of sleep, his body shrinks away before the observer's eyes. Poe himself probably wondered about the medical authenticity of such a demise, but George W. Eveleth reassured him, citing Bell's Anatomy, as authority for the dissolution of the body "within the space of a single minute."[2]

In the pre-Eureka period, before 1847, Poe made wide use of articles published in encyclopaedias. An early edition of the Encyclopaedia Britannica[3] supplied data for "A Descent into the Maelstrom" which was based on the faulty assumption that "a cylinder swimming in a vortex, offers more resistence to its suction, and (is) drawn in with greater difficulty than an equally bulky body, of any (other) form whatever." In the tale, "Some Words With a Mummy", he was indebted to reference material available in the Encyclopedia Americana. Rees's Cyclopaedia served as the source of much of the "Hans Pfaal" background material. Again he borrowed, this time with few changes, a pas-

1 Ibid., p.325.
2 James Harrison, The Complete Works of Edgar Allan Poe, T.Y. Crowell and Company, New York, 1902, VI, p.154.
3 Edmund Stedman and George Woodberry, op.cit., II, p.244.

sage from Macaulay's Warren Hastings[1] for inclusion in "A Tale of The Ragged Mountains" which Groff Conklin chose in 1946 for publication in his book, The Best of Science Fiction.

Throughout his stories he made use of terms from physiology, botany and medicine, such as tunica albuginea, os sesamoideum, articulo mortis, platanus, Epidendrum, phthisis, ossification, to bring realism and accuracy into harmony in his literary work. While in "The Thousand-and Second Tale"Poe mentions recent physical experiments based on changes in the wavelength of color which intensify or nullify results as the wave length varies. He points out that "analagous experiments in respect to sound produce analagous results."[2] In other words, sound might be multiplied to a deafening volume or completely muffled by a control of the re-inforcing or overlapping of wavelengths. For the second time bichloride of mercury finds its way into Poe's pages, this time as a wood preservative in "The Gold Bug" (The (Philadelphia) Dollar Newspaper, June 21-28, 1843). In the same story aqua regia[3] (hydrochloric acid, three parts and nitric acid one part) is used to dissolve the precious metal, gold. Both the tales, "Mesmeric Revelation" and "The Case of M. Valdemar" pivot on the principles of hypnosis as practiced by Mesmer.

It is evident that Poe had not only an interest in

1 Killis Campbell, The Mind of Poe, p.174.
2 Edmund Stedman and George Woodberry, op.cit., II, p.282.
3 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.208.

science, but also obvious that science influenced much of his writing, that he knew, as does any true student, where to uncover reference material, that he was cognizant of the inventions which complicated life in the first half of the nineteenth century, and that he attacked some of the false sciences by satirizing them in his literary productions.

CHAPTER THREE

EUREKA AND ITS SATELLITES

During the last century and a half the whole concept of the universe has been altered by the knowledge that man, subservient to the physical laws and processes about him, cannot be considered apart from the world, for the scientific method, observation, induction, deduction and experiment, is applicable not only to science itself, but to all fields of human endeavor and thought.[1]

It is possible to accept both science and religion and wait for time to resolve discrepencies and amalgamate the two. Science must admit the psychological validity of religion just as religion must admit scientific proof as evidence of the Almighty in the fashion of the Puritans in New England. There is an added awe for with investigation of physical phenonema, the true complexity of God's handiwork becomes revealed. Newton said, "'The Business of Natural Philosophy is to argue from Phenomena...and to deduce causes from effects, till we come to the very first Cause, which certainly is not mechanical.'"[2] We still are faced by that awful mystery concerning the "life Stuff", even though atom smashers, cyclotrons, and electronic microscopes probe endlessly, for mechanical means proceed just to a certain point. No power other than the supernatural can focus on the answer beyond.

1 William Dampier, A History of Science, p.217.
2 Ibid., p.492.

Just as Poe believed that the creation of the universe came about because of Divine Volition or Godhead, so his philosophic-scientific treatise Eureka came into being because of an urge, a driving desire to find the divine plan exemplifing unity in variety, immortality in mortality, soul in body.

As early as 1827[1] Poe commenced his survey of the vastness of the heavens in "Al Aaraaf", seeking "for treasure in the Jewelled skies"[2] which he later expanded to the Universe of space in Eureka. His tales "Hans Pfaal" and "the Balloon Hoax" brought him in close contact with the mathematics of astronomy, (even if viewed in an imaginative light) and he noted again the boundless horizons of the celestial sphere.

The embryonic stirrings of Eureka may first be observed in Poe's polished review of Macaulay's "Critical and Miscellaneous Essays", published in Graham's Magazine, June 1841. Macaulay is turned slowly over the critical coals by Poe because of his tendency to concentrate on minutiae, to lose sight of the whole by abject study of the part. Continuing this argument Poe writes:

> That we know no more to-day of the nature of Deity, of its purposes--and thus of man himself--than we did a dozen years ago, is a proposition disgracefully absurd; and of this any astronomer could assure Mr. Macaulay. Indeed, to our mind, the only irrefutable argument in support of the soul's immortality--or, rather, the only conclusive proof of man's alternate dissolution and

[1] Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.321.
[2] Ibid., p.533.

> rejuvenescence ad infinitum--is to be found in analogies deduced from the modern established theory of the nebular cosmogony.[1]

It can be seen that the writer had been studying astronomical theories, especially Laplace's[2]; and he is so immersed in them that he draws upon appropiate astronomical analogies to strengthen his literary works. Poe feels that man has been progressing, or as he writes in a note, "that all things are in a state of perpetual progress,"[3] that the field of knowledge has been expanded, especially by the astronomers and he reasons logically

[1] Margaret Alterton and Hardin Craig, op.cit., p.321.

[2] Laplace's Nebular Hypothesis was based on the assumption that gaseous nebula occupying the space encompassed in Neptune's orbit were in a state of rotation. These nebula contracted, becoming more dense with a resulting increase in velocity; as contraction continued, bands of dense planetary matter thrown off from the revolving mass formed the planets and their satellites. These newly created celestial bodies continued to revolve around the central sun, itself at one time matter in a gaseous state. In other words, the sun in a gaseous state once occupied a diameter equal to Neptune's orbit but by successive contractions, during which time new planets came into being, finally attained its present highly dense state at the pivot point of the universe.
This theory has been challenged by scientists like F.R. Moulton and Jeans. They point out that gravity, at least in our small universe, would not be great enough to counteract the diffusive effects of molecular velocity(which at any instant owing to molecular collision, will start molecules moving with all velocities in all directions) and radiation pressure (which theoretically occurs when a radiated particle falls on any surface, though the resulting pressure is exceedingly small). Therefore the force of gravity would not be powerful enough to condense out matter, thus forming dense planetary material. However, Laplace's theory might be applied to the spiral nebulae, thousands of times larger than the gaseous nebula imagined by the eighteenth century Frenchman. Gravity might be powerful enough in a stellar universe of infinite space to overcome the diffusive forces which defeated the Laplace Nebular Hypothesis in our minute solar system.

[3] Margaret Alterton and Hardin Craig, op.cit., p.533.

that man knows more "of man himself, than...(he)...did a dozen years ago." The science of astronomy probably appealed to Poe because it transcended the minute materialistic debates which impeded work in other sciences. At least the astronomer, even if engaged in controversy, had the whole of the heavens in which to defend his principles.

Speculations which are crystallized out in Eureka find expression in "The Power of Words" (The Democratic Review, June 1845) which marks the beginning of his mature metaphysical period. As in Eureka, Poe deals with the problems of the origin of the universe and of God's relation to the universe. In it Agathos says:

> 'In the beginning only, he (sic) created. The seeming creatures, which are now throughout the universe so perpetually springing into being, can only be considered as the mediate or indirect, not as the direct or immediate, results of the Divine creative power (or Divine Volition).'[1]

Closely approximating the Eureka idea of the radiation of atoms out from a center for equable distribution throughout is the thought expressed again by Agathos that:

> 'It is indeed demonstrable that every impulse, given the air, must, in the end, impress every individual thing that exists within the universe; and the being of infinite understanding...might trace the remote indulations of the impulse (almost like a beating of the Divine Heart); trace them upward and onward in their influences upon all the particles of matter--upward and onward forever (through the Universe of space) in their modifications of old forms (evolution or Darwinism), or in other words, in their creation of new--until he found them reflected...back from the throne of the Godhead.'[2]

[1] Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, I, p.237.

[2] Ibid., p.239.

The circle is complete; like Einstein's theory of the curvature of space, the cycle has been made but no end point has been reached. It is Poe the philosopher-scientist who traces the thought processes onward and upward, oftentimes soaring so high that he loses contact with his readers.

Several years before Poe created Eureka, he wrote "A Prediction"[1], in which an attempt was made to amend Laplace's nebular hypothesis, which contended that gaseous nebula, contracted, condensed and became planetary material revolving about the central sun. In this manner the earth, moon, Neptune and other celestial bodies came into being according to Laplace.[2] This piece complements Eureka and though it was not published until after the main work, it will be discussed as one of those productions of the pre-Eureka period, at a time when the writer's scientific study was preparing him for his final fusion of the dualism of body and soul, between changing material phenomena and absolute changless scientific laws, between heterogeneity and homogeneity, between mortality and immortality.

"A Prediction" is mentioned in a letter to George W. Eveleth written 29 February, 1848. The missive concludes:

> 'By the bye, lest you infer that my views, in detail are the same with those advanced in the Nebular Hypothesis, I venture to offer a few Addenda, the substance of which was penned, but never printed, several years ago under the head of "A Prediction.'[3]

1 Edmund Stedman and George Woodberry, op.cit., IX, pp.293-301.
2 See footnote 3 on p. 51 for elaboration on Laplace's nebular hypothesis.
3 Edmund Stedman and George Woodberry, op.cit., IX, pp.293-294.

Poe reasons that Laplace's theory will be revised in the twentieth century for it will be proved "that the Sun was originally condensed, at once, not gradually according to the supposition of Laplace, into his (the sun's) smallest size."[1] The intuition which Poe credits to Kepler finds lodging within his own mind for he writes in "A Prediction","I did not design to offer any evidence of its (his argument's) reasonableness; since I have not, in fact, any collected, excepting as it is flitting in the shape of a shadow to and fro within my brain."[2] Here he is the Poe of Eureka, darting from assumption to assumption but always returning to the proof of fact and formula. Like Emerson he saw behind physical phenomena, reality,but unlike Ralph Waldo he attempted to bridge the void between the material world and the spiritual by calculations which added rigidity to his arguments.

Some of the phrasing in this piece recalls "A Descent Into A Maelstrom" but the vortex is magnified and

> The planets have their orbits lying within this vortex at different distances from its centre; so that their liabilities to be absorbed by it are ...inversely just according to those distances, since length, not surface, is the measure of the absorptive power along the lines marking the orbits.[3]

Throughout Poe employs simple arithmetic relationships to explain Kepler's first and third laws, "which laws cannot be explained upon the principle of Newton's theory."

1 Ibid., pp.293-294.
2 Ibid., p.295.
3 Ibid., p.295.

Summarizing them they may be stated to be: (1) the planets travel in paths which are ellipses with the Sun in one focus (either of two fixed points on the principal axis of an ellipse) and (2) the squares of the periodic times which the different planets take to describe their orbits are proportional to the cubes of their mean distances from the sun.[1] Poe seemingly is as pleased with his celestial calculations as was Kepler, who found in some of his mathematical gyrations proof of a harmony in the music of the spheres, of the geometry of God.

In the "Addenda" to Eureka, sometimes called "A Prediction", the author believes the density of the planetary bodies to be governed by their distances from the central orb, the sun. Therefore the closer a planet approaches the sun the greater its density must be; and he maintained that the velocity of rotation depended on the density, the more dense, the greater the velocity. Conversely, those farthest from the sun revolved slowest. Poe disagrees with Laplace in that though Laplace assumed gravity to exist, he, Laplace, allowed atoms to extend in unlimited succession throughout space; according to Poe, he had no logical right for making this assumption since gravity acted along predetermined lines which governed the distribution of the particles throughout the universe.

The purpose of the "Addenda" is evidently to guard against the wholesale acceptance of all of the Nebular Hypothesis of Laplace which so concerns Poe in the pages

1 William Dampier, A History of Science, pp. 140, 165, 169.

of Eureka.

Poe began work on Eureka in 1847, the year in which Virginia Poe died. The creation of the universe and God's relation to this universe seem to form the core of Eureka, for it is with these problems that Poe deals in the more than one hundred pages of philosophic-scientific exposition. The poet-scientist had been assimilating astronomical theories and reading in Newton, Laplace, Ferguson, Humboldt, Dick, Coleridge besides perusing encyclopaedic works old and new.[1] This accounts for his extensive use of astronomical calculation in Eureka and for his frequent citing of Laplace, Newton and Herschel.

Wishing to resurrect The Stylus, a magazine founded in 1843 to serve as a literary medium for biographical and critical sketches of American writers, Poe decided to raise money by lecturing at the Society Library on "The Cosmogony of the Universe."[2] On the night of February 3, 1848 some sixty persons took their seats, wet from the storm outside. Though some were entranced for two and one half hours by a precis of Eureka, others were of the opinion of a reporter who signed himself "Decius" and wrote:

> 'This lecture was extraordinary in many respects. In the first place, its delivery lasted upwards of two mortal hours. At the end of an hour and a half, some of us began to be quite sensible of the lapse of time; every minute after that seemed to be possessed of the famous property of matter so conspicuous in his discourse, called gravity. It

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.xxxviii.
Also see Killis Campbell, The Mind of Poe, p.17 for additional references to Poe's study of astronomy.

2 George Woodberry, The Works of Edgar Allan Poe, II,p.238.

> weighed upon the heart....There were results; yet it is not an easy task to ascertain precisely what they were.'[1]

That the lecture was not lucid may be gathered from the Express reporter who wrote nothing of interpretive value in his report but rather passed off his failure to understand the Poe lecture by confessing that:

> 'It would be impossible to give any respectable report of this extraordinary work of Art without devoting several columns to it, and even then justice could not be done. For the immense ground covered by the Lecturer rendered compression and close condensation one of the leading characteristics of his performance, so that in reality it should be published as delivered in order to present it fairly to the mind of the reader....'[2]

Undoubtedly, unless those in the small audience at the Society Library were of the genius level of the lecturer, it must have been impossible to follow his mental gyrations and astronomical flights. He himself had been digesting, choosing, editing the material since the early forties and had already visualized the final celestial stature of Eureka, while the majority in this intimate gathering were of the same mind as the reporters. They respected the author for his ideas but, feeling unfamiliar in the heavens, they sought relief in treating various aspects of the presentation with humor.

The talkative Mrs. Clemm, Virginia's mother, told Mr. R.E. Shapley of Philadelphia that:

> 'When he was composing Eureka (1847-1848) we used to walk up and down the garden....He would stop every few minutes and explain his ideas to

1 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, IX, p.314.
2 Ibid., p.313.

me, and ask if I understood him.'[1]

This seems rather far-fetched since Mrs. Clemm was certainly not capable of understanding the astronomical thought and phraseology of this work. Of course, Poe might by repeating his arguments and concepts out loud have been able to further clarify statements which were hazy in his mind.

Poe like the modern physicist dealt with the smallest particle of matter then known, the atom. Like Boscovitch (1758-1759) he believed that matter came from nihility and consisted of centers of force, and echoed Descartes[2] and the ancients in the belief that matter possessed no motion except that derived from God, The Divine Volition, in the beginning. He works with the primordial particle, for that particle is closely linked to the Godhead, to the unity or oneness which Poe sought to prove in the geometric heavens of Eureka.

Under the influence of Kant, philosophy took into account all branches of knowledge and intermingled with scientific thought. The trend as the nineteenth century got underway was away from this union of philosophy and science. In a letter written in February 1848 and owned by Dr. Albert E. Sterne (1930) of Indianopolis, the author of the treatise Eureka mentions:

> ...that the objection of merely scientific men--men I mean, who cultivate the physical sciences to

[1] George Woodberry, The Life of Edgar Allan Poe, II, p.236.
[2] William Dampier, A History of Science, p.150.

> the exclusion...of the mathematics of metaphysics and of logic are generally invalid except in respect to scientific details.
> ...They are at the same time the most bigoted and the least capable of fusing, generalizing, or deciding upon the facts which they bring to light in the course of their experiments, and these are the men who chiefly write the criticism against all efforts at generalization, denouncing these efforts as speculative and theoretical--[1]

Here Poe expresses his disdain for those laboratory men of the utilitarian school who work only to give man a greater control over nature. Taking the data obtained by scientists such as Newton and Laplace, he translated their physical results into metaphysical thoughts and then by generalizing attempted to solve by interpolation the problems of creation and God's place in the Universe.

"That Eureka produced little effect upon the science of its day is not surprising,"[2] for Poe presented some unusual theories which ran counter to the stolid thought of scientists of the 1840's. Then too, the views of a literary man on science carried little weight among the experimenters of the time who felt more at home in the laboratory than in the library or lecture hall.

Not pleased with the newspaper account of his lecture published in The New World, Poe presented his views in a letter to George W. Eveleth written on 29 February 1848. He explained his ideas on the universality of gravitation, also stating that the Universe of Stars was limited as compared with the Universe of Space, that the mind is aware

1 "Letter Written by Him in 1848 Reveals His Cosmic Ideas," The New York Times, (December 26, 1930) p.13, col.1.
2 Arthur Quinn, Edgar Allan Poe, p.557.

of matter only because of its two properties of attraction and repulsion, that matter springs from Unity to variety, from homogeniety to heterogeniety, to return to a Unity that is Nothingness.[1] This is the skeleton of the lecture which finally grew to the stature of Eureka, published in 1848.

It was Eveleth who in 1849 called Poe "'the starter' of an effort to 'change' views of metaphysics and physical science."[2] This praise was, of course, directed toward the "Prose Poem" dedicated to Alexander von Humboldt (1769-1859).

Why did Poe honor this Prussian naturalist and traveler? Perhaps, because he gave an impetus to scientific exploration the world over. Humboldt traveled for five years in South America collecting data that established physical geography and meteorology as true sciences. It was he who mapped the Earth's surface, charting isothermal lines which allowed him to indulge in a study of comparative climates[3] on a global basis. His Kosmos, one of the columns of science, was published 1845-1858. Von Humboldt took for his laboratory the land and ocean of earth, the Universe of Stars and "his theme...is the law of each portion of the merely physical Universe, as this law is related to the laws of every other portion of this merely physical Universe."[4] Edgar Allan Poe experimented in the vastness of the Universe

1 Ibid., pp.542-543.
2 Margaret Alterton, Origins of Poe's Critical Theories, p.145.
3 William Dampier, A History of Science, pp.287-288.
4 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.438.

of Space, employing intuition as well as physical law.

Before examining specific passages in Eureka, it might be well to give an overall view of the essay as I observed it while reading and jotting marginalia in Alterton's Poe.

Poe does not test by Moral Purpose as would Emerson. To Poe there is only a chemical immortality, an everlasting life not for the soul but for the atom. True unity is nothing; all things proceed from this condition and return to it. In other words, substituting Emersonian phraseology, there is "unity in variety."

Poe mentions that the Universe of Stars is of the physical universe and therefore limited, while the term Universe alone has no limit for its expanse is controlled by the intellect--"whenever employed without qualification in this essay, I mean to designate the utmost conceivable expanse of space, with all things, spiritual and material that can be imagined to exist within the compass of that expanse."[1] Consistency is the only test of truth and the intuitive method is more powerful than the inductive or deductive. This, to my way of thinking, stamps Poe as a philosopher, tempered by science.

The starting point then is the Godhead which is the dwelling place of the Divine Volition. "By dint of his (sic) Volition--at some point of Space which we will take as a centre--at some period...immensely remote--by Him... let us to suppose to have been created...Matter in its

1 Margaret Alterton and Hardin Craig, op.cit., p.438.

utmost conceivable state of...Simplicity."[1] Simplicity is the keynote. Originally the Godhead ("assuming him as Spirit...not Matter"[2]) took simple matter and by means of the Divine Volition forced homogeneous unity into heterogeneous variety thus making for an ultimate return of the many into the one, which created conditions of action and reaction. "An action of this character implies reaction. A diffusion from Unity...involved a tendency to return into Unity--a tendency ineradicable until satisfied."[3] The proof of Newtonian gravity is brought to bear in explaining the desire of the many to return to the original one; also introduced to counteract this reaction is the agent electricity, which tends to dispel atoms into a greater state of heterogeneity. "In fact, while the tendency of the diffused atoms to return into Unity, will be recognized...as the principle of the Newtonian Gravity, what I (Poe) have spoken of as a repulsive influence prescribing limits to the (immediate) satisfaction of the tendency, will be understood as that which we have been in the practice of designating now as heat, now as magnetism, now as electricity."[4]

Matter exists only as two tendencies, attraction and repulsion. "No other principles exist. All phaenomena are referable to one, or to the other, or to both combined.... Attraction and repulsion are the sole properties through

1 Ibid., pp.440-441.
2 Ibid., p.440.
3 Ibid., p.442.
4 Ibid., p.445.

which we perceive the Universe; in other words, by which Matter is manifested to Mind."[1] Today's physicists and atom-splitter feel that the ultimate matter may prove to be just that, positive and negative charges. The ancients believed that all matter was motion; thought, too, fell into this category. Poe now begins with gravity's action and attempts to work back to that unity which he proved intuitively to be the source of our universe. "...I have attained a point at which it will be advisable to strengthen my position by reversing my processes. So far, we have gone on a priori, from an abstract consideration of Simplicity, as that quality most likely to have characterized the original action of God. Let us now see whether the established facts of the Newtonian Gravitation may not afford us, A posteriori, some legitimate inductions."[2] Each atom has gravitational pull, or attraction, for other atoms which in turn are attracted toward the center, which is not a point or a place, but a principle. This condition of attraction which varies inversely as the squares of the distances between the influenced bodies should hold true throughout the entire Universe. Poe expresses Newton's law philosophically: "Every atom, of every body, attracts every other atom, both of its own and of every other body, with a force which varies inversely as the squares of the distances between the attracting and attracted atom."[3] The

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.447.
2 Ibid., pp.447-448.
3 Ibid., p.448.

writer stresses the common parentage of the many atoms, again emphasizing the "many from one" idea. "...Is it not because originally...they (the atoms) were One--that now, in all circumstances--at all points--in all directions-- by all modes of approach--in all relations and through all conditions--they struggle back to this absolutely, this irrelatively, this unconditionally one."[1] The atoms are described as having been radiating spherically into space. Intuition is mentioned and Poe expresses complete confidence in this faculty even though it cannot be supported by mathematical proof. "I can only declare that, with an irrestible intuition, I perceive Unity to have been the source of the observed phaenomena of the Newton gravitation."[2] Now the author has returned to the prime particle of matter, simplicity, which he perceived intuitively. Newton's law reinforces Poe's intuitive reasoning, working this time from the heterogeneous state to the homogeneous to complete the circle.

This portion of Eureka closely follows the thought of Emerson who wrote in "Nature" (1836) on "unity in variety" that "although the works of nature are innumerable and all different, the result or the expression of them all is similar and single."[3] More religious than Poe, Emerson saw in every natural law its moral counterpart, perceiving that "the moral law lies at the center of nature and radiates to the circumference....Herein is especially

1 Ibid., p.448.
2 Ibid., p.453.
3 Frederick Carpenter, Ralph Waldo Emerson, American Book Company, New York, 1934, p.20.

apprehended the unity of Nature,--the unity in variety,--which meets us everywhere."[1] Ralph Waldo discovered proof of this not in the laws of Laplace and Newton but instead in every leaf, drop, crystal, moment of time. Believing also in the intuition or as he stated it, the Reason as contrasted with the understanding, Emerson felt that:

> 'At present, man applies to nature but half his force. He works on the world with his understanding alone. He lives in it and masters it by a penny-wisdom; and he that works most in it is but a half-man (a utilitarian), and whilst his arms are strong and his digestion good, his mind is imbruted, and he is a selfish savage. His relation to nature, his power over it (the goal of the Baconians), is through the understanding as by manure; the economic use of fire, wind, and the mariner's needle, steam, coal, chemical agriculture....Meantime in the thick darkness, there are not wanting gleams of a better light,--occasional examples of the action of man upon nature with his entire force,--with reason as well as understanding.'[2]

Emerson again discusses the function of the intuition in his essay "The Over Soul" in which he writes, "We know truth when we see it, from opinion, as we know when we are awake that we are awake."[3]

Poe chose Kepler, Herschel, Laplace, Newton while Ralph Waldo focused his attention on Jesus Christ, Kant and Swedenborg.

To continue the Eureka discussion, Poe uses light as a visual means of showing how atoms are dispersed and spaced in the Universe. Atoms, like light, farthest from

1 Ibid., pp.30, 31.
2 Ibid., p.47.
3 Ibid., p.141.

the center posses the least energy or as Poe writes "the number of light-particles...received upon the shifting plane will be inversely proportional with the squares of distances of the plane. Generalizing yet again, we may say that the diffusion--the scattering--the irradiation in a word--is directly proportional with the squares of the distances."[1] The writer has now connected unity, the centre, with variety, the Universe of Stars, by means of employment of the idea of irradiation. This irradiation is non-continuous, for if the action were infinite there would be no chance for a condition of reaction to arise in opposition to the original action. Atoms are distributed throughout space in concentric spherical layers, "the force and the number of atoms sent out by the force, being directly proportional."[2] This also accounts for the spread of the celestial bodies in the Universe of Stars. The Universe of God is a perfect plot and the perfect end is a return to unity. Poe compares God's perfect handiwork with "the construction of plot. For example, in ficticious literature, we should aim at so arranging the incidents that we shall not be able to determine, of any one of them, whether it depends from any one other or upholds it."[3] As part of diffused matter, we are part of God; "By faint indeterminate glimpses (we creatures discover)...an identity with the Divine Being...of an identity with God."[4] This is

[1] Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.454.
[2] Ibid., p.458.
[3] Ibid., p.463.
[4] Ibid., p.473.

the "Divine Heart" idea.

Poe depends on science and on the intuition while much of the Emersonian thought was based on the work of the German metaphysician Kant. However, Poe echoes Emerson for his "unity" is quite similar to the New Englander's oversoul." Final unity to the author of Eureka meant that matter "would disappear, and that God would remain all in all."[1] In "The Oversoul" Emerson reveals "that Unity, that Over-Soul within which every man's particular being is contained and made one with all other; that common heart.... Within man is the soul...to which every part and particle is equally related; the eternal One." [2]

In Eureka when Unity is achieved, neither the law of gravity nor the electric force will be needed, for the atoms have returned to their original state of simplicity and the ultimate result is Nothingness.

While Emerson was moved by a moral purpose, a desire to find God so that he might act like and become Divine, Edgar Allan desired to fathom the Divine Plan by using the scientific approach of the rational Deist. Emerson projected himself beyond Poe's atomic immortality, attempting to find everlasting existence in the "Oversoul". By placing an emphasis on the moral law Ralph Waldo withdrew from the mechanistic Deism which influenced many during the eighteenth and nineteenth centuries. However, he did not disregard

[1] Margaret Alterton and Hardin Craig, op.cit., p.471.
[2] Frederick Carpenter, Ralph Waldo Emerson, p.135.

science for in his Journal he wrote: "The Religion that is afraid of science dishonours God and commits suicide." [1] He never produced a Eureka-like work, preferring rather to lose himself in the mists of transcendentalism.

To capsule the overall survey more compactly, the thought-framework contained in Eureka may succintly be stated as:

First a state of Nothingness existed. Then the atom was created by the Godhead. Diffusion of the atomic masses was caused by action of the creating force or Divine Volition. The force of electricity acted as an agent of repulsion to keep the atoms dispersed in concentric spherical layers. The Divine Volition ceased to exert influence and the attractive force of gravity began to consolidate the dispersed atoms. A reaction against heterogeneity was set in motion. Finally because of this force of gravity, Unity will be attained. This action-reaction might occur numerous times and the analogy of the Divine Heart is employed to illustrate the expansion to create a Universe, the contraction to regain compact Unity again.

Therefore the Universe has a beginning, a middle and an end, with the beginning and end fused by the heat of divinity, of proximity to the "life stuff."

It is in Eureka: A Prose Poem that Poe reveals that he understands the science of his day and is able to translate the thought of others, Newton, Laplace, Kepler into an intelligible philosophic-scientific essay. He discusses

1 Frederick Carpenter, Ralph Waldo Emerson, p.xxvii.

the "nebular theory" of Laplace, the laws of Kepler, and uses Newton's studies to reinforce his expanding--contracting universe idea. To a layman in astronomy, Poe's comprehension of the universe seems to be much above average, much more scientific than the Martian dreams of such a modern as H. G. Wells. To Poe, who was not a religious man, Truth, and God were probably one. God was Truth since He was consistent and orderly in His acts and in Eureka Poe used geometry to emphasize the symmetry of the Universe which is God.

Woodberry wrote, "Eureka affords one of the most striking instances in literature of a naturally strong intellect tempted by overweening pride to an Icarian flight and betrayed...its merely specious knowledge, into an ignoble exposure of its own presumption and ignorance."[1] Poe is taken to task for employment of faulty data and the Jupiter calculation is singled out especially for condemnation. However these mathematical debates over densities, velocities and physical constants should not diminish Poe's stature for as science improves her instruments, more accurate mathematical results are recorded. In the 1800's the physical constant for the speed of light was "known" to be 167,000 miles per second and Poe mentions this velocity, expanding it into the statement that light will travel "about ten millions of miles in a minute, or about six hundred millions of miles in an hour."[2] Yet in March

1 George Woodberry, The Life of Edgar Allan Poe, II, p.256.
2 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, IX, p.112.

of 1933, Michelson calculated after almost three thousand experiments that the average figure for the speed of light in a vacuum was 299,774 kilometers or 186,264 miles per second. Therefore the physical results obtained are relative figures only and may change from year to year as new tools of science machine finer the ultimate constants.

As Nordstedt pointed out in his article "Poe and Einstein ", if "Poe's essay is but a composite of the theories of Herschel, Boscovich, Faraday, and Laplace... then it must be equally true that Einstein's Theory of Relativity is but an echo of the theories of Newton, Gauss ..., Minkowski, Lorenz and others."[1] As in history and theology, former results and movements must be interpreted by science and used as a base for present investigation. Poe did utilize the results of those who pioneered in science, shaping their theories to his thought pattern. He saw the chain of research and adaptation which linked theory with theory for in a footnote in Eureka he wrote, "The late experiments of Comte...are to the Laplacian theory what those of Maskelyne were to Newton."[2]

Woodberry believed that Poe was foiled in his essay "by the old obstacle--the impossibility of making an equation between nothing and something."[3] Poe attempted to solve this problem by beginning with the simplest form of matter, the "primordial particle", which came into being

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.547.
2 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, IX, p.84.
3 George Woodberry, The Life of Edgar Allan Poe, II, p.246.

because it was so determined by the Godhead. Since there must be a starting point this is as good as any and infinitely better than a more complicated creation. Eddington, the modern British astronomer, admits that a supernatural beginning[1] is the only plausible place to start. If Poe began with nothing, then mathematically found a quantitative universe which was in time reduced to zero, he did no more than Einstein who abolished the infinity[2] which had blocked the efforts of so many of his predecessors. Poe conjecturing on infinity in Eureka hits upon an almost indentical solution:

> 'My purpose is but to show the folly of endeavoring to prove Infinity itself, or parallel even our conception of it, by any such blundering ratiocination as that which is ordinarily employed. Nevertheless, as an individual, I may be permitted to say that I cannot conceive Infinity and am convinced that no human being can.[3]

However, by use of the intuition Poe means "to designate the utmost conceivable expanse of space, with all things, spiritual and material, that can be imagined to exist within the compass of that expanse."[4] Thus he approaches an infinity which is expandable and contractable at will. The author relies throughout Eureka on this faculty, intuition, which is limited only by the intellect of the individual. Early, in a ficticious letter introduced in the essay, Poe emphasizes the importance of intuitive reasoning and the turmoil of discussion current in his day

1 Arthur Eddington, The Expanding Universe, The Macmillan Company, New York, 1933, p.178.
2 Ibid., p.31.
3 Edmund Stedman and George Woodberry, op.cit., IX, pp.22-23.
4 Ibid., p.6.

revolving about the deductive and inductive methods:

> True Science...makes its most important advances, as all History will show, by seemingly intuitive leaps....For many centuries so great was the infatuation, about Hog (Sir Francis Bacon, father of modern science) especially, that a virtual stop was put to all thinking, properly so called. No man dared to utter a truth for which he felt himself indebted to his soul alone.[1]

Poe discusses Kepler, a scientist whom he much respects because of his intuitive background, who admitted that he (Kepler) guessed, by-passing the deductive or inductive routes; and this confession from a man whose laws "disclosed to the greatest of British astronomers...the basis of all... physical principle."[2] Again Poe stresses this thought process which the imaginative Kepler employed to obtain "the three omniprevalent laws of revolution..." which were "but subsequently demonstrated and accounted for by the patient and mathematical Newton."[3]

The intuitive Poe, writing in Eureka, satirized the methods of Aristotle and Bacon which were continually under discussion and analysis in the pages of The American Journal of Science.[4] Striking out first at the Greek philosopher, Poe calls him the father "of what was termed the deductive (the system in which reasoning carries the mind from the general to the individual; from a given premise to its necessary conclusion) or a priori philosophy. He started with what he maintained to be axioms, or self-evident truths; and

1 Ibid., pp.9-10.
2 Ibid., pp.100-101.
3 Ibid., pp.100-101.
4 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.549.

the now well-understood fact that no truths are self-evident really does not make in the slightest degree against his speculations."[1] Edgar Allan also blasted Sir Francis Bacon's system of inductive investigation whose "vital taint...its most lamentable fount of error lay in its tendency to throw power and consideration into the hands of merely perceptive men of those...the microscopial savants, the diggers and pedlars of minute facts, for the most part in physical science."[2] Poe believes in the spark of intuition which may arc above the inductive-deductive plane to find truth and consistency in the universe; to Poe a "perfect consistency can be nothing but an absolute truth."[3]

Attempting to remain scientific and lucid in his essay Poe informs that "on important topics it is better to be a good deal prolix than even a very little obscure."[4] Throughout Poe attempts to live up to this initial statement though at times the discussion becomes immersed in the nebulous clouds of metaphysics. At the one-third point of the essay he consolidates his material and like a mathematics instructor explaining a geometry theorem writes for the enlightenment of the reader:

> I say to myself 'Unity', as I have explained it, is a truth; I feel it (intuition). Diffusion is a truth, I see it (observation). Radiation, by which alone these two truths are reconciled, is a consequent truth; I perceive it.[5]

1 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, IX, p.8.
2 Ibid., p.11. Also see pp.9-10 for further condemnation of the Baconian method.
3 Ibid., p.16.
4 Ibid., p.19.
5 Ibid., p.49.

To explain the diffusion observed in the universe Poe employs the terms of physics, attraction and repulsion which he parallels with the material and the spiritual, the body and the soul.[1]

Attraction and repulsion begin to operate immediately upon the discontinuance of the Divine Volition; that is, Newton's law of gravity enters and attempts to bring about a return to unity. It is this all important physical law on which Poe bases much of his Eureka argument and he admits:

> I confidently expect to find lurking in the present condition of the atoms (the imaginary sphere is now filled with atoms by means of radiation)...the secret of which I am in search- the all-important principle of the Modus operandi of the Newtonian law...[2]

Newton in 1665-1666 discovered after learning from Kepler's rule of the periodic times of the planets that the forces holding the celestial bodies in their orbs must be inversely as the squares of their distances from the centers about which they revolve. Some twenty years later the Englishman proved that a sphere of gravitating matter attracts bodies outside itself as though all its mass were concentrated at the center. Applying these laws to the astronomical bodies the universe took on the pattern of a mathematical plan set in motion, a balanced, well-oiled machine.

It was Poe's desire to prove that this universe was again returning to a state of unity and that Newton's calculations satisfied this condition, whereby the atoms, distributed in

[1] Edmund Stedman and George Woodberry, op.cit., IX, pp.65-66.
[2] Ibid., p.52.

the concentric spheres, were gravitating toward a center, "because in the direction of the centre lies the utmost possibility of satisfaction, generally for its own individual appetite. To be brief, the condition, Unity, is all that is really sought."[1]

Pointing out that gravity is a result of a reaction to the cessation of the Divine Volition, Poe concludes that this law of return would be absolutely the reciprocal of the law of departure,[2] that is radiation, which the Godhead set in motion at creation. Poe continues using the Newtonian Law as his argument that since gravitation has taken place the act of Creation has ceased and the primary processes of creation can no longer be observed.[3] In other words the universe has begun to contract, it has entered a state of progressive collapse. Such a modern as Sir Arthur Eddington agrees in part with this theory, saying "it is true that the extraploation foretells that the material universe will some day arrive at a state of dead sameness and virtually come to an end."[4] In explaining Einstein's idea of the universe, Eddington pictures the idea of the universe, Eddington pictures the idea of an expanding-contracting universe. While Poe used the terms attraction and repulsion, Eddington states that there are two forces operating, Newtonian attraction and cosmical repulsion.

1 Ibid., p.85.
2 Ibid., p.53.
3 Ibid., p.85.
4 Arthur Eddington, The Expanding Universe, p.178.

> 'When more matter is inserted, the mutual gravitation tends to hold the mass together and opposes the expansion. The more matter put in, the slower the expansion. There will be a particular density at which the Newtonian attraction between galaxies is just strong enough to counterbalance the cosmical repulsion, so that the expansion is zero (a stable universe). This is Einstein's universe. If we put in still more matter, attraction outweighs repulsion and we obtain a model of a contracting universe.'[1]

In picturing the emmission of atoms, Poe in a manuscript note writes "describe the whole process as one instantaneous flash." The actual process is slowed down so that the reader may visualize the atoms deposited stratum upon stratum, "until these concentric strata growing gradually less and less, come down at length to the central point, and the diffusive matter, simultaneously with the diffusive force, is exhausted."[2] Therefore Poe was of the opinion that the celestial cycle passed from expansion through contraction and that during his day, and our day, too, the entire Universe was in the latter state.

Eddington is of the opinion that the world started as an Einstein model and that it is now in a state of rapid expansion.[3] In Eureka Poe declares that "we have no difficulty in picturing to ourselves any one of an infinity of beginnings. As our starting-point, then let us adopt the God head."[4] Using this as his creative fountain, Poe pours forth his ideas on the universe and

1 Ibid., p.68.
2 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, Ix, pp.51-52.
3 Arthur Eddington, op.cit., pp.80-81.
4 Edmund Stedman and George Woodberry, op.cit., p.25.

creation. Eighty-five years later Arthur Eddington, contemporary of Einstein and Millikan, wrote: "The beginning seems to present insuperable difficulties unless we agree to look on it as frankly supernatural."[1] And earlier he stated that that part of our material experience representable by physical symbols (especially in the practical sciences) ought not to claim to be the whole.[2] The Quaker astronomer Eddington was of the opinion that the formulae of physics, chemistry and the practical sciences, though precise and accurate, did not hold the complete answer to religion, and life. Pat phrases and mathematical functions manipulated by man to gain solace in the material world offered an answer to only a small segment of the whole of existence. In other words the intellect of the individual must fathom some problems and in this respect Eddington and Poe agree on the intuition. Poe may well be as close to the truth as any man in this material world can get, for many of today's systems are built on assumptions as to the universe's beginning and end. As Eddington affirms astronomical measurements are measurements of physical phenomena and it is by theory alone that they are applied to the vast expanse of the universe outside.[3] That is, man by means of interpolation and extension by analogy, attempts to fathom space and the universe. Man's measurements of physical phenomena on earth may be projected into

1 Arthur Eddington, The Expanding Universe, p.178.
2 Ibid., p.62.
3 Ibid., p.25.

the heavens, but only theoretical solutions result. The physicist is able to predict experimental results within a thousandth of a millimeter, to the eighth place right of the decimal point, but all this accuracy is enclosed by the controlled atmosphere of the laboratory; when he speaks of the action of light or sound in the infinity of space, he modifies his statements, saying, "in theory", or "if like properties hold true."

Although Poe wrote an open letter 20 September, 1848 to Mr. C.G. Hoffman of The Literary World, in reply to a criticism of Eureka in which he "'observes that the ground covered by Laplace compares with that covered by his own theory as a bubble with the ocean on which it floats,'"[1] he utilized much of Laplace's data. Laplace (1749-1827) it was who asserted that the solar system was evolved from a rotating mass of incandescent gas. In writing of Laplace's nebular theory, Poe felt that:

> It is by far too beautiful indeed, not to possess Truth as its essentiality....In the revolution of the satellites of Uranus, there does appear something seemingly inconsistent with the assumptions of Laplace but that one inconsistency can invalidate a theory constructed from a million of intricate consistencies, is a fancy fit only for the fantastic.[2]

Though the author was liberal in his estimate of the "intricate consistencies to which the theory applied, it was generally accepted in the nineteenth century. Recent

[1] George Woodberry, The Life of Edgar Allan Poe, II, p.274.
[2] Edmund Stedman and George Woodberry, op.cit., IX, pp.73-74.

research has disclosed that this creation hypothesis is not tenable for the sun and planets but that the nebular theory may be an answer for the formation of the larger aggregates of stars.[1]

Having outlined the findings of Laplace, Poe believes that he has presented "with all the detail necessary or distinctness--a view of the Nebular Theory as its author himself conceived it."[2] And now that the Frenchman's views have been presented, Eureka's author proceeds to modify this theory. Poe wishes to demonstrate the true meaning of gravity, a return to unity or nothingness, which is not encompassed by Laplace's assertions.

> 'His (Laplace's) most unwarranted assumption was that of giving the atoms a movement towards a centre, in the very face of his evident understanding that these atoms: in unlimited succesion, extended throughout the Universal space. I have already shown, that under such circumstances there could have occured no movement at all; and Laplace, consequently assumed one on no more philosophical ground than that something of the kind was necessary for the establishment of what he intended to establish.'[3]

Since, according to Poe, the atoms saturated "Universal Space" there would be no condition which could warrant the establishment of a reaction since there was no cessation in the emission of atoms by what Poe terms the Divine Volition. Thus a staple universe is the result and a static system results which would not allow for "a movement towards a centre" since all the universe would be in balance.

1 William Dampier, A History of Science, p.193.
2 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, IX, p.73.
3 Ibid., p.88.

Incorporating the thoughts and theories of others Poe continued to shape his essay Eureka. From Pascal (1623-1662) he obtained a definition for the Universe of Space which is, he says "'a sphere of which the centre is everywhere, the circumference, nowhere.'"[1] Now it is no longer necessary to wrestle with the uncomprehensible problem of the end of space. Contra-distinguishing the Universe of Stars, the author states that this universe (of stars) is finite for "were the succession of stars endless, then the background of the sky would present an uniform luminosity...since there could be absolutely no point in all that background, at which would not exist a star."[2] Eddington echoes a similar idea in The Expanding Universe when in speaking of spherical space he says, "it is finite but unbounded; we never come to a boundry... we can never be more than a limited distance from our starting point."[3]

Throughout Eureka, Poe differentiates between the Universe of Stars and that of Space--"Through the boundry walls of the Universe of Stars, into the illumitable Universe of Vacancy beyond."[4] Beyond our finite universe there is an insulating cover of space, a wilderness untenanted whose confines are bounded only by the observer's intellect.

Now that Poe has emphasized the fact that the reaction gravity, is causing movement toward a center, he further

1 Ibid., p.25.
2 Ibid., p.95.
3 Arthur Eddington, The Expanding Universe, p.50.
4 Edmund Stedman and George Woodberry, op.cit., p.96.

substantiates his thesis with quotations from scientific sources. Dr. Nichol (author of "The Architecture of The Heavens") says:

> 'When our greatest telescopes are brought to bear upon them (the "nebulae")...there occurs a very remarkable circumstance in reference to these comparatively sweeping circular masses of nebulae....We find...that all around them on every side, there are volumes of stars, stretching out apparently as if they were rushing towards a great central mass in consequence of the action of some great power.'[1]

While Sir John Herschel contributes:

> 'On one hand, without a rotary motion and a centrifugal force, it is hardly possible not to regard them (the clusters of stars) as in a state of progressive collapse.'[2]

Poe attributes this reluctant attitude to the fact that Sir John could conceive only of an immutable Universe, a universe in Einstein balance. Poe believes that he has now definitely presented evidence of a contracting universe which will eventually approach unity and finally attain true homogenity, or nothingness.

Eddington, too, has noted this movement, but he chooses to interpret the motion as an outward expansion rather than as a gravitation toward a central point. "In a general dispersal or expansion every individual observes every other individual to be moving away from him."[3]

The author's acute reasoning power is evidenced by the fact that he rejected Madler's system consisting of a central pivot point, Alcyone in the Pleiades, about which all

1 Ibid., p.120.
2 Ibid., p.122.
3 Arthur Eddington, The Expanding Universe, p.18.

celestial systems revolve. Showing that this central sun must be either luminous, in which case the body would be visible, or non-luminous in which case it could not have thrown off luminous suns,[1] Poe by means of a logical, penetrating mind, and the faculty which he called intuition, chose wisely and fused the many theories into a thought provoking essay in Eureka: A Prose Poem.

In a letter to Arthur Quinn, author of Edgar Allan Poe, Dr. Charles Olivier of the University of Pennsylvania expressed the opinion that:

> '...I should say that Poe had read widely and with keen appreciation the general astronomy of the day. So long as he limited himself to choosing between rival hypotheses of others, he usually chose either the right one or the most probable in his day.'[2]

However, he mentions that Poe tended to "mix up religion... with his hypotheses." Poe in dealing with celestial problems was forced to use theology as a basis, but Eddington himself admits that the beginning is definitely supernatural for "views as to the beginning of things lie almost beyond scientific argument."[3]

Sir Arthur Eddington, writing to Quinn in September 1940, agrees that:

> 'I think you make out clearly that Eureka is not a work of dotage or disordered mind. It is I think the work of a man trying to reconcile the science of his time with the more philosophical and spiritual cravings of the mind. Poe, besides being fairly well-informed in science and mathematics, seems to have had the mind of a

1 Edmund Stedman and George Woodberry, op.cit., pp.117-118.
2 Arthur Quinn, Edgar Allan Poe, p.556.
3 Arthur Eddington, The Expanding Universe, p.79.

> mathematician...and made a creditable attempt to introduce precision of thought.'[1]

With such an intellect at work it is not surprising that Poe anticipated some of Einstein's ideas and the discoveries of modern physics. The relativity theory states that space, or space-time, has a certain natural curvature which is increased in the vicinity of matter or in an electro-magnetic field. Einstein sets a maximum limit to his closed space-time "in which there are no distances beyond a certain amount."[2] Setting not mathematical, but instead intuitional boundaries, Poe, to a certain degree, pictures Einstein's finite but endless universe when he writes: "'A sphere is necessarily limited'" but this Universe is so immense as to encompass the "'utmost conceivable expanse' of space."[3]

Both Poe and Einstein agree that it is possible that man may never become aware of other existing universes. In Eureka he says:

> Have we or have we not an analogical right to the inference, that this cluster of clusters, is but one of a series of clusters of clusters, the rest of which are invisible through distance-through the diffusion of their light being so excessive, ere it reaches us, as not to produce upon our retinae a light impression or form there being no such emanation as light at all, in those unspeakably distant worlds- or lastly, from the mere interval being so vast that the electric tidings of their presence in Space have not yet--through the lapsing myriads of years--been enabled to traverse that interval?[4]

1 Arthur Quinn, Edgar Allan Poe, p.555.
2 William Dampier, A History of Science, p.517.
3 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, IX, p.84.
4 Ibid., p.97.

As pointed out by Alterton[1], Poe comes quite close to the Einstein theory that light is a prisoner in our universe and by analogy this would account for the impossibility of locating other universes. This light, traveling at 186,000 miles a second along a celestial circle which "is a curve composed of an infinity of straight lines,"[2] will, according to Einstein's calculations eventually return to its starting point.[3] Since the circle is so immense "it would scarcely be paradoxical to say that a flash of lightning itself, travelling forever on the circumference of this unutterable circle, would still, forever, be travelling in a straight line."[4] However, since Poe was unfamiliar with the curvilinear nature of space, his argumentation is directed against an acceptance of the Madler theory that our astronomical system is revolving about a central star, Alcyone. Believing that no curvature would be observable in the mere two or three thousand years of man's astronomical history, he refutes the Madler hypothesis.

Though the death of the Universe will occur, Poe expresses the end more optimistically, saying, "Let us endeavor to comprehend that the final globe of globes will instantaneously disappear, and that God will remain all-in-all."[5] Then immortality will be omniprevalent for "all is Life--Life--Life within Life--the less within the great-

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.547.
2 Edmund Stedman and George Woodberry, op.cit., IX, p.118.
3 See G. Nordstedt's "Poe and Einstein", The Open Court, 44, pp.173-180.
4 Edmund Stedman and George Woodberry, op.cit., IX, pp.118-119.
5 Ibid., p.133.

er, and all within the Spirit Divine."[1] Here Poe has answered those who would look upon a return to Nothingness as another proof of atheism. Since God created the World there is no valid reason why He should not terminate existence when His handiwork is complete. Edgar Allan assures those who fear a loss of their individuality in a footnote at Eureka's conclusion that:

> ...When we further reflect that the process, as above described, is neither more nor less than the absorption by each individual intelligence of all other intelligences (that is, of the Universe) into its own. That God may be all in all, each must become God.[2]

1 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, IX, p.138.
2 Ibid., p.138.

CHAPTER FOUR

"BEGINNING, MIDDLE AND END"

While in the army, Poe wrote his anti-science poems, "To Science" and "Al Aaraaf". These pieces from Poe's early period represent him when least inclined to curb his imagination, when he visualized himself to be a romantic young poet arrayed against a practical science which obscured true beauty from mankind. Not as yet had the methodology of knowledge become important to Edgar Allan Poe.

In the "Sonnet--To Science" he wrote:

> Science! true daughter of Old Time thou art!
> Who alterest all things with thy eyes.
> Why preyest thou thus upon the poet's heart,
> Vulture, whose wings are dull realities?
> How should he love thee? or how deem thee wise,
> Who wouldst not leave him in his wandering
> To seek for treasure in the jeweled skies,
> Albeit he soared with an undaunted wing?
> Hast thou not dragged Diana from her car,
> And driven the Hamadryad from the wood
> To seek a shelter in some happier star?
> Hast thou not torn the Naiad from her flood,
> The Elfin from the green grass, and from me
> The summer dream beneath the tamarind tree?[1]

This "Preface to Al Aaraaf", published in 1829, takes science to task; it is the poem of a twenty year old author who feels that the probing scalpel of science is too realistic, killing the imagination, marring supernal beauty by dragging "Diana from her car." Ironically enough Edgar Poe employs that science, which here he ridicules, "to seek for treasure in the jeweled skies"

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.15.

of Eureka. Wordsworth, too, accused science of making men so heartless that they would "peep and botanize" over their mothers' graves. This is a typical Romantic attitude, an attack on science, and the "dull realities"; a revolt against the impersonal, the polished, the orderly of the Age of Reason.

Again in "Al Aaraaf", probably written between 1827 and 1829[1], the poet gives vent to his early feeling that "the breath of Science dims the mirror of our joy...,"[2] reinforcing the sentiment expressed in "Sonnet to Science." This immature attitude on Poe's part fits well the four section mold prepared by Alterton, which emphasized a complete subservience to the ungoverned imagination in period one, in time crystallizing into the final product of "imagination tempered by reason." Even at this time Poe discovered natural analogies in sights about him. In explaining the figure "like fire-flies in Sicilian night,"[3] Poe adds in a note:

> 'I have often noticed a peculiar movement of the fire-flies;--they will collect in a body and fly off, from a common centre, into innumerable radii.'[4]

In the editions of 1829 and 1831 the young Poe in an introductory passage in "Al Aaraaf" writes :

> A star was discovered by Tycho Brahe (1546-1601) which burst forth, in a moment, with a splendor surpassing that of Jupiter--then gradually faded away and became invisible to the naked eye.[5]

1 Killis Campbell, The Poems of Edgar Allan Poe, Ginn and Company, Boston, 1917, p.171.
2 Margaret Alterton and Hardin Craig, op.cit., p.24.
3 Ibid., p.19.
4 Killis Campbell, The Poems of Edgar Allan Poe, p.181.
5 Ibid., p.174.

Brahe was a Danish astonomer who scanned the heavens in the sixteenth century.

"The Colloquy of Monos and Una" (Graham's Magazine, August 1841) should be mentioned in conjunction with the anti-science poems since Poe again speaks out against organized knowledge. Monos recalls:

> 'There were periods in each of the five or six centuries immediately preceding our dissolution[1] when arose some vigorous intellect boldly contending for those principles whose truth appears now, to our disenfranchised reason, so utterly obvious--principles which should have taught our race to submit to the guidance of the natural laws, rather than attempt their control. At long intervals some master-minds appeared looking upon each advance in practical science as a retrogradation in the true utility. Occasionally the poetic intellect...did..proceed a step farther in the involving of the vague idea of the philosophic, and a distinct intimation that knowledge was not meet for man in the infant condition of his soul.'[2]

Throughout the ages there have been those who seek power by control natural phenomena, the utilitarians who are concerned only with the materialistic in the world. Today many under the shadow of the atomic umbrella look upon "each advance in practical science as retrogradation." Here Poe the philosopher is expressing his views. He does not reject science, but rather finds a closer approach to consistency or truth or God by transcending the world of the test tube and experimentation-observation to view "reality"

1 See Poe's "The Conversation of Eiros and Charmion," Graham's Magazine, December 1839 for a detailed explanation of the earth-consuming conflagration mentioned here.

2 Edmund Stedman and George Woodberry, The Works of Edgar Allan Poe, I, pp.216-217.

through the poetic intellect. Emerson writes in "The Oversoul" that "the nature of these revelations (the announcements of the soul) is the same; they are perceptions of the absolute law. They are solutions of the soul's own questions."[1] Both authors believed that some "truths" perceived intuitively or imaginatively are as valid (or moreso) than those reached by reason, science.

In the critical review "A Letter to Mr. B_____" (1831), Poe said, "a poem, in my opinion is opposed to a work of science by having, for its immediate object, pleasure, not truth."[2] Here he seems to have borrowed from Biographia Literaria where Coleridge wrote in Chapter IV that "a poem is that species of composition, which is opposed to works of science, by proposing for its immediate object pleasure, not truth."

Sometimes, as Poe pointed out in "Al Aaraaf" and in "A Letter to Mr. B_____," knowledge is a hinderance to mortals and poetry and science are in many combinations as non-miscible as oil and water. However, Poe utilized science directly as subject matter in such tales as "The Balloon Hoax", "Some Words With a Mummy" and "Hans Pfaal" and as a springboard for much of his speculation in Eureka. Science too, influenced the literary form and content of many of his reviews and other stories.

He recognized the operation of certain laws in literature as well as in the universe, drawing "an analogy between

1 Frederick Carpenter, Ralph Waldo Emerson, p.143.
2 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.248.

a perfect arrangement of parts in a story or poem and the action of forces in nature under the government of immutable law."[1] Poe considered unity to be a scientific procedure with the "ideal plot form (ing) itself into a miniature universe."[2]

It was in Blackwood's Edinburgh Magazine that A.W. von Schlegel's principle of "unity or tolality of effect"[3] was first introduced to English writers. Edgar Allan read not only Blackwood's but also discovered more about Schlegel from the German's own work, Dramatic Art and Literature.[4] Poe wrote exerting a conscious effort "to produce that impression (of the single effect)."[5] Applying the scientific principle of gravitational attraction toward a center to his literary work, the plots of "Murders in the Rue Morgue", and "The Cask of Amontillado" became in effect universes in miniature, spinning on an axis of unity.

In 1843 "The Pit and the Pendulum" was published; though the tale did possess a beginning and an end, the conclusion lacked complete finality. Numerous ups and downs serrated the action: the pit, the swinging pendulum, the contracting heated walls. Plateaus of relief diluted the tale's unity, but the feeling of horror was sustained throughout and it is "one of his most perfect (renditions)

1 Margaret Alterton and Hardin Craig, op.cit., p.xiv.
2 Margaret Alterton, The Origins of Poe's Critical Theory, p.91.
3 Killis Campbell, The Mind of Poe, p.182.
4 Margaret Alterton and Hardin Craig, op.cit., p.xxviii.
5 Margaret Alterton, The Origins of Poe's Critical Theory, p.32.

in what is described...as Poe's scientific technique."[1] Scientifically the author combined the elements of his story to produce a compound of terror in the days of the Inquistion. The thumb screw of tension continually tightened as the prisoner escaped the pit only to suffer under the razor arc of the pendulum from which he was saved for a more exquisite torture, crushing by the ever-approaching walls of his prison. Though the literary atoms were gravitating toward unity, Poe's literary universe was not yet in perfect balance.

A year before, in the "Twice Told Tales" review Poe employed scientific analysis to precipitate out the elements of good literature, to reveal the theory of the short story. Hawthorne is reviewed (Graham's Magazine, May 1842) and Poe again adopting the technique of a mathematics instructor outlined the essentials for successful prose tale production:

1. "The tale proper...affords unquestionably the fairest field for the exercise of the loftiest talent, which can be afforded by the wide domaines of mere prose."

2. "In almost all classes of composition, the unity of effect or impression is a point of the greatest importance."

   a. "It is clear...that this unity cannot be thoroughly preserved in productions whose perusal cannot be completed at one sitting."

   b. "We allude to the short prose narrative, requiring from a half-hour to one or two hours in its perusal."

[1] See Margaret Alterton's excellent notes on "The Pit and the Pendulum" in Edgar Allan Poe, pp.518-519.

c. "As it (the ordinary novel) cannot be read at one sitting, it deprives itself...of the immense force derivable from totality."

3. "Truth is often, and in very great degree, the aim of the tale."

a. "Some of the finest tales are tales of ratiocination."

b. "For Beauty can be better treated in a poem (but) not so with terror, or passion, or horror, or a multitude of such other points."[1]

Poe adhered quite faithfully to the dicta contained in "Twice Told Tales"; many of his stories written before 1842 also fall into the pattern he established here though not in as clean cut manner as in later stories. He applied the scientific technique to his critical work, employing concrete standards to evaluate the literary efforts of authors under review. Eliminating vague phrasing Poe substituted principles backed by reason, logic and research.

Like the wine in "The Cask of Amontillado", the story was the mature distillation of Poe's rational approach to an aesthetic literary problem. He wasted not a sentence in channeling the stream of effect he desired to portray, cold-blooded revenge. Montresor, the protagonist of the balanced action revealed that "thethousand injuries of Fortunato I had borne as best I could, but when he ventured upon insult I vowed revenge."[2] The murder was to be carried out "one evening during the supreme madness of the carnival season,"[3] an ideal setting for violent death. Poe worked

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, pp.358-360.
2 Ibid., p.221.
3 Ibid., p.221.

always toward the climax, luring the reader as well as Fortunato deeper and deeper into the natural wine cellar. Always revengeful Montresor led his "willing" victim farther from the frolic in the streets, giving him chance after chance to withdraw to the color and crowd above. The bells on Fortunato's foolscap, heard as the story opened, jingled crazily behind the new wall in the catacombs, tieing together the "beginning, middle, and end" of "The Cask of Amontillado." Applying Poe's prose formula, the story fits the master mold to die-like perfection. Short, the story falls well within the hour and a half perusal limit; the effect is based on a revenge theme that is emphasized and re-emphasized as the two enemies probe deeper in the low vaulted cellar. There is a ring of reality, a vein of irony which satisfies the essential of verisimilitude while the picture frame plot of mathematical dimensions fulfills Poe's "microscopic universe" ideal.

In the "Tortesa" review (Burton's Gentleman's Magazine, August 1839), the author is concerned with the fact that "three-fourths of the play might have been blotted out without injury to the plot."[1] Unity is Poe's focal point with all parts of a literary production fitting the mold of single effect.

His critical eye discovered the symmetry of unity in "Undine: A Miniature Romance" and the scales swing in favor of this German romance. To the reviewer:

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.283.

> Undine is a model of models, in regard to the high artistical talent which it evinces. We could write volumes in a detailed commentary upon its various beauties in this respect. Its unity is absolute--its keeping unbroken. Yet every minute point of the picture fills and satisfies the eye. Everything is attended to, and nothing is out of time or place.[1]

A year and a half later in April 1841, Poe again stressed the importance of unity in plot construction. He wrote in the review of "Night and Morning: A Novel" that a plot

> properly defined is that in which no part can be displaced without ruin to the whole. It may be described as a building so dependently constructed, that to change the position of a single brick is to overthrow the entire fabric...Every page bears marks of excessive elaboration, all tending to one point--a perfect adaptation of the very numerous atoms of a very unusually involute story.[2]

Like the Newtonian concept of the universe, the plot was to be nicely balanced, a smooth functioning unit. The singleness of effect acted in literary productions to produce a unity closely paralleling the flight of atoms to attain oneness.

With the appearance of Poe's third criticism of Longfellow in Graham's Magazine, April 1842, the author felt that:

> to convey 'the true' we are required to dismiss from the attention all inessentials. We must be perspicuous, precise, tense. We need concentration rather than expansion of mind. We must be calm, unimpassioned, unexcited.

He amplified this thought trend, adding that this presen-

1 Ibid., p.291.
2 Ibid., p.305.

tation of the truth is the antithesis of poetic expression. Therefore, though he believed in the scientific, in the true, he could not visualize an amalgamation of poetry and truth.

Longfellow in the Poe review of "Ballads and Other Poems" is observed to be too concerned with morality and truth. Instead the Cambridge professor is advised to produce prose. However,

> of the poets who have appeared most fully instinct with the principles now developed, we may mention Keats as the most remarkable. He is the sole British poet who has never erred in his themes. Beauty is always his aim.[1]

Not truth but the rhymical creation of beauty was the domain of poetry. Form was important, but the content need only excite the poetic intellect. Prose was the proper medium for fact.

Though many consider "The Philosophy of Composition" (Graham's Magazine, April, 1846) to be an essay founded on super rationalization of "The Raven", it is a prime example of Poe's work when most influenced by science and the analytical approach. Emphasizing the rational, the ordered in the creation of a work, Poe admits:

> I have (no difficulty) at any time...in recalling to mind the progressive steps of my compositions; and since the interest of an analysis, or reconstruction...is quite independent of any real or fancied interest in the thing analyzed, it will not be regarded as a breach of decorum on my part to show the modus operandi by which some one of my own works ("The Raven") was put together.[2]

[1] Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.349.
[2] Ibid., pp.366-367.

According to Poe, "the work proceeded, step by step, to its completion with the precision and rigid consequence of a mathematical problem."[1] Since "pleasure is deduced solely from the sense of identity--of repetition"[2] the author chose the refrain, "Nevermore" to enhance his production. Because "it has always appeared to me that a close circumscription of space is absolutely necessary to the effect of insulated incident:--it has the force of a frame to a picture,"[3] the scene was set in the lover's chamber where he sat pondering. He continues, "most writers --poets in especial--prefer having it understood that they compose by a species of fine frenzy--an ecstatic intuition."[4] Refuting this statement, Poe traces the conception, assembly and final production of "The Raven" in a scientific, methodical manner. Like the endless surface of a sphere, a "poem may be said to have its beginning--at the end, where all works of art should begin."[5]

In the years from 1844 to 1849, Poe contributed numberless articles to Graham's Magazine, the Southern Literary Messenger, Godey's Ladys' Book, and the Democratic Review, ranging in length from a paragraph to several pages. This "marginalia", though often journalistic in nature, offers ample material for tracing his interest in and the influence of science. Poe, reflecting the scientific attitude in "Genius and Hard Work" (Godey's Lady's Book, August 1845),

1 Margaret Alterton and Hardin Craig, Edgar Allan Poe, p.367.
2 Ibid., p.369.
3 Ibid., p.373.
4 Ibid., p.366.
5 Ibid., p.372.

discusses the constructive ability of genius; he remarks that "this ability is based...in great part upon the faculty of analysis, enabling the artist to get a full view of the machinery of his proposed effect, and thus work it and regulate it at will."[1]

Like the research chemist who produces a pure complex carbon compound after numberless attempts, Poe believes that the true literary man will never be balked by the idea that some "thoughts are beyond the compass of words."

> I (Poe) do not believe that any thought, properly so called, is out of the reach of language. I fancy, rather, that where difficulty in expression is experienced, there is, in the intellect which experiences it, a want either of deliberateness or of method. For my own part, I have never had a thought which I could not set down in words, with even more distinctness than with which I conceived it.[2]

Here the analytical Poe is expressing himself. At times he was unable to explain his theories clearly in Eureka but the infinite scope of his subject matter tended to blur the focus of his thought.

In a paragraph from the Southern Literary Messenger (May, 1849), Poe employed a chemical analogy to illustrate the function and properties of the "pure imagination." He writes:

> The pure imagination chooses, from either Beauty or Deformity, only the most combinable things hitherto uncombined; the compound, as a general

[1] Margaret Alterton and Hardin Craig, op.cit., p.406.
[2] Ibid., p.410.

> rule, partaking, in character, of beauty, or sublimity, in the ratio of the respective beauty or sublimity of the things combined.... But, as often analogously happens in physical chemistry, so not unfrequently does it occur in this chemistry of the intellect, that the admixture of two elements results in a something that has nothing of the qualities of one of them, or even nothing of the qualities of either....But, in general, the richness or force of the matters combined; the facility of discovering combinable novelties worth combining; and especially the absolute 'chemical combination' of the completed mass--are the particulars to be regarded in our estimate of Imagination.[1]

Poe, too, applied this method to the phrases and thoughts borrowed from fellow-authors. Encorporating non-original material, he smoothed it into the context of his literary production, grafting, fitting, until the part became a homogeneous whole.

To Poe, a defective plot was ugly, deformed, a heterogeneous impurity to be discarded. As he said in "Novel and Tale",

> Most of our tale-writers...neglect the distinction (between a rambling novel and a short story). They seem to begin their stories without knowing how they are to end; and their ends, generally... appear to have forgotten their beginnings.[2]

In this paragraph printed in July 1849, he reasserted what he had already mentioned in "The Twice Told" review as well as in "The Philosophy of Composition" and "The Poetic Principle". The element of totality must be present to rate a critical nod of approval from Poe.

Much of his literary criticism is as reasoned and logical as his ratiocinative stories, his pseudo-scientific

[1] Ibid., p.424.
[2] Ibid., p.426.

writings. He turned a searching eye on the work of his contemporaries, deftly handling his principles of unity, brevity, reality as critical standards. Poe was concrete when other reviewers were vague; he presented cutting facts when others offered flattery. (However, he, too, stooped to "pot-boiling" on occasion.)

Aside from the fact that science serves as subject matter in some of the stories, the balance and homogeneity of many of the tales point strongly to Poe's affinity for astronomy and mathematics. Not only is science related to such a story as "The Murders in the Rue Morgue", but also to the delicately formed, well-proportioned structures, "The Cask of Amontillado" and "The Pit and the Pendulum". They reflect the operation of a mind "scientific" and rational in its approach to literary problems. The tales encompass the four laws of the short story that Poe mentions in the "Twice Told Tales" review. They are:

1. Verisimilitude (Truth)
2. Immediacy (Immediate effect on the reader)
3. Totality (Unity)
4. Finality (Definite Ending)

His very logical theory of the short story which conceived of plot as a series of ordered steps leading to unity, possibly emanated from the core of science.

Superior intellects often attempt to find the formula that seems to answer the question of creation or being. Poe, in my opinion, wished to discover the secret of the pattern

of harmony and balance in the universe. An intelligent man, a sensitive writer, he called on science in his search which ended with his death in 1849. Some of the influence attributed to the methodology of science may have stemmed from Poe's rational mind, ordered by the basic journalistic questions, "Who, what, why, when, where?" But the magnetic core of science was in evidence, its field of force acting on Poe, the writer.

Ranging from his early readings in phrenology to the later astronomical-philosophical work in Eureka, Poe oftentimes exhibited the keen mind, which made him an acute observer of life and physical phenomena. Though his formal educational training did not emphasize natural studies,his extra-curicular browsing in encyclopedias, his reading in the technical fields and as a reviewer of astronomical works, his interest in contemporary inventions, did much to fill the void.

Poe tempered his philosophical conclusions with scientific speculations current in his day. Relying on intuition in his investigation of the heavens, he attempted to translate the man-made theories of the material world into an intelligible answer concerning the Universe. He was not a laboratory man, a plodding individual absorbed in observation, recordation and interpretation of data. Instead Poe focused his organizing talent in the heavens, attempting to read the blue print that apparently brought order to the universe. His reasoning intellect caused him to gravitate

toward the study of astronomy and mathematics; in Newton's law he hoped to find the formula of ultimate unity, for gravity evidently explained the desire for oneness that influenced not only the fall of an apple to earth but also controlled the path of astronomical bodies in their celestial orbits.

Edgar Allan Poe felt, I believe, the pressure of science, though instead of fighting the force he sharpened his literary tools on its grindstone.

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