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A Brief Survey of the Art and Execution of Bronze Sculpture

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Art and Execution of Bronze Sculpture

A BRIEF SURVEY OF THE ART AND EXECUTION OF BRONZE SCULPTURE

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CHAPTER I

THE PROBLEM

I. CONDITIONS OF THE PROBLEM AND PURPOSE OF THE STUDY

What is fact?

The word "fact" is commonly credited with a singular meaning, but analytical inquiry reveals that fact connotes a multiplicity of meanings. An arbitrary acceptance of any one meaning precludes the perception of truth.

On a path in a deep forest a boy traveling east met a man going west. The boy informed the man of the fact that a snake lay coiled in the man's path, that the man should be careful lest he tread on the snake and be bitten. The following day the boy and the man met again. The man informed the boy that what he had seen was not a snake, but merely a coiled rope. The dimness of the light had deceived the boy. The reptile had been a creature of the boy's unverified imagination.[1]

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1 An abridgement of a story by Paul Brunton, The Hidden Teaching Beyond Yoga (London: Rider and Company, 1941), p.139.

The boy asserted the fact that he had seen the snake. The man asserted the fact that the "snake" was merely a coiled rope. Had the boy and the man never met again, the boy would have continued to assert it was a fact that he had seen a snake. The man would continue to assert it was a fact that the boy had seen a rope.

It is clear to the thoughtful person that more care must be exercised in the use of this term. If a fact is something reported by the five senses, then it is possible to be deceived by the senses.

What, then, is the fact about a work of art? More specifically, what is the fact about the bronze statue of Buddha which stands in the Field Museum at Chicago? Suppose, for a moment, that Gautama Buddha is alive today. A mold is taken from his body and a bronze casting is made. The senses report that the casting is an exact image of Buddha. Is that which the senses report a fact about a work of art? The statue of Buddha at the Field Museum is not, however, an exact image of Buddha. The senses report that this statue is the image of Buddha, but they do not report that it is the exact image of Buddha. Is that which the senses report about this statue the fact about a work of art? In both cases, if the senses reported the fact about a work of art, why is there a discrepancy in

the second report -- that it (the statue) is not the exact image of Buddha? Obviously, in the second case, the report of the senses is supplemented by some sort of reasoning power. Which, then, is responsible for reporting the fact about a work of art? The senses or the reasoning power? If the reasoning power reports the facts, then that which the senses report is not fact. And if that which the senses report is not fact, then what is fact? If reasoning power reports the fact, then what about reason itself? Is fact contained within reason, or does reason surrender its reports to an even higher power of the mind?

These are but a few of the questions which have harassed the author. The irresistible desire to create and thus execute a work of art forced him to respect something other than "face-value" fact. It has become apparent that the fact, or facts, of art exist beyond the realm of the five senses, but such reasoning is by no means final. For if facts exist within, or because of, a power of the mind, it is evident that the facts of one mind will never be identical to the facts of another. Such harmony is impossible because cognizance of fact is relative to the limited nature of the mind and the condition of knowing. Thus there is no plausible law of fact. Such being the case, it is impossible for two individuals to talk of the facts about a work of art, because each individual speaks of

the facts of his own mind. By what right, then, may two persons speak and even agree on the facts concerning a work of art? If harmony does not exist between the facts of one mind and the facts of another, the purport of art is rendered invalid. Without substance, art would cease to be needed and the urge to create would leave the artist. The limited nature of fact (precluding any plausible law of itself) imports that fact is only an illusion, and that the "real" or truth exists in another realm of the mind. In order that the author might indicate more clearly the relation of truth to this other realm of the mind, in order that some basis might be established (or at least be understood) for the common interpretation of art, this thesis was planned.

II. STATEMENT OF THE PROBLEM AND ORGANIZATION OF REMAINDER OF THESIS

The general problem included the art and execution of bronze sculpture. It was felt that the theory of the art of bronze sculpture, or any art, could best be comprehended when substantiated by practical illustration. In order to fully realize the problem, a brief history of bronze metal and bronze sculpture was presented in addition to the research in the field of various techniques of bronze casting. The practical illustration of this study was made "in the form of a composition

for bronze sculpture. To give this work an atmosphere of reality, a site on this campus would be chosen to be adorned with a work of sculpture. The student would proceed in the same manner as does a sculptor who competes for a commission (study of site, preliminary sketches, choice of subject, sketch models)." [2]

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2 Cf. "Proposed Thesis."

PART II: HISTORY OF BRONZE ART

CHAPTER II

PREHISTORIC HISTORY OF BRONZE SCULPTURE

I. DEVELOPMENT OF THE BRONZE AGE

One of the most important steps in human progress was marked by the introduction of metal. Apart from the invention of fire-making, which in the childhood of the race helped to raise man above the lower animals, there was no similar advance in his material condition until the very recent development of steam and electricity. Atomic energy, as yet, exists only theoretically beneficial to the advancement of man. The enormous period known as the Stone Age, which can only be measured by geological time, left man still ignorant of many essential arts of life. The world-wide relics of that time demonstrate that substantial progress was made, but in many particulars that progress was insignificant when compared with the results achieved since metal began to supersede stone some five or six thousand years ago. The earliest efforts of the worker in metal, which made such rapid progress possible, are therefore of transcendent importance in the history of civilization.

The period from the beginning of metallurgy down to the dawn of recorded history is commonly divided into two parts,

each named after the metals which successively occupied the most prominent place in human history: an earlier or "Bronze Age," succeeded by an age of Iron. These terms have been so convenient that they have passed into general use. It must be remembered, however, that no two prehistoric periods can be separated by a hard and fast line. Words do not denote divisions of time. Rather, these divisions are stages of time which gradually supersede each other and are not uniform in all parts of the world.

The very use of the term "Bronze Age" may appear to beg a serious question, for though bronze was undoubtedly the most important metal employed in the early period, it was probably not the first to be fashioned into an implement, weapon, or object of art. Besides the purely ornamental metal gold, there were two others, copper and iron, in favor of which a claim for priority has been put forward. Metallurgists have pointed out that there is no reason why iron should not have first attracted some inventive genius at the close of the Neolithic Age.[3] Its ores were more abundant and more easily reduced than others, while in its meteoric form it required no reduction at all. In this form it has within the memory of man been fashioned into

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3 Reginald A. Smith, "A Guide to the Antiquities of the Bronze Age," Department of British and Mediaeval Antiquities (Oxford: Oxford University Press, 1920), p.2

implements by the Eskimo of Greenland, probably without any aid or suggestion from foreign peoples; and it is reasonable to inquire whether it may not have occurred in a similar way and been similarly used in other parts of the world at a remote epoch. It has been suggested, for example that the use of iron might have been easily discovered by the accidental reduction of a rich piece of ore on the domestic hearth and the way thus opened to an experimental repetition of the process.[4] It should further be remembered that iron may have been known in Egypt almost, if not quite, as early as bronze; that is to say, as early as the Fourth and Sixth Dynasties. In the paintings of the time of the Ancient Empire, weapons and tools were painted blue or black, the hues in which iron was always represented. Iron played an important part in Ancient Egyptian myths, the firmament of heaven having been described as a rectangular iron plate. The Chinese, too, are thought to have been acquainted with iron at least as early as 1000 B.C., and probably even earlier. But reasonable as such arguments are in favor of the priority of iron may appear in themselves, there is one thing wanting to their serious consideration; they are not often born out by archeological discovery. It is known that when men once

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4 Otis F. Mason, "The Origins of Invention"(vol. XXVIII, Havelock Ellis, editor, The Contemporary Science Series, 28 vols.; London: Walter Scott, Ltd., 1895), pp. 109-14

became acquainted with the harder metal, they ceased to make their weapons of the softer. The fact is proved beyond controversy by the finds of the Transition Period which terminated the Bronze Age. When the bronze sword or dagger was superseded by that of iron, bronze was retained only for ceremonial and ornamental purposes. It is most unlikely that if iron had been used before any other metal, it would have fallen into disuse in any place where its ores could be readily obtained, or that men once acquainted with its merit would have continued to manufacture weapons of a metal inferior in offensive power.

This consideration disposes of the argument that primeval iron weapons may have once existed but later rusted away. It is not to be supposed that the iron weapons and ornaments deposited with the dead would have disappeared so completely as to have left no single instance, not even a trace of discoloration upon the surrounding objects. In various countries there have been found interments and even cemeteries in which bronze and iron weapons, instruments, and ornaments were intermingled. Information from other sources indicates that the forms in bronze were of later invention than the forms in iron.[5]

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5 Smith, op. cit., p. 3

The forms in iron were not forms for which the metal was best suited, but were almost servile copies of the bronze forms. Thus, the proof of the one having succeeded the other is almost absolutely conclusive.

Iron may be eliminated from the general inquiry: there remain copper and bronze, the former a simple metal, the latter an alloy of copper and tin. Along the Coppermine River in Alaska, and on the shores of Lake Superior in Central North America, ores containing copper in the metallic state were made into knives and spear-heads by the natives long before the advent of the European invader. Some of the North American tribes thus passed from the exclusive use of stone to the knowledge of copper simply by the use of their own inventive faculty. If the Red Indian were able to make this advance, why, it may be asked, should not prehistoric man have done the same in Europe? But North American copper ores contained large masses of pure copper metal. Copper in this form was treated by the Indians as if it had been stone. It was hammered into shape without exposure to heat. Thus, the Indians were merely users of metal and in no sense metallurgists.

On the other hand, the prehistoric inhabitants of the Old World melted their copper before they fashioned it.[6]

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6 Mason, loc. cit.

All the copper objects known to science have certainly been produced by casting, which presupposes a more significant advance in human knowledge, and one much more difficult to explain -- involving, as it does, the introduction of completely new methods and the employment of fire. In some localities where oxidized copper ores occurred in admixture with tin ore, a true bronze may have been made contemporaneously with, or even earlier than, the pure metal; and the alloy, at first due to accident, may have been almost immediately reproduced of set purpose. The primitive mind is not unobservant, and if many of the uncivilized tribes of the modern world are capable of the like simple experimental processes, there is no reason why the prehistoric man should not have given proof of similar attitude. But it is probable that in most localities copper was really the first metal of which objects were made, and being far more widely distributed than tin (the second constituent of bronze), was more likely to have first attracted man's notice. An especial attraction for copper probably occurred when the metal was found in the form of oxides and carbonates (surface ores).

There are still great numbers of primitive metal implements which have not been chemically analyzed, and the material available for scientific generalization is very

incomplete. But the evidence, so far as it goes, is against a universal stage of culture characterized by the sole use of copper. The fact that the most primitive forms frequently prove to have been made of copper, though favorable to the theory of a Copper Age, is not in itself conclusive. For, as opponents may point out, copper can only be successfully cast in flat molds open to the air, and if it is poured into double or closed molds, it produces unsatisfactory results.[7] Even if all the known objects in primitive form proved to be of copper, this might still only show that tin for some reason was temporarily unobtainable. Those casters who were able to produce forms of more elaborate description, might have returned to the forms of primitive appearance because these alone were suited to the metal actually at their disposal. Really effective evidence in favor of the general phase of culture based on the exclusive employment of copper, though it may confirm the argument "from form," must be independent of it. The exclusive employment of copper can only be attributed to certain definite regions in the countries of the Eastern Mediterranean.[8] Over these regions the occurrence of copper in deposits of objects, conceded by authorities to be older than the first

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7 Smith, op. cit., p. 5

8 Loc. cit.

practices. Jupiter might shave his beard only with a bronze knife; and it was an ancient usage that the site of a new town might only be ploughed round with a plowshare made of bronze. The same feeling is expressed in the Book of Deuteronomy (XXVII:5): "And there shalt thou build an altar unto thy God, an altar of stones; thou shalt not lift up any iron tool upon them." Folklore tells a constant tale of the fear with which iron was everywhere regarded as something new and uncanny by the conservative sentiment of the countryside. There was a fear engendering a feeling of awe for the smiths and founders who were able to bend the powers to their will. To the smiths, who were often regarded as abnormal or even supernatural beings, mysterious powers were generally assigned.[11]

III. LOCATION OF MANUFACTURE

It now becomes necessary to touch on another unsolved problem, the origin of the manufacture of bronze. In what part of the world was the alloy first produced? Any answer given to this question must necessarily take into consideration the distribution of tin; for if traces of tin workings exist within easy reach of the most ancient centers of civilization, a way out of the difficulty may be found. At present

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11 Childe, op. cit., p. 4-7

the piece of bronze for which the highest antiquity is claimed is the rod (dating about 3000 B.C.) found at Medum in Egypt. Mesopotamia claims a statuette of Gudea (2500 B.C.), and an almost contemporary vase of Ur Engur, but both of these are now said to be of unalloyed copper.[12] A contemporary statuette of a basket carrier was composed of copper with eighteen per cent lead. So far as is known, tin was not found within the borders of either Egypt or Babylonia; and the nearest regions rich in metals, even in Armenia and the Caucasus, appear to have been devoid of stanniferous ores. Tin is said to have existed in Asia Minor. One Greek historian has declared that it was produced in Drangiana, a district west of modern Afghanistan.[13] The allusion to tin in Numbers XXXI, as part of the spoils of Midian, suggests that there may even have been mines in Northwest Arabia.

In Eastern Asia, beyond the radius of the ancient civilization of Mesopotamia, there would seem to be no region likely to have witnessed the discovery nearer than Southern China; for India, which has copper implements of a very primitive type, is poor in tin. The Malay Peninsula, an extremely rich stanniferous region, does not appear to have been mined in very ancient times.

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12 Smith, op. cit., p. 8

13 Horace L. Jones, The Geography of Strabo (vol. VII, T. E. Page, editor, The Loeb Classical Library, 8 vols.; New York; G.P. Putnam's Sons, 1930), p.145

In Southern China copper and tin are found together in abundance under conditions which would give every opportunity for primitive experiment; but here again the authorities have to be content with a bare statement of possibility, for as yet there is no proof. Outside the realm of legend nothing is known of the state of China in the fourth millenium B.C.; yet unless a theory of independent invention in different parts of the world is adopted, it is to this remote period that the first use of bronze in that country must be assigned.[14] If China originated, Mesopotamia and Egypt must have followed, and yet they produced bronze as early as 3000 B.C. And the difficulty would hardly be lessened if the date of the Medum rod should prove to be a thousand years later than that claimed for it. The search for the birthplace of bronze in China is therefore barren of positive results, though there is ample room for future discovery in what is an almost unknown land.

IV. ORIGIN OF SCULPTURE IN METALS

Among the several theories advanced by archeologists and related to the origin of sculpture in metals is one which holds that in Northern or Western Asia there had originated a

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14 Smith, loc. cit.

distinctive art known until recently as "Scythian animal art" or even more recently termed "Eurasian animal art" or the art of the Steppes.[15] Through the process of time, migrations of barbarians from the Eurasion Steppes, southward and eastward at first, then westward, the style was carried to Persia and the upper valleys of China where it was absorbed by the pre-Buddhist culture. Later these barbarians are supposed to have migrated west and carried their innovation to Finland and thence onward down the European countries. This would mean that a number of the heretofore assumed independent sources of art would have instead a common origin. In the survivals of art is seen evidence of a common bondage. The Luristan animal figures of Persia, the Scythian originals of Lower Russia, the early animal sculpture of China, and the rare examples of Northern Europe are closely related in motives and sculptural feeling. According to the evidence found, the Scythian style in India flowered at once. Then for reasons not clear, the style was lost. But in China it found continuous life and its spirit triumphed.

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15 Raymond S. Stites, The Arts and Man (New York: McGraw-Hill Book Company, Inc., 1940), pp. 490-3

CHAPTER III

HISTORY OF ORIENTAL BRONZE CULTURE

I. CHINA

From the earliest times the bronze products of China have been of such excellent quality that they take their place among the truly fine arts of that nation. In the past there has been an extensive collection of these bronzes made by enthusiastic amateur collectors. Volumes of encyclopedic proportions, often profusely illustrated with drawings that were anything but scientific, were originated to record these bronzes. Antiquarians divide Chinese bronzes into two general classes: (1) those whose surface has been worked over; (2) those which remain in the same condition as when they were first excavated.[16] In most cases the bronzes which have remained for years in Chinese collections have been worked over and vastly changed in appearance, making true ascertation of facts almost impossible. Though honest witnesses may report certain conditions under which bronzes are excavated, in most cases these witnesses are untrained in archeological terms and are unable to interpret correctly the conditions under which

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16 Charles Faben Kelly, "Chinese Bronze," Encyclopaedia Britannica, 1947 edition, IV, 246-51

the bronze has been found. Very few excavations of bronzes can be dated with any degree of certainty. The first systematic catalogs of Chinese bronzes, thirty volumes in all, were compiled during the Sung Dynasty (960 - 1279 A.D.) by Wang Pu; the most famous of all the catalogs is one in forty-two volumes, compiled for the Emperor Ch'ien Lung and printed in 1751. The first information about the manufacture of bronzes is found in the treatises written during the Chou Dynasty (1122 - 249 B.C.). Bronzes dated with some degree of certainty to be in the fifteenth and fourteenth centuries B. C. are of such perfection achieved only after much experimentation and long years of experience; bronzes of lesser merit are credited with earlier dates, examples being assumed as legitimate ancestors of the Anyang pieces.

Dr. Karlgren of Sweden made what seemed the first systematic study contributing to the dating of Chinese bronzes. He determined that early bronzes can be divided into three classes -- Chang, Chou, and an intermediate transitional class that might belong to either.[17] Using this classification, some of the main characteristics of the various periods can be stated with a certain amount of assurance, some of the characteristics carrying over to, changing, or disappearing in the succeeding epochs.

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17 Ludwig Bachhoffer, A Short History of Chinese Art (New York: Pantheon Books, Inc., 1947), p. 52

The favorite decorative motives of the Shang Dynasty (1765 - 1122 B.C.) were cicadas, snakes, a great variety of birds, many dragon types, and occasional elephants. Most often of all appeared the "t'ao-t'ieh" which ultimately, according to linguists, meant nothing at all, and which could perhaps best be described as a sort of monster mask identifying it with some awe inspiring supernatural being. Practically all early bronzes had the distinctive feature of projecting vertical flanges, probably a decorative feature suggested by the "fins" retained on a piece-mold casting. The surfaces of the Shang flanges were generally incised in T-shaped or L-shaped lines, the whole development as a decorative motif being one of the most revealing criteria in the dating of Chinese bronzes. Though most legs supporting tings and similar vessels were of simple cylindrical form, there were supporting legs of animal form. The gabled roof, also a distinctive early form, was frequently used as a design for knobs. There were free-standing animal heads — the ram, the ox, and the deer. Some of the animals had bottle-shaped horns, never spiraled horns. The thread-like ground pattern on the early bronzes was always the meandering "thunder" pattern.

The Chou Dynasty (1122 - 206 B.C.) comprised three periods (Early, Middle, and Late), and characterized a radical

departure from the decorative motives of the Shang Dynasty. The Middle Period bronzes won a freedom from the austerity of the Shang Dynasty; they exhibited the intense creative fervor which possessed their makers. Broad figured bands of decoration appeared; the bottle-shaped horns gave way to spiraled types; and the flanges assumed simple forms. During the Late Period the motives showed an increased use of animal forms, a tendency towards "all-over" decoration, and an interest in inlaid patterns of gold, silver, and copper wire. All periods gave evidence of the influence of nomad tribes from the north.

It was only after the beginning of the third century that Chinese scholars began recording the forms of life in detail. The next dynasty (Han, 206 B.C. - 220 A.D.) was one of the most outstanding periods of sculptural art. Bronze sculpture, though for the most part lost to the modern world, gave evidence of unprecedented creative powers. The high standards set by the bronze founders remained through the ensuing six dynasties (220 A.D. - 618 or 689 A.D.). During the T'ang Dynasty (618-960 A.D.) Asiatic sculpture recorded its greatest and final triumph. The decline in sculpture commenced with the Sung Dynasty (960-1276 A.D.), and the art of painting sprang into new being.

It is impossible to view the history of bronze sculpture without seeking the underlying reason for its creation and

existence. Although there is no proof there is the possibility that the entire Scythian or Eurasian Steppe art may have been the by-product of religion, the visual evidence of a cult of the animal. It is also possible that as art spread over the continents the original reason of religion gave way to the purely decorative necessities dictated by the particular civilization of the time. Though it retained its native Eurasian characteristics, art grew homogeneously with the religion of China. All the art of China was in tune with the spiritual life, and the rise of Taoism (founded by Lao-tse in the sixth century B.C.) was perhaps only an effected statement of the power that motivated the workers of art even at the time of creative inception. Who is to deny that the art of the Eurasian, the Ancient Chinese, or modern man is not bound to a common incentive? The Chinese acknowledged the dual aspect of existence in all that they conceived, and sought a balance between the two. Could this not be the object of that art? Chinese art grew with the ability of every person to be absolutely sincere with himself and his thinking.

The religion of Lao-t'se derived a monistic world from nameless matter but insisted on giving each person his innate freedom and his right to act. Whether or not the individual may have subscribed to that derivation of the world was a question

of small consequence. At that time what was really important was the acknowledgment of the appropriateness of existence. By contemplation and by the cessation of all activity one could withdraw into eternal being. Perhaps, in the present day, the most misunderstood quality of this attitude is that meaning is not achieved by idealistic mysticism. Meaning culminates with a philosophical discernment of universal reality. Mystical exercises aim only at the attainment of emotional and mental peace.[18] Such is the real doctrine introduced into China from India between 206 B.C. and 23 A.D. Certainly such quality cannot be denied the bronze art, or any other art of the ancient Chinese.

II. INDIA

If credit is to be given the Eurasian theory advanced by archeologists concerning the origin of sculpture in metals, the early art history of India, like that of China, is bound to the influence of the barbarians who migrated from the Eurasian Steppes. India, as a country with geographical boundaries and with a history unique within itself, did not exist. There is too much evidence suggesting a link with Sumerian civilization to assure any theory of independent origin.[19] In the Vindhya Mountains,

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18 Brunton, op. cit., pp. 63-6

19 Ananda K. Coomaraswamy, History of Indian and Indonesian Art (Leipzig: Karl W. Hiersemann, 1927), pp. 4-7

prehistoric cave paintings exhibit a close kinship with the Paleolithic murals in France and Spain, and the relics of later prehistoric ages are frequently like those of North-eastern Europe and Western Asia. Indian art, which is essentially Indian sculpture, first emerged as an independent art in the millenium between 1500 and 500 B. C. By that time the Aryan invaders from the northwest, from Persia or Afghanistan, had been absorbed into the persistent cultures of the native Dravidian tribes. Typical Indian sculpture, which includes sculpture in bronze, has a definite Persian quality. Legend has it that in the middle of the third century B. C., an emperor of the Maurya Dynasty imported sculptors who brought with them an unfamiliar foreign court art.[20] That art emerged with the native art and eventually was named "Asokan" art in honor of its promoter, the Emperor Asoka.

Authorities have divided and re-divided the periods of Indian art history into a chronology which may best be reviewed in terms of inspirations introduced by two main religious cults -- Hinduism of the Brahmins, and Buddhism.[21] The Iranian invasion led to a Vedic religion and philosophy which was culturally established about the sixth century B.C. The rise of a group of

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20 Ibid., pp. 15-40

21 Sheldon Cheney, A World History of Art (New York: The Viking Press, 1944), p.299

priests who called themselves the Brahmins collected a group of theological treatises, the Brahamanas, and thereby established the nevershaken caste system of India. In the highest caste of all, the Brahman, the priesthood gathered the essential wisdom of the prehistoric mother cults and the Vedic religions into a system called Hinduism. (The Vedic religions, which emphasized a polymorphic theism, were symbolized in Vedic hymns -- collectively called the Rig-Veda. The concept of soma as a vital force running through all human life emphasized the part played by the generative instinct in carrying forward all invention.) The Brahman, two centuries later, retreated into the wilderness and there composed a series of writings offering a solution to the riddle of existence.

A group of followers, who rejected the idea of personal asceticism in order to achieve personal salvation, subsequently founded the religion of Jain. A member of this group was Gautama Buddha (563 - 483 B.C.), the founder of Buddhism, which eventually found its way into China (about 206 B.C.). Though Buddhism was continually practiced, thereafter in India it had far less religious and philosophic influence on art than did Hinduism which returned with the second rise of the Brahmins in the seventh century (the Hindu Rebirth). The great mass of Indian art was shaped in accordance with Brahmanic philosophy

and psychological intention.[22] Actually, it was designed in the essence of the secondary stage of Buddhism which held that the soul was the only reality and that allegiance to the world only delayed the return of the spirit to its source, the fountain of existence. The Buddhists, of course, felt that idealistic mysticism was not the answer, and progressed on to philosophical discernment of knowledge revealing the connection between the human and the divine.

Bronze sculpture of India reveals the Oriental rejection of what Western education has long since practiced as reason, and which to the Oriental mind stands in the way of esthetic response and enjoyment of form. It is an art of an abstract philosophy, it serves its prophets and teachers as a bridge to carry a message to the people. Bronze sculpture of the First Brahamanic Period was formal and unperturbed about natural law. It had the convention of the "law of frontality." The greatest innovation regarding subjectmatter was the use of the human body. Peculiar in this usage of the human form was the lack of anatomical accuracy. Representing the nature spirit was the "Yaksha" and his consort the "Yakshi," figures appealing to region lying beyond familiar fact and to an interest beyond the model. The succeeding Buddhist bronze works which eventually adopted the human

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22 Ibid., p. 301

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[25] Ibid., p. 201

form as a motive, were centered in the figures of Buddha and Buddhisattva. The universality of Buddhist philosophy was represented in those bronze figures which united the spirit and the loveliness of outward life. Concurrently there developed another style rich in compositions of figures, floral forms, and repeated geometrical abstractions. The eventual reappearance of Brahmanism proper brought an art devoted to the individual caste levels, particularly the lower caste that comprised the great mass of Indians. Siva, who represented the principle of destruction and also the reproductive or destroying power, was found in two types of image: a phallic menhir and immovable icon; and a manifestation of Siva as Nataraja often times representing cosmic activity (one of the five actions of Siva).[23] Figures depicting Siva with four arms and the suggestion of a superior personality capable of overcoming all inertia were common motives. The Hindu spirit prevailed through the remainder of India's "Golden Age" (the Gupta), but after the fifteenth century the Hindu sculpture became hard, linear, and finally stereotyped.

III. INDO-CHINA, INDONESIA, AND NEIGHBORING TERRITORIES

Chronologically the next step in tracing the history of bronze should be devoted to Asia Minor where its history, according to archeological finds, is possibly equally as old as that of

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23 Coomaraswamy, op. cit., p. 43

the Far East.[24] In accordance with the theory that the origin of sculpture in metals was simultaneously carried by migrations of barbarians to the Far East, Asia Minor, and Northern Europe, such a plan is logical. However, in this approach to the study of bronze art, the author considered the culture of the Far East to be in contrast to that of the West. The two regions, though of common ancestral heritage, ultimately developed civilizations with opposing philosophical points of view. In order that he might be consistent with this argument, the author proceeded with the review of bronze history in Indo-China and Japan.

The history of the arts in Indo-China, Indonesia, and neighboring territories indicates that Java in particular was invaded by the tide of Buddhism from China. Malaya and Indonesia give evidence of the parallel growths of Brahmanic and Buddhist cultures (cultures inherited from India).[25] The arts of all those regions culminated in an achievement closely related to that of the two mother countries. Yet there was a distinctive development. They added their own unique native character. In Java the composition of sculpture was simplified, creating in that sculpture a note of logic and restraint; in Cambodia and

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24 Cf. post., p. 34

25 Cheney, op. cit., p. 315

Champa the religions of India were united with the inherited art from China to produce an art personified in its own right. Spiritual implications and abstract intent were so fused as to give all sculpture a feeling of inner tranquility. In the whole of Indo-China there was harmony in sculptural creation.

IV. JAPAN

The Japanese do not appear to have immigrated to the islands they now occupy earlier than perhaps seven or eight centuries B. C. They were of the same stock as the Chinese and in reality were, at that time, Chinese. There is the possibility that these Chinese found on the islands people of the same lineage (from the Eurasian Steppes) as were the Chinese themselves. It is known that the aborigines, whom the Japanese (Chinese) found on the islands, were totally unacquainted with the use of metals.[26] Hence, all objects of metal which have been discovered are Japanese and are not older than the time of the Japanese immigration.

The evidence afforded by tumuli and dolmens clearly demonstrates that in the early history of the Japanese there were two periods of metallurgical progress, viz., a Bronze and

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26 Annual Report of the Board of Regents of the Smithsonian Institution, 1894 (Washington, D.C.: United States Printing Office, 1895), p. 609

an Iron Age. The Bronze Age began with the immigration of the race and terminated about the second century B.C. The Iron Age then commenced, extending to the present time. There is no evidence whatever of a Copper Age preceding the Bronze Age, but contemporaneous with the early Iron Age, and up to the sixth or seventh centuries A.D., copper is found to have been more extensively used than bronze. While bronze objects of this period are rare, gold and copper covered iron swords and horse trappings are found in abundance.[27]

In Japanese annals two events of marked importance occurred during the periods of the seventh and eighth centuries. Buddhism, which was introduced about 552 A.D., had been adopted as the religion of the country. Through the energy and enthusiasm of Prince Shotku Taishi (593 - 621 A.D.) a fixed capital and court had, for the first time in Japanese history, been established at Nara (709 A.D.). Those two circumstances created a brilliant epoch in the history of the art of bronze founding and sculpture. Numerous temples -- some on a scale of great magnificence -- were erected for the services of the new religion. The skill of both native and foreign workers was specially enlisted for the decoration of the temples and for the production of statues of the divinities of Buddhism.

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27 Ibid., p. 610

Stimulated and supported by the priesthood in efforts to produce objects worthy of the church, the bronze founders achieved results which were never surpassed in that country. Unfortunately many of their works were destroyed by conflagration and spoilation during civil wars. Many tales record the enthusiasm with which the founders of the time were supported by their patrons and of the stubborn manner in which, after repeated failures, the founders overcame the difficulties which beset them. The Empress Koken (749 - 758) is said to have personally aided the founders in stirring the molten metal for a statue of a Buddhist saint, which was only completed after six unsuccessful attempts. During that period the development of bronze founding and the encouragement of bronze artists was entirely due to Buddhism. For many centuries later the chief works of the art founders were executed for the adornment of Buddhist shrines. The survival of most older bronzes is solely due to the care which has been given them by the priests of the Buddhist religion.

Japanese records and traditions of that epoch invariably speak of the help afforded them by Korean and Chinese artists, and not a few of the ancient examples of bronze which survive are attributed solely to the Chinese and the Koreans.[28]

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28 Kukuzo Okakura, The Ideals of the East with Special Reference to the Ideals of Japan (London: William Clowes and Son, Ltd., 1920), p.39

Besides the influence which the neighboring countries -- China and Korea -- had on the technique and the motives of Japanese bronze founders, there is evidence of the influence of art of more distant regions. Among the treasures of the Temple Horyuii (near Nara, Yamato) are several bronze statues of Buddhist saints and deities which are obviously of Indian design. The characteristic poses of the figures, the modeling of their features, and their jeweled headdresses are distinct Indian motifs. During the "Nara Period" (the seven reigns during which Nara was the capital, 709 - 784 A.D.), the art of bronze founding made its first great advance. Near the end of the Nara Period the court was removed to the City of Kiot, which, from that time (784 A.D.) up to 1868, continued to be the imperial capital. This removal of the court was a severe blow to the art life of the ancient city, and the works and traditions of its old bronze founders were apparently forgotten.

From the beginning of the ninth until near the end of the twelfth century, there was a period of decadence in all art (the Golden Age of Literature). The entire country was engaged in civil war.

During the last years of the twelfth century, when peace was established throughout the country by the victories of Yoritomo, there was a revival of the old art of the Nara Period.

From 1190 A.D. up to the time of Yoritomo's death (1198 A.D.), considerable energy was devoted to the cultivation and advancement of the arts of peace. The artistic spirit was aroused from its dormant condition, and for nearly a hundred years there was a renaissance in art -- a period chiefly remarkable in the history of bronze for the casting of the colossal Amitabha, the Daibutsu of Kamakura. This image, although slightly smaller than the great Buddha of Nara, is superior in execution. Like the Buddha of Nara it was cast in segments, but these segments were "burned together" rather than riveted. Other bronze images of the divinities of the Buddhist hierarchy were made for the temples of Yamato and Kioto, one of the chief groups being a trinity for the monastery Horyuji. Several bells were also cast. A bell at Kamakura is worthy of note, especially since the record given of it indicates the source of metal.[29] It is said that 300,000 copper coins which had been collected by the priests of the temple were melted down for the casting. The metal, being insufficient in quantity, caused the casting to be a failure. Thirty thousand more coins were then collected. The addition of the metal from these coins gave a sufficient quantity of metal for the casting. It is also recorded that copper coins were similarly melted for the casting of Buddhist images and ornamental

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29 Annual Report of the Board of Regents of the Smithsonian Institution, 1895, op. cit., pp. 616-17

utensils. Hence, it would appear that it was not then deemed necessary to use a different alloy for bells and art castings than for coins.

During the fourteenth and fifteenth centuries there was again a period of decadence. The exceptions were two short intervals -- the first during the supremacy of the Ashikaga Shogūn, Yoshimitsu (1368 - 1493 A.D.), and the second during the reign of Ashikaga Yoshimasa (1440 - 1471 A.D.). For the greater part of this period the country was again in a state of unrest, and the arts of peace were little encouraged.

In the last decade of the sixteenth century, after another period of civil war, the patron of art was again a soldier. Although his country was engaged in war with Korea, Taiko Sama caused to be built a huge wooden Buddha. A temple for housing the statue was built at the City of Kioto. After the destruction of the wooden image by an earthquake only eight years after its erection, Taiko Sama planned to replace it with a statue in bronze. Though the execution of this plan was delayed by Sama's death, the bronze version was accomplished by his widow and son sixteen years later. Apparently few large bronzes were cast during this century. However, several specimens of dedicatory bronzes were placed not only in Buddhist temples, but also in Shinto shrines (shrines of the ethnic cult and religion of the Japanese. Services held within

such shrines consisted chiefly of the reverence shown to the spirits of imperial ancestors, historical persons, and some deities of nature.).

In 1603, Tokugawa Iyeyasu succeeded in establishing the Japanese system of feudalism on a firm foundation. The following two and a half centuries saw an unparalleled period of peace. During the supremacy of the Tokugawa Shogūns, the bronze founders as well as other workers of art, were encouraged as never before in their work. But, in spite of the prodigious amounts of bronze works turned out, with sculpture the gradual interest in fineness exhibited by the painters led to an overinterest in detail and to the loss of the larger plastic rhythm.

At the beginning of the eighteenth century the skill of the bronze artist was chiefly exerted in the production of colossal images and other huge castings for the temples of Buddha. But, beginning with the period from the middle of the eighteenth century up to the present time, their art found a wider range in the designing of objects for secular use, for decoration in the home, and for the everyday needs of life. Shortly before the eighteenth century, the okimono, or ornament -- a thing of no practical utility -- was introduced. This, among other items, offered the artist a new field for the exercise of his ingenuity. The vase, formerly used only as a ceremonial vessel of the

Buddhist altar, became a necessary object for the adornment of private life. In the choice of form and decoration the artist was no longer hampered by the old traditions and rules of the church. Hence, the founders of this period are not chiefly notable, as in earlier times, for the works destined for the services of Buddhism or the embellishment of its shrines. Even so, some interesting castings were made. These consisted principally of standard lanterns, dedicated as votive offerings to temples and monasteries, and torii, or gateways to Shintō shrines.

The period from the eighteenth century was marked by a movement toward naturalism -- the result of more immediate contact with the West. Geometric designs gave place to those based on natural forms. Studies were made of the designs of naturalistic painters. A greater impulse was given to the art of bronze founding than had been known since the Nara Period. For a little more than three-quarters of a century there was another golden age in Japanese history. The arts gradually passed into a stage of decadence. The macabre influence of the West was evident.

CHAPTER IV

INTERLUDE: THE MEETING OF THE EAST AND WEST

I. ASIA MINOR AND THE NEAR EAST

The cultures of the East versus those of the West can be defined as opposite in philosophic points of view when there is cognizance of the elements of time and distance which separate the areas fostering such philosophies. In the regions of the Far East the motivating sources of art were tied with two main religions, Brahmanism and Buddhism, at a far earlier time than the art stimuli of the West was associated with any universal religion. Religions in the West did not exhibit the early harmony as did those of the East, though many flourished and exhibited considerable influence for short periods. It was not until the advent of Christianity that any philosophy general to the West could be recognized. This agent for motivating the arts was long thereafter in a perpetual state of internal disorder, not only within itself, but with other factions who by their cumulative strength harassed it in its propagation. The early inhabitants of the lands designated as the West were of common heritage with those of the East, but differed with their cousins and themselves in attitude. However, the early art of all those peoples indicates a bondage, which, in the light of the

theory of common heritage, has given rise to much speculation. Again there is the problem -- who preceded who in the origin of the use of metals -- in this case, the original use of bronze. For lack of any other conclusive evidence, the author continued to subscribe to the "Eurasian" theory of the origin of sculpture in metals.

The indispensible necessity of metal constituted the free use of metal, especially tin, in regular foreign trade. In the Ancient East, trade of the third millenium B.C. was probably conducted on very much the same lines as is native commerce in Asia today, save that coined money was at first unknown. A collection of clay tablets found in Cappadocia are inscribed with the business letters of a group of bankers and merchants who settled there in connection with the metal trade.[30] They give a lively picture of the traffic between the metalliferous regions of Asia Minor and the agricultural and industrial cities of the Tigris-Euphrates Plains. Great caravans of merchandise traveled up and down the famous route that followed the Euphrates. The commerce was financed by a system of loans, secured by contracts, many of which are known to historians. Other documents from Mesopotamia, also written in wedge-like characters called cuneiform, refer to the importation of copper from the mountains east of the Tigris and

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30 Childe, op. cit., p. 38

of metal and stone from Magan (probably Oman on the Persian Gulf). Egyptian records from the Old Kingdom onward refer to expeditions sent by Pharaohs across the desert to Sinai for the extraction of copper and turquoise.[31] It was to secure this trade that the Egyptians established a colony or protectorate at Byblos. Historians point out how commercial relations between civilized states would have involved actual transference of populations.[32] Craftsmen from foreign lands would gravitate to cities where political and geographical circumstances had created a market for their wares and skills, and in turn, would add to the riches of their adopted home. The most dramatic proof of extensive commercial relations is, however, the discovery (in several pre-Sargonic sites in Mesopotamia) of seals, differing altogether in design and fabric from the countless native seals, but identical with specimens unearthed in prehistoric sites in the Indus Valley.[33] This is the earliest recorded instance of the transmission of manufactured products over such vast distances. So it can be seen that the caravans were already crossing the Syrian and Persian Deserts and that merchantmen were already sailing the Mediterranean and Erythrean Seas five thousand years ago.

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31 Ibid., p. 39

32 Leonard C. Wooley, The Development of Sumerian Art (New York: Charles Scribner's Sons, 1935), p. 53

33 Ibid., p. 39

Excavations at Tepe Gawra in Mesopotamia have turned up evidence that a pre-Sumerian peoples possessed many of the attainments commonly accepted as pertaining to civilization. Among the evidences offered were beads representing the first worked metal. The author was unable to find of what metal these beads consisted, the note from which this information was obtained neglected to say.[34] If this metal was of copper with varying amounts of tin it might be suggested that bronze was known in pre-Sumeria at least before 4000 B.C. In these excavations archeologists now hope to establish evidence of civilized man at levels to be dated 7000 - 7500 B.C. Such evidence would contribute much to the confused theories of the origin of metal work, particularly bronze.

At the time from which a more definite history of bronze art can be established the inhabitants of Southern Mesopotamia were called Sumerians (from Sumer, their name for their land). The cuneiform was a Sumerian invention, the product of a people well civilized by 4000 B.C. One phase in the early art of Sumeria is a degree of unforced realism and of fidelity to surface nature exemplified in statuettes characteristically "lifelike." The art works that survive have mostly to do with gods, kings, and upper-class personages. They are votive figures commemorative of

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34 Cheney, op. cit., p. 38

honors paid to the gods and celebrating the exploits of king and conqueror, they are articles of luxury and show. When the Sumerian kings of Ur and Mari commenced their rule about 3000 B. C., the land of Sumer gradually extended its influence to the west and eventually encroached upon the Semitic territory at Kish. There is some indication that the arts of this period had been preceded by a long development of mature drawing and carving.[35] The heraldic emblem at Lagash shows that there was a large scale usage of copper. Even after the two cultures of the lands of Kish and Assur (Sumerian and Semitic cultures) were united by the first Sargon in 2650 B.C., there was very little change in the conventions of art, and certainly no great gain in mastery. Discoveries in some graves near the Biblical Ur of the Chaldees reveal that bronze was used for weapons and some ornamental purposes. Not until the time of the Assyrian ascendancy did any great work in art appear. Under Babylonian domination in 600 B.C., art was brought into one focus. Designers and craftsmen were imported from the surrounding countries of Phoenicia, Syria, and Egypt, each doing his part without a clear idea of the whole, but with a grand result.

Though Christianity had not made its appearance, its predecessor was a dominant power in the history of Mesopotamia. The earliest inhabitants had their totems and fetishes. Then the active components of nature were thought of as being masculine,

personified by warriors, or hunter gods. There was a peculiar aspect of femininity realistically subordinate to that of the deity. Hence, the mental attitude of fear generated by the dominance of the one, profoundly influenced the individual in his approach and appreciation of a work of art. Interestingly enough, the male deity and his consort appeared at a not much later time incorporated in the creation story of the Bible.

When Babylonia succumbed to the Persians in 558 B.C., its art had a rebirth. Actually, the Persians had but a meager art of their own, but they brought with them a fresh spirit. After sifting out the ingredients from captured peoples, from the artisans imported from Syria, Egypt, and the lands near the Siberian Steppes, the Persians turned in the opposite direction toward a formalized and decorative art, rich in color and incidental patterning. The art of Persia was a manifestation of the meeting of the Occident and the Orient. By 525 B.C. the Persian Empire under the Achaemenid Dynasty was the greatest in extent known to that time of human history. Persian influence repeated itself time and time again in the cultural development of Asia and Eastern Europe, although the Persian Empire officially ended in 331 B.C. Fortunately there are many examples of Persian artistry that escaped the wrath of later conquerors. Persian bronze art was conceived in new plastic forms and new rhythms. It was unconcerned

with the strict imitation of nature. The Luristan bronzes, the repoussed platters and vessels, and the fine jewelry were illustrative of Persian technique. There was a lack of monumental art due to the Persian Zoroastrian religion. This faith discouraged the making of devotional images, although it did not prohibit representational art in other religious channels. The sculptural impulse was turned to metal wares, minor crafts, and near-abstract decorative accessories for architecture.

The eventual invasion of the Mohammedans incurred a fanatical destruction of what monumental sculpture there was in Persia. The Koran prohibited human representation in art. Though the Arabs had little art of their own, the absorption of Persian genius, combined with the ambitions of the Mohammedans and succeeding powers, gave all Southwest Asia a distinctive and unparalleled art. Thus, the West got a glimpse of the glory of the East.

It is interesting to note that the Ancients regarded the Caucasus as the seat of metallurgical invention.[36] Its fame was partly due to old legends and traditions; partly to the ignorance of geographers, who saw in the great range one of the boundaries of the world; partly, again, to the neighborhood of tribes like the Tubal and Meshech of the Bible and the Chalybes, who worked metal and trafficked with it in foreign countries.

The Bronze Age in Syria and Palestine has been dated between 2000 and 1250 B.C., metal having possibly been introduced by the Semitic tribes who preceded the Israelites and who were known as the Amorites and Canaanites. The non-Semitic Hittites of Asia Minor dominated North Syria soon after 2000 B.C., and influenced the coast lands from about 1500 B.C. Meanwhile, Egypt under the Thoimes I-III exerted pressure from the south. As is illustrated by the frequent occurrence of the early Cypriote dagger of copper, contact with the civilization of Cyprus was inevitable. The earliest local productions were probably of that metal, bronze following later. Early in the twelfth century B.C., the Philistines, entering Palestine from Southwestern Asia Minor, drove the Israelites out of the coastal region, and after failing in their attempt on Egypt in 1196 B.C., settled themselves there. The place of their culture in the world stream of art is not easily marked off by geographical boundaries or stylistic independence. Eventually, Oriental Christian art (already half brother to the Arabian-Moslem art) united with the art of the ascetic Egyptian Coptics and featured on the art of Southwestern Asia and Southern Europe. United in spirit with some other phases of Christianity, this art was absorbed by the Byzantine cultures. But before continuing the story of bronze art in that advanced stage, it is necessary to follow its history in the lands to the west.

II. EGYPT

Other than gold, copper was the first metal employed in the Nile Valley. This metal was obtained from the mines of Sinai, to which expeditions were made as early as the time of the First Dynasty — about 3500 B. C. However, copper weapons were already known at the close of the Pre-Dynastic Period. During the first three dynasties (about 3500 - 3000 B.C.), copper was the only metal used, but in the Fourth Dynasty bronze came into use, whether or not introduced from Babylonia is difficult to say. In any case, the tin was imported. The very nature of the alloys used in Egypt seems to have varied considerably throughout the long period in which bronze was the chief industrial and artistic metal. There is a question as to whether the Egyptians were ever absolutely dependent on bronze, for iron was known almost as early as was bronze.[37] Also, iron was obtainable both in Egypt itself (in Nubia) and on the western slopes of Mount Sinai. The rod from Medum, upon which so much depends, was found deep down in the filling of a mastaba. (The mastaba was contemporary with the pyramid of the Monarch Snefru, so the rod is held to date from the period of Snefru's reign -- about 3000 B.C.) Bronze swords of undoubtful Egyptian origin are rare. Although Egypt was in constant communication with Crete, the Aegean Islands, Greece, and Asia Minor, it developed its early bronze art along

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37 Ibid., p. 169-70

its own lines. The first bronze artists neither borrowed nor transmitted forms to any extent. Because the concept of art was associated with pleasure -- either the pleasure of knowing that one's appearance, and therefore one's soul, was to be made permanent for eternity -- the sculptors generally confined themselves to the use of the more convenient stone. Bronze was chiefly limited to use in implements and articles of minor decoration. The only period which saw considerable use of bronze for sculptural purposes was late in Egyptian history. The influx of Greek and Roman culture, beginning with the Christian era, brought representationalism and decadence to all Egyptian art.

CHAPTER V

HISTORY OF OCCIDENTAL BRONZE SCULPTURE

I. EARLY BRONZE SCULPTURE IN SOUTHERN EUROPE

GREECE AND THE ISLANDS

As early as 3000 B.C., the hardy mariners of Greece and the Islands were familiar with copper. Shortly thereafter, they became acquainted with bronze. On the mainland of Greece, the Mycenaean group represented only the closing phase of the whole of the Bronze Age in Crete. A distinct but parallel culture on the other islands was known as the Cycladic culture (from the finds in the Cyclades on the north coast of Crete). As the chronology has an important bearing on Europe and the Near East, the table on page 49 is given to show the connection with Egypt.[38]

The first Aegean painted pottery appeared in the Early Minoan Period. Before the end of that period precious metals appeared in abundance. Without having been preceded by poorer alloys, a bronze rich in tin suddenly made its appearance in the Second City of Hisslarick. The first spiral appeared in Minoan art. This spiral motif may have originated with coils of gold wire, such as appeared in pins of the so-called treasure of Priam. The use of

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38 Ibid., p. 159

CHAPTER V

HISTORY OF CONTEMPORARY ARCHAIC SCULPTURE

I. EARLY BRONZE SCULPTURE IN SOUTHERN GREECE

CRETE AND THE ISLANDS

As early as 3000 B.C., the early masters of Greece and the Islands were familiar with copper. Shortly thereafter, they became acquainted with bronze. In the mainland of Greece, the Mycenaean group represented only the closing phase of the whole of the Bronze Age in Crete. A distinct but parallel culture to the other Islands was known as the Cycladic culture (from the finds in the Cyclades on the north coast of Crete). As the chronology has an important bearing on Europe and the Near East, the table on page 38 is given to show the connection with Egypt.[38]

The first Aegean painted pottery appeared in the Early Minoan Period. Before the end of that period precious metals appeared in abundance. Without having been preceded by pewter alloys, a bronze rich in tin suddenly made its appearance in the Second City of Hissarlik. The first spiral appeared in Minoan art. This spiral motif may have originated with coils of gold wire, such as appeared in pins of the so-called treasure of Dvkem. The use of

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[38] Ibid., p. 139

the spiral motif spread to other metals, to stonework, and to pottery, until eventually it reached Egypt, Central Europe, Scandinavia, and Ireland.

The Middle Minoan Period saw the first palace at Knossos. Contemporary pottery of many colors, known as the Kamares ware, were found in a cave on Mount Ida (near Ancient Troy). The occurrence of an identical ware on the twelfth dynasty site of Kahun in Egypt was an important link in the chronological chain and proof of the intercourse between the two countries about 2000 B.C. Many of the shapes of this ware were copied from bronze vases.

The acme of Minoan civilization was reached in the next period, by which time colonies had been planted on the Greek mainland. The shaft graves of Mycenae have furnished many contemporary relics of Minoan art. But it is more important to the present purpose to note the decline of the Minoan naval power and the rise of artistry. Both conditions were probably responsible to the successive invasions of barbaric peoples from the North (probably the Danube Basin) by the way of Thessaly into Greece.

Large sculpture was almost non-existent at the excavated sites of the Cretan and Mycenaean civilizations. There was no mention of monumental statues like the golden youths with torches

TABLE I

CHRONOLOGIC CONNECTION OF MINOAN PERIODS AND EGYPTIAN DYNASTIES

Cretan Neolithic Period (Perhaps 10,000 - 3000 B.C.)

Early Minoan	I.	3000-2800	III-V Dynasties
	II.	2800-2400	VI Dynasty
	III.	2400-2200 (2d City, Troy)...	VII-X Dynasties
Middle Minoan	I.	2200-2000	XI Dynasty
	II.	2000-1800 (Kamares Ware)....	XII Dynasty
	III.	1800-1600	Hyksos (XIII-XVII Dynasties)
Late Minoan	I.	1600-1500 (Shaft Graves, Mycenae).....	Early XVII Dynasty
	II.	1500-1350 (King Minos).....	Later XVIII Dynasty
	III.	1350-1100 (Mycenaean).....	XIX Dynasty

(Traditional Greek Date for the Trojan War, 1194-1184 B.C.)

mentioned by Homer.[39] There were, however, a great number of bas-reliefs in alabaster, plaster, and metal, figurines in terra cotta, ivory and bronze, and specimens of chased and repousse metal work done in gold, copper, and bronze. The religion did not call for god-images and conspicuous idols. There was less seriousness about gods and the divinity of kings than there was in Egypt. Though religious symbols were frequent in their decorative art, there were, for the Cretan and the Mycenaean, higher virtues to be reckoned with. For them, hospitality was a prime virtue.[40]

The first wave of barbaric peoples was identified with the Achaeans (about 1400 B.C.), who appropriated the leading Mycenaean centers, and who, to some extent, assimilated Minoan culture. After the destruction of the Palace at Knossos, civilization ebbed in Crete. The Minoan traditions, however, were kept alive on the coast of Asia Minor and in Cyprus. The twelfth and thirteenth centuries B. C. marked a relapse in the Aegean world. The Dorian invaders, the second wave of emigrants from the North, displaced the Achaeans who either became slaves or immigrated to Ionia on the coast of Asia Minor. This event took place in the eleventh century B.C., and ushered in the Geometric Period of Greek art.

Both the Achaeans and the Dorians were Aryan and European, whereas the Minoans were non-Aryan. The Ionians were a people of

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39 Walter Leaf, "Homer and History," The N.W.Harris Lectures (London: Macmillan and Company, Ltd., 1915), pp. 33-4, 64

40 Cheney, op. cit., p. 112

mentioned by Homer.[39] There were, however, a great number of bas-reliefs in alabaster, plaster, and metal. Figurines in terra cotta, ivory and bronze, and specimens of cloisonné and repoussé metal work done in gold, copper, and bronze. The religion did not call for god-images and consequently idols. There was less seriousness about gods and the divinity of kings than there was in Egypt. Though religious symbols were frequent in their decorative art, there were, for the Cretan and the Mycenaean, higher virtues to be reckoned with. For them, hospitality was a godlike virtue.

The first wave of barbaric peoples was identified with the Achaeans (about 1400 B.C.), who appropriated the leading Cretan centers, and who, to some extent, assimilated Minoan culture. After the destruction of the Palace at Knossos, civilization ebbed in Crete. The Minoan traditions, however, were kept alive on the coasts of Asia Minor and in Cyprus. The twelfth and thirteenth centuries B. C. marked a relapse in the Aegean world. The Dorian invasion, the second wave of emigrants from the North, displaced the Achaeans who either became slaves or emigrated to Ionia on the coast of Asia Minor. This event took place in the eleventh century B.C., and ushered in the Geometric Period of Greek art.

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[39] Walter Leaf, "Homer and History," The Ilad, Book XVIII (London: Macmillan and Company, Ltd., 1915), pp. 309-10.

[40] Chaney, op. cit., p. 112.

Western Asia Minor and certain of the Aegean Islands. They developed their own culture earlier than did the Dorians or other tribes who merged in the Greek civilization. These two peoples, the Dorians and the Ionians, grew independently as soon as the cultural advance began. Ionia inherited its artistic feeling from the cultures of the East -- Babylonia, Assyria, Persia, and Egypt.[41] Both the Dorians and the Ionians firmly re-established Minoan and Mycenaean art.

The Archaic, or early, Greeks were masters of the metal processes. Their bronze statuettes exhibited sculptural control. A bronze statuette of a horse is testimony of the little sacrifice the Archaic Greeks made of sculptural compactness for natural effect. The Archaic Period, covering the time from the beginnings of Greek sculpture to the crisis of the Persian Wars (or, to the immediate predecessors of Phidias)was strong in plastic quality. From 480 B. C. which marked the wars with Persia, the arts were humanized and Greek sculpture, in accordance with the Athenian philosophy, became rational, intellectual, and realistic.[42] Though some of the most desirable sculptural qualities of Archaic art were carried over into the Transitional Period of 480 - 450 B.C., the Phidian era marked the beginning of a long decline. The Charioteer of Delphi was part of a bronze group which included four horses,

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41 A. De Ridder and W. Deonna, Arts in Greece (New York: Alfred A. Knopf, 1927), pp. 6-7

42 Ibid., pp. 10-11, 56-7, 71-80, 84

a chariot, and a second figure representing Victory. This bronze with enamel and silver inlay, five feet eleven inches high, although representative of the excellence of Greek bronze technique, typified the trend toward scientific idealism. The First Period, then, might have been termed inspirational; the Second, observational. The last named period combined materialism and scientific idealism into a philosophy known as the "Development," which explains the difference in attitude between the East and the West. The philosophy of sensualism in the realm of art, explained in part the desire for photographic realism, which appeared throughout the succeeding five hundred years of Greco-Roman activity. Late Greek sculpture, rather than show any inner moral character, revealed illusionism of the real, pathos, and literal realism.[43] Such desire for realism, which became the dominating force in Roman sculpture, was portrayed in small bronzes such as the Spinario -- the figure of a small boy pulling a thorn from his foot.

ITALY, THE HOLY ROMAN EMPIRE AND BYZANTINE ART

In the Neolithic Period, North Italy was occupied by Ligurians, a non-Aryan people who buried their dead unburned, and who, in classical times, were confined to the seaboard of the Gulf of Genoa. At the end of this period a new race descended by Alpine passes into Western and Central Lombardy. This race planted

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[43] Ibid., pp. 334-8

pile-dwellings in the lakes (what are now peat-bogs). These people were Aryans in the Aneolithic (copper and stone) stage of culture. They burned their dead. In the full Bronze Age these invaders were followed by their kinsmen from Croatia, Moravia, and Lower Austria. The kinsmen entered Italy from the northeast and established their culture in the provinces of Mantua and Brescia, and in the region of the Po. These invaders, sometimes called the Italici, were later responsible for the Villanova culture. Bologna was their headquarters during the Early Iron Age. During the Bronze Age they pressed southward, small groups settling here and there and even reaching the Gulf of Taranto. It is to these people that the foundation of Rome (about 750 B.C.) is attributed. For a long time the Aborigines continued their neolithic culture, which was, however, influenced by the culture of Aryan neighbors. The first invaders lived in pile-dwellings on the borders of the lakes north of the Po Valley, and the earliest evidences of bronze work in Italy are found in their district.

The invaders of the second wave spread over most of the Po Valley. They were responsible for the full Bronze Age culture of Northeastern Italy. Bronze finds in Southern Italy and the Island of Sicily show that these early cultures owed much to the Aegean civilization. Finally into those groups of neolithic races, the Etrurian element from the Hittite states of Asia Minor

was established in Northwestern Italy (eighth century B.C.), and soon thereafter that element forced its way into the Roman State. In their first state in Northwestern Italy the Etruscans emerged with an art distinctive from that of the later Roman. Their sculpture admitted Asiatic and Cypriote rather than Greek influence. It was primitive, conventionalized, consistent, and definitely Oriental in its affinities. The Etruscans were inventive and expert in metal work. The Chimera of Arezzo, the Pantheress, the Lion of Perugia, and numerous warrior statues testified as to their ability. They were also expert in bronze crafts such as jewelry, pottery, and furniture. Unfortunately, the later Roman chose to ignore the attributes of Etruscan art and decided instead on the realism of the classic Greek.

The countless bronzes left by the Romans testify to the Roman philosophy of life, pragmatic and realistic. Art was an expression of fine living rather than a triumph of the spirit. It was motivated by personal ambition, and reeked with luxury and display rather than character and formal sensibility. Plotinus's conception of artistic talent as something derived from the inherent reasonableness of the Divine Creator left something to be desired in that contemporary art.[44] Only after the quasi-religious beliefs of the Romans were discredited by the Christian's faith did Italian art rise again.

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[44] William R. Inge, " The Philosophy of Plotinus," Vol.II, The Gifford Lectures at St. Andrews (New York: Longmans,Green & Co.), pp. 214-17

The history of bronze art in Southwestern Asia was temporarily terminated with the advent of Christianity in order that the author might bring up to date the history of bronze art in the lands to the west. In Persia and Syria the new Christian sect was tolerated. But not until the Roman Emperor Constantine made law the Edict of Toleration (313 A.D.), did Christianity in the Western Roman Empire escape persecution and suppression. When the Emperor Constantine chose Constantinople, or Byzantium on the Bosporus, for his new capital (330 A.D.), Christianity blossomed out over the great Roman Empire. With it went the expression, mainly Oriental, or Near Eastern art. At the Council of Nicea in 325 A.D., Constantine presided over the discussion that fixed the official creed of Christianity, and thus, over official Christendom spread the ideas of imperialism, autocracy, and intolerance which were to appear in various forms later on. Out of Plato's idea of the soul as a triangle,[45] and the beliefs of the Cretans that the dove was the symbol of the mother-goddess, the Father, the Son, and the Holy Ghost were conceived. About 400 A.D. Augustine the Saint formulated the doctrine of predestination and thence forward Christians surrendered their free will to the predetermined action of God. Until the death of Justinian, the magnificence of Roman ostentation united with Eastern color and formalism to create an art superior to that of the old naturalistic and classic Roman.

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[45] John Wild, Plato's Theory of Man (Cambridge: Harvard University Press, 1946), pp. 156-7

While the religion of Islam threatened the Empire in Persia and Arabia, the ideas of intolerance supported by the official creed emerged into the open and the iconoclasts, or destroyers of images, began their suppression and their purging of art. In 717 A.D. the iconoclasts won the support of the Moslems who long believed that any representation of the Divine in human was impious. Eventually the intolerance of the iconoclasts caused a division of interests and the two centers of the Eastern and Western Empires, Byzantium and Rome, conveniently seized upon the question of "idolatrous" art to obscure their political motives. Finally, in 800 A.D., the Pope found an ally in the Emperor Charlemagne and thus the Eastern, or the henceforth Orthodox Church was separated from the Roman Church. As a consequence, representational art was again adopted by the Christian Faith (The Roman Christian Faith). In the East the iconoclasts prevailed for a century more. They at last lost their hold in 843 A.D., when representational imagery was again legalized. Thus began the Second Golden Age of Byzantine art which flourished until the invasion (in 1204) of Constantinople by the disciples of the Latin Church. The use of bronze in the arts appeared in the technique (inherited from the early Persians) of fusing colors on heated brass, or enameling. Gold, brass, and copper were used in the small portraits of sacred personages or "icons" -- portraits of strict formalization, abstraction, and convention, and conventionalism. The artificers used bronze in crosses, chalices

platters, and ornamental shields. The use of bronze (in the arts of the Eastern Church) survived the influx of Roman art seven centuries later, the influx of Byzantine art in the fourteenth and fifteenth centuries, and thereon continued to the present day.

In the Western Christian Empire (after the establishment of its independence), the Oriental principles and practices of art carried there by Christianity, and the sluggishly surviving Graeco-Roman art, met with a new disruptive element. With the arrival of barbarian invaders from the North, a fresh impulse surged throughout Italy. The conflation of these alien (really, estranged) elements introduced another trend in art, that called Romanesque. As the cultures of the Near East had a common bondage with those of the Far East, so did the culture of the barbarians stem from the same source as did the culture of the Near East. But before the reunion it is necessary to trace the early history (as it concerns bronze) of the Eurasian barbarians who migrated westward into Central and Northern Europe.

II. EARLY BRONZE CULTURE IN CENTRAL AND NORTHERN EUROPE

The early stages of the Bronze Period are represented over a very wide area, embracing practically all the high ground of Central Europe, from the East of Bohemia to the Middle Rhine and the Upper Rhone. (Scandinavia was partially isolated by the flat country of

Northern Germany. Consequently early manifestations are not so common.) Within the larger area the closest connection appears to have been between Bavaria, Austria, Upper Hungary, and Bohemia, identical bronze pins and bracelets being found from the last country as far west as the Rhine and Rhone Valleys. The earliest period of the Bronze Age in Germany is well illustrated by the many bronze discoveries, particularly those at Frankfurt, Weimar, and Würtemberg. During the Middle Bronze Age Germany was traversed by two main trade routes which owed their existence to the wealth of amber on the west coast of Denmark and the South Baltic.[46] The first trade route ran from the head of the Adriatic near Venice, through the Brenner Pass, and down the Inn where it joined the Danube. The Bohemian Forest was then crossed to Moldau, and the North Sea gained by following the Elbe to its mouth. The second route struck off from the Gulf of Trieste, thence to Gratz and down the Leitha to the Danube. The tributary March was then ascended and the route finally passed along the Oder, the Vistula, on to Danzig. In connection with the trade routes it should be mentioned that during the Middle Bronze Age the spiral, so prevalent in Aegean and Egyptian art, was seen only east of the Elbe route and in Great Britain. The spiral was probably carried to Great Britain in earlier times by still another route.

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46 Childe, op. cit., pp. 46-7, 56-7, 136, 144, 168, 213

The antiquities of the earlier period of the Bronze Age in Hungary show many indications of external influence. The later period witnessed a development of bronze industry which in splendor and artistic quality was only surpassed by the art of Scandinavia. The part of the Danube Valley which lies to the west of the great bend in the river has especially rich remains of metal. That area lay upon the path of early commerce, and the first improvements in industry and art arrived there not very long after their invention. But it was in Transylvania and on the southern slopes of the Carpathians, far from the main trade routes, that the Later Bronze civilization flourished. There in undisturbed seclusion, the more elaborate types and ornaments were developed down to and beyond the time when iron had been introduced into neighboring countries. The presence of the spiral indicates Aegean influence about 2500 B.C., (when that ornament first appeared in Minoan art). At that approximate date the inhabitants of the Danube Valley probably became acquainted with metals, either by independent invention or instruction from a more advanced civilization. Various evidences of Southern and Oriental influences seem to favor the second alternative: bronze collars with coiled ends, as known in Italy and Egypt; bronze pins of Cypriote form; and bronze axe-adzes such as were known in Crete, Greece, Cyprus, and Western Asia.[47]

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47 De Ridder, op. cit., pp. 346-9

[4] De Ridder, op. cit., pp. 345-9

Such finds confirm the antiquity of the earliest period of bronze. At that time Hungary, united by a similar bronze culture, formed one of a zone of countries stretching from Bohemia to the Middle Rhine to the Upper Rhone. The antiquities of the later Hungarian Bronze Age show many similarities to those of Scandinavia. So both groups, at one time or another, were affected by similar influences. It was possible that the Hungarian industry did not transmit the spiral and other features from south to north. There may have been an isolated local development.

During the Bronze Age the artistic faculties of the Swiss people were not highly developed. They were unable to reproduce animal forms with accuracy and vigor, and they did not advance beyond geometrical designs of simple description. They had a knowledge of metallurgy, as is shown in the finds of the crucibles, molds, ingots, and pieces of slag. They were still hunters and fishermen, living in lake-dwellings which furnished security in unsettled times. Though Switzerland is more especially associated with the lake-dwelling habitation, it was by no means unique in that respect. Remains of like character have been found all over Europe and in various parts of Asia, Africa, and America. Bronze brooches and other objects, both of Scandinavian and North Italian affinities, show that the countries to the north and south exerted some influence on the intervening territory. But it is probable

that traffic between the north and south skirted the edges of Switzerland rather than crossed that rugged country.

Situated at one extremity of the Old World, the Scandinavian countries received their culture at a comparatively late date, and in their isolation brought the arts of working stone and bronze to a high degree of perfection. Meanwhile, the more advanced nations had already entered the succeeding stage. It must, however, be born in mind that throughout the Bronze Age the amber trade brought merchants, or at least manufactured goods, from the Mediterranean. Fine bronzes of Italian origin were not uncommon in Denmark and Southern Sweden. While some authorities date the beginning of the Bronze Age in that area at 1500 B.C., others date it earlier.[48]

The extreme scarcity of pure tin and copper in the Scandinavian finds of the Bronze Age suggests that bronze was at one time imported. Apart from the obvious Italian productions, the manufacture of bronze implements and ornaments was local, and many hoards in Scandinavia show molds, jets, and broken articles ready for remelting. The art of casting bronze was practiced with great success in that part of Europe. The lost wax process was adopted for bowls, ceremonial axes, and other elaborate productions.

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[48] Childe, op. cit., p. 55
Smith, op. cit., pp. 130-1

Because the Rhone was on the highway of the early trade between the Mediterranean countries and Northwest Europe, the land to the west, France, may not have developed its bronze culture as early as did Germany and Hungary. The First Bronze Period is generally dated at 1850 B.C. and is marked by a bronze of about ten per cent tin. Bronze was used in the form of daggers, simple pins, and bracelets with tapering ends. Later periods show the use of bronze in more elaborate work. Finds indicate there was a close connection between Great Britain and the areas of Brittany and the Paris Basin in France.[49] In Britain the first copper and bronze objects have been found in round barrows. The bronze objects have often been found in association with the beakers or drinking cups (of pottery). The beaker-people were connected, according to anthropologists, with the round-headed invaders who came from several points beyond the North Sea. However, there is only one admitted beaker find in Ireland. It can be concluded, therefore, that metal came into common use after the brachycephalic population arrived.

According to historians, it is possible that between 1500 and 1200 B. C. the Phoenicians were already acquainted with the mineral fields of Britain.[50] Other sources indicate that Ireland derived its earliest bronze and copper forms from the Mediterranean by the way of Spain. Britain, being more closely affiliated with the north

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49 Cf. Reference 50, p. 56

50 Childe, op. cit., pp. 46-59

of France, was in its turn supplied to a certain extent from Italy (through the passes of the Alps and by sea to Marseilles). Anthropologic specimens indicate that West Scotland was inhabited by a Nordic race, while remains in East Scotland mark a race almost Slav in appearance (similar to those of the upper valleys of the Elbe and the Rhine).

While archeological discoveries indicate there was a Bronze Age in the Iberian Peninsula, beginning about 2000 B.C., there is little evidence that Spain and Portugal had a bronze culture as early as did the countries of the East Mediterranean. There the use of bronze was concurrent with the bronze trade that was effected over the connecting trade routes of the Mediterranean and the Northwest. Recent researches have resulted in connecting Celtic folk (Central and Western Europeans with an Indo-European name) with a group of Urnfield folk (culturally descended from the Late Bronze Age lake-dwellers of Switzerland and Savoy).[51] The Celts, along with the Illyrians from the East Adriatic coast, formed the first known culture in the Iberian Peninsula. Since the Bronze Age, the Spanish Peninsula has been the melting pot of diverse peoples.

III. LATE BRONZE CULTURE IN EUROPE

Over the whole of Northern and Central Europe the Bronze Age had a long and fruitful existence. Introduced, or invented,

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51 Cheney, op. cit., pp. 346-9

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III. EARLY HISTORIC CULTURES IN EUROPE

Over the whole of Northern and Central Europe the Bronze
Age had a long and fruitful existence. Independent, or inspired,

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[1] Childe, op. cit., pp. 196-9

or both, at a time long after bronze art was known in the East and the Near East, the Bronze Age continued undisturbed until the introduction of the Iron Age. In Southern England, for example, the Bronze Age lasted as far down as 200 B.C.

THE ROMANESQUE PERIOD

Civilization, as recognized by the Roman, did not exist in the lands north of Italy. To the Roman the peoples of the North (who still lived in a Bronze and an Iron Age) were barbarians, and as such for centuries they descended upon Italy until the Christian Faith of the newly established Western Christian Empire (800 A.D.) flung its gospel (and the Oriental principles and practices of art it had inherited) out over the furthest limits of its own dominion and the land of the invader. It was in the North, then, that the relatives of Eastern source-art met. The eloquent art of the Celt (or Kelt) and the decorative art of the Norsemen and Normans, the Vikings of Norway and Denmark, fell under the sway of the Church. Thus Romanesque art was born. It was the art of the Church — the Church which held the individual to be the vassal of God.

For three centuries the Crusades were directed against the resurgent Moslems in the Holy Land. The asceticism of the Coptic Egyptian was established in the monasteries which fathered the arts of Europe. The omnipotence of God was everywhere felt. In Burgundy French genius sprang into being; in Germany, Romanesque art was made

into something consistent, yet different from Byzantine; in England the Norman united with the resident Anglo-Saxon to produce an art of mixed interpretation; and even in Italy, art took on an inner plastic vitality. Sculpture was an integral part of the cathedral. Never before or after in Europe did the sculptor practice at one time with so many diversified materials and in so many fields; in stone, wood, and metal, in monumental composition, architectural decoration, votive statue, miniature furnishings, caskets, and ivories.

THE GOTHIC PERIOD

The Romanesque Period came to an end with the rebellion of the European individual against the framework of the Church. During the twelfth century the spirit of independence and skepticism began to question the powers of the Church at Rome, the Popes, and the priests. Although still faithful to the Christ idea behind the Church, the individual assumed a new relationship with his God. No longer was he a vassal to his God and the Church. Rather, he was a conspirer with his God. For such universality he demanded equal representation of the three estates — Church, Lords, and Commons. In his art there was realism and logic subservient to his purpose, the attainment of emotional and mental peace. His art, Gothic art, was closer than any other Western art in affinity to the purpose of Far Eastern art. Possibly the total acknowledgment of the Eastern

"appropriateness of existence" was not achieved because the awe of the Church was still felt in Gothic art.

THE RENAISSANCE

Though the Gothic style continued to pervade art for several centuries, particularly in Northern Europe, the realism and logic that were heretofore subservient to the purpose of every Gothic artist, became the purpose of the Renaissance artist. The Renaissance created great individuals who united the opposing aspects of previous European styles into a great unified expression. The Renaissance was "a state of mind reached by some individuals."[52] Humanists such as Petrarch and Boccaccio attempted to discover new moral codes in the classics. Scientific inquiry was freed from the bonds of superstition. Geographically, the Renaissance began in the South and, for the greater part, characterized the art of the fourteenth and fifteenth century Italian cities, particularly Florence; in the sixteenth the Renaissance spread to France, Germany, and England. Concurrent with the works produced by Nicola Pisano, Lorenzo Ghilberti, and Filippo Brunelleschi. For the Florentine guilds, Ghilberti made the "Gates of Paradise," the huge bronze Baptistry door depicting the story of the Old Testament in ten rectangular relief panels. In the bronze panels around the doorway of the Church San Petronio at Bologna, the sculptor Jacopo della Quercia maintained a largeness of conception and strength

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52 Stites, op. cit., p. 544

in modeling. The David by Andrea Verrochio was imbued with such a spirit of realism as to make the work sculpturally uneasy. The many bronze works of Leonardo da Vinci indicate a knowledge of anatomy and of light and shade that might better be used in painting than in sculpture, for example — the Rearing Horse. The bronze statuettes of Benvenuto Cellini, though of questionable merit, were within the current idiom. Similar in popularity and merit were the statuettes of the Frenchman Jean de Boulogne, for example -- the Flying Mercury. There was an occasional work of the Paduan School, particularly the work of Alessandro Vittoria, that had exceptional design, for example -- the Negress with a Mirror. Of unusual quality were the series of small bronze medals designed by Pisanello of Verona. But it was Michelangelo who surpassed all the Renaissance sculptors with his many statues of stone and bronze. Even today, when the subjectmatter can be ignored, Michelangelo's early works display unemcumbered abstract values and plastic vitality.

In Northern Europe the Renaissance assumed a different aspect. With the failure of the Gothic spirit during the latter half of the fifteenth century, most of the great art of Northern Europe was limited to the field of painting. Sculpture, bronze sculpture in particular, was impotent during the Northern Renaissance. In Spain, the Catholic fanaticism and the accompanying Inquisition had all but forbidden the acceptance of the Renaissance spirit. Such

was the plight of sculpture (other than Italian) at the beginning of the seventeenth century.

THE BAROQUE PERIOD

Throughout Europe the advance of skepticism, accompanied by the breakdown of the authoritarian ethics offered by the Church, carried Renaissance realism and logic into the realm of semi-religious philosophy. Enlightened as Francis Bacon, Rene Descartes, Baruch Spinoza, John Locke, Immanuel Kant, and other philosophers may or may not have been, one fact is now apparent, the theories of those philosophers did not provoke great sculpture. On the other hand, due to improper digestion of the truth, the sculptors themselves may have been responsible for the failure of their art. In the field of painting and architecture there were some notable exceptions. But for the most part, sculpture was dead. At any rate, Baroque art was born. However dead sculpture may have been as an art, there was nevertheless a tremendous amount of bronze work. Bronze was turned into furniture, candalabra, jewelry, and, of course, sculpture in the round, all impeccable in technique and all equally bad. Among the multitude of baroque sculptures, the work of Lorenzo Bernini was the most famous and may well stand for all.

TWENTIETH CENTURY EXPRESSIONISM

The beginning of the twentieth century has heralded a new life for sculpture. Painting in the nineteenth century had

was the plight of sculpture (other than Italian) at the beginning of the seventeenth century.

undergone several revolutionary changes, ranging from realism, through impressionism, to modernism. With sculpture, the impotent spirit that prevailed at the beginning of the seventeenth century saw its last famous disciple in the nineteenth century sculptor Auguste Rodin. The twentieth century witnessed the overthrow of sculpture dependent on transcribed natural effects and the return of the struggle to achieve non-representational values. The bronze works of the French sculptor Aristide Malloil, the German Wilhelm Lembruck and Georg Kolbe, the Swedish Carl Milles, the English Eric Gill, Henry Moore, and Jacob Epstein (American born), the American Gaston Lachaise (French born), William Zorach, and Alexander Archipenko (from Ukrania), attest the desire of the twentieth century sculptors to become expressionists. An expressionist is one "who becomes careless as to nature in order to express at a higher degree of intensity (1) his own feelings, (2) the characteristic values of his sculptural medium, and (3) the inner as against the surface character of the model." [53]

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53 Cheney, op. cit., p. 906

CHAPTER VI

OTHER BRONZE CULTURES

I. AFRICA

With the advent of twentieth century expressionism there arose an appreciation of the art of the African Negro. In France and Germany, in particular, the fight against the prevailing academic ideals in art led some of the more radical members of the expressionist group to vaunt the virtues of Bushman sculpture. The work produced in the State of Benin gave evidence of a high degree of civilization, and it was in this testimony that various members of the expressionist group took courage. Those sculptures explained the intuitive grasp necessary to the form element in art, plastic organization, and rhythmic order; they were the work of the cosmologic artist. About the history of African Negro sculpture not much is known. The preponderance of bronze works are thought to date between 1775 A.D. and 1875 A.D. Some critics believe that the knowledge of the lost wax process of bronze casting, which in the perfection of finish the Negro has surpassed all other races, was introduced by the Portuguese in the fifteenth century. Others believe that it came to the Negro from Egypt.[54] Argument for the latter theory

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54 Ibid., pp. 852-4

appeared suddenly. The animal and floral motives common to the Far East were frequent in all art works. Sometime in the ninth century A.D., their arts began to degenerate and, in spite of recurrent empires, never again attained such high quality.

PART III: PROCESSES OF BRONZE SCULPTURE

CHAPTER VII

PREHISTORIC PROCESSES

I. SMELTING

The first miners obtained copper from weathered surface-deposits. In the case of tin, supplies were obtained from alluvial deposits by washing as with gold. Before the end of the Bronze Age, however, it is certain that even in Europe the veins of ore were followed underground by means of shafts and galleries.[56] Many of such mines have been well preserved in the Austrian Alps.

The process of smelting was comparatively simple. This was particularly true in the case of surface ores, which consisted of oxides, and silicates or carbonates -- the so-called oxidized ores. Heating with carbon (charcoal) sufficed to effect the reduction and to liberate the metallic copper. In the case of some of the copper ores which were found principally in deeper workings, a preliminary roasting was necessary to the artificial production of an oxidized ore. The reduction was quite well effected in shallow clay-lined pits (such as were used in Japan during the last century). Ignited charcoal was placed on the floor of the pit. Alternate layers of conically piled charcoal and ore were then heaped on the ignited charcoal. A blast was applied through a clay nozzle and the

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56 Childe, op. cit., p. 28

CHAPTER VII

TECHNOLOGICAL PROGRESS

I. SMELTING

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[36] Childe, op. cit., p. 28

mass was reduced in about an hour's time. The metal settled to the bottom of the hole. The slag and the unburned charcoal were raked off and the lumps of hot metal (which were on the point of solidifying) were dragged out. In Tyrol, remains of elaborate furnaces (built in hillsides) have been found.

Tin and lead were obtained by the same methods, though loss from volatilization was considerable. At first the lead ores were probably valuable for the silver they contained. To purify the precious metal the process termed cuppelation must have been applied. Simple reduction was accomplished by subjecting the silver-lead amalgam to blasts of hot air. The heat oxidized the lead and allowed the metallic silver to remain at the bottom of the furnace or crucible.

For the production of the important alloy, bronze, two processes were available. The ores of copper and tin might be smelted together, or the two metals might be fused together. The former process may have been first employed. In the true Bronze Age, however, the extant evidence points to a deliberate mixture of the two metals.[57] Another alloy used in antiquity was electrum, which consisted of approximately two parts gold to one part silver. This alloy was used in Troy, the Caucasus, Mesopotamia, and Hungary.

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57 Ibid., p. 29

Generally, the raw material from the smelters was not cast into ingots. Instead, the material from the bottom of the furnaces was broken into cakes of convenient size before the metal was permitted to harden. However, ingots were occasionally used. In Cyprus and Crete a number of ingots of copper were cast in the forms of Minoan double-axes. Sometimes these axes were stamped with a character of the Minoan script. Similar ingots were depicted among the tribute brought to Eighteenth Dynasty Pharaohs. One ingot was recently found in Sardinia. In Central Europe, as was mentioned in the history of bronze sculpture, neck-rings and torques were some of the forms in which copper was traded.

The raw metal was first melted in crucibles of clay. In Egypt those crucibles were heated over an open fire. Actual crucibles have been found in European sites also, but these crucibles exhibit the effects of heat only around their rims and interiors. Thence, it is assumed that the Europeans employed some sort of furnace. The clay crucible was placed in a hollow packed with charcoal, sticks of ignited charcoal were laid in the crucible, and the whole was covered with lumps of copper. On application of a blast of heat, the metal melted and dripped into the crucible. As a steady blast of air was needed to secure adequate heat, the smiths were forced to call on assistants. In Egypt, down to the time of the New Kingdom, human lungs provided the current of air.[58] In

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58 Ibid., p. 31

Egyptian tomb paintings, parties of youths are seen blowing through pipes. Later tomb paintings depicted leather bellows. The wind from these leather bellows was conducted through a clay nozzle and thence into the fire. Similar bellows were also common in both Europe and the Far East.

II. CASTING

Simple, flat-faced objects were cast by pouring molten metal into a form which had been previously hollowed in the ground or carved in a block of stone. Nowadays this is known as the open hearth process. Usually a more elaborate sort of mold was required. Even for daggers (except the most primitive flat type), spear-heads, and palstaves, two-piece molds must have been employed. The usual procedure incorporated two corresponding pieces of stone (generally schist or sandstone, carefully rubbed flat and smooth on one face each). On the flat face of each piece of stone was carved the negative outline of half the desired object. The combination of the two stones formed a "valve mold" whose internal hollow was the exact negative of the object to be manufactured. Of course, it was essential to secure an exact correspondence between the two valves. A stable union was sometimes ensured by doweling the two halves together, but often it was sufficient just to bind the two pieces with a lash. Ribs were sometimes cut in the back of the mold to give the thongs a better grip.

When the valves were fitted together, liquid metal was poured into the hollow through a channel especially cut in the mold. In the case of large objects, such as rapier blades, fine capillaries running from the internal hollow were cut in the mold to allow the escape of air. When large, thin plates were cast in a valve mold, similar capillaries (which radiated like veins from the inlet tube) were needed to allow the liquid metal to spread evenly. As the two valves never fitted exactly, a little of the liquid metal spread into the joint between the two faces. This appeared on the product as a thin ridge or "seam." This seam, together with the spur or "found" left by the metal remaining in the inlet channel, was usually removed by hammering and by rubbing with sand. Some traces of this seam are now found on rough or rejected metal tools. More complicated molds were needed for elaborate tools, vases, and figurines. Nevertheless, except for quite simple implements, stone or metal molds were seldom used. Instead, the "lost wax" process was employed.

The lost wax or "cire perdue" process employed during the Bronze Age was forerunner of the complicated lost wax process used today. A wax model of the desired object was first prepared. The model was then coated with a skin of creamy clay. This first coat was then enveloped in a thick, protective coat of clay. When the protective coat had dried, the whole was heated until the wax melted and ran out through the aperture left in the clay. Liquid

metal was then poured through the same channel into the internal hollow of the clay mold. When the metal had cooled, the clay mold was broken and the cast was extracted. Only a few fragments of actual molds have survived. Hence, the archeological evidence for the prehistoric use of the process is largely inferential. But one group of objects (representing the stock-in-trade of the Late Bronze Age smith) unearthed in France, included a large lump of wax.[59] Also, in Egypt and Mesopotamia there has been found textual evidence for the employment of the cire perdue process.

The lost wax process was applicable to the casting of thin objects over a core. Metal vessels could be made by modeling a lump of clay into the required shape, coating the lump with a thin layer of wax, and then eveloping the whole in a mantle of clay. A passage for drawing off the wax and pouring in the metal was left in the outer clay. In the case of objects such as vases, the clay core was broken up after casting. In other cases the clay was left in place.

With castings made by the open hearth or the valve mold methods, seams had to be trimmed by rubbing with sand and by hammering. With cutting tools and other weapons (whether cast in

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59 Ibid., p. 36

stone molds or made by the lost wax process) the edges had to be sharpened by hammering. Hammering not only served to harden the metal, but was the only method known to the ancients for producing sheet metal. While hammering could work cold copper and gold, bronze had to be brought to a red heat before hammering had much effect.

Wire, at least in Europe, was never made by "drawing."[60] Gold and bronze wire was made by alternately hammering and rolling the metal. Alternatively, a narrow ribbon of thin metal was twisted very tightly. A wire of triangular cross section was made by hammering a V-shaped grove in a metal rod. Throughout the Bronze Age rivets were used for joining pieces of metal. The rivets had, of course, to be of softer metal than the objects to be joined. In the Aegean region and in Spain, silver rivets were often employed for riveting bronze or copper daggers. In the Far East, soldering was regularly used for joining pieces of gold and silver. The Sumerians employed lead as a solder for copper. Brazing (the union of metal pieces by heating and hammering) is known to have been commonly practiced by the Sumerians and the barbarians of Continental Europe. The European employed a process of "casting on." When, for example, it was desired to weld together two tubes, the tubes were placed end to end, the joint was surrounded by a wax ring, and the wax ring was

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60 loc. cit.

50 Ibid. 411.

coated with clay. Through the lost wax process the wax ring was replaced by a metal ring and the union was accomplished. The hilts of daggers were fitted to their blades in the same manner (the hilts of wax being modeled over the blades).

CHAPTER VIII

MODERN PROCESSES

I. SANDCASTING

As metal can only be cast in a molten condition, the mold must necessarily be of some material impervious to heat. At the same time, it must be plastic enough to make a clear impression. The most common mold materials are plaster of Paris, powdered brick, and sand -- the last two materials being most frequently employed. When the model is not too complicated, the procedure of sand casting is fairly simple.

SIMPLE MOLDS

For sand casting, two iron frames (generally of rectangular shape) are required. These frames, or "flasks," are of sufficient size to easily contain the model. The upper flask has pins which fit into corresponding rings of the lower flask, thus enabling the two flasks to be placed in correct relationship with each other. The lower half of the flask is placed on a board and is rammed full of sand. (The sand is really a mixture of fine sand and loam. Pure sand being too loose to bind together, the necessary adhesive quality is supplied by the loam. The proportions of each depend on the nature of the work.) After

CHAPTER VIII

MOLDING PROCESSES

I. SAND CASTING

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being well rammed in with a mallet, the upper surface is leveled with a straight edge. Over this surface a small amount of sand is evenly sprinkled. Another board is placed upon this surface and is struck sharply and evenly with a mallet. This serves to consolidate the sand. The board is removed and again the superfluous sand is struck off with a straight edge. The model is then laid in position on the sand at a proper distance from the pouring holes. If the model is too near the pouring holes, the weight of the metal will not be sufficient to force itself into the interstices; if the model is too far away, the metal will cool on its journey. The position of the model being determined, a hollow corresponding to the depth of one-half the pattern is scooped out of the sand. The model is then coated with shellac, and, when dry, is dusted with French chalk or blacklead. (Shellac precludes the danger of sand adhering to the model. The French chalk or blacklead is merely another safeguard. The shiny surface so obtained gives a better impression in the mold, and consequently, a better casting.) The model is then pressed home in the former position in the sand. The whole surface is then dusted over with red brick dust. The superfluous brick dust is brushed away with a soft camel's-hair mop. The upper frame is then fitted into place, i.e., the pins are dropped into the corresponding rings of the lower flask.

Fine sand is carefully pressed well over the model, ensuring that all the interstices are filled. The upper flask is rammed full of sand, and is leveled off as before. A board is then placed

upon the top of the flask, and the two halves are separated. The model is removed and a channel is scooped from the cavity to the pouring hole in the flask. This channel, of course, is made in both halves of the mold. The channel is usually carried down to the base of the mold,so that the metal entering below will gradually rise and fill the mold. (When the metal enters from above there is a danger that the force of its downward rush will carry away projecting portions of the mold.) When the pour is arranged, a few vents are cut for the escape of air. Otherwise, the air might be imprisoned and subsequently cause an explosion. The face of the mold receiving the metal is dusted with meal dust or waste flour, or, for fine work, charcoal, loamstone, or rotten stone. Sometimes the smoke from a lighted torch is used. The sooty deposit so obtained gives a smooth surface. The flasks are again fitted together, the boards are replaced at the top and bottom, and the whole is securely fixed with screw clamps. The mold is then dried in properly built ovens.

As was stated before, mixtures with greater proportions of loam require more drying. The proportions of the sand and loam depend to some extent on the nature and quality of the casting to be done. If the mixture is damp with a large proportion of loam it rams more tightly into the mold and takes a better impression of the model. There is less likelihood of crumbling. On the other hand, the close, impervious nature of this metal is more likely to

cause an accident (due to the non-escape of hot air) when the metal is poured. Again, when the casting cools, it contracts slightly, and if the mold is too hard to give with the cooling metal, cracks occur in the latter. For that reason the mold is generally dried in a properly built oven. When thoroughly dry, the flask is placed in an almost vertical position and the liquid bronze (temperature between 1500 F.° and 1900° F.) is poured in from the crucible. The fore-cited brief description explains the process of casting simple objects which are not "undercut" and which "draw" easily from the mold.

COMPLICATED MOLDS

When the model is undercut, or in any way complicated, it is necessary to make a mold in separate pieces. This permits the model to be withdrawn without damaging the sand impression. If the impression is not left clean and true, the casting is poor. The process of casting a more complicated object is in the first part the same as in the casting of a simple object. The lower flask is prepared in the same manner, the difference being in the placing of the object in the sand. Only that surface which has no undercuts and which would not draw easily from the mold is forced into the sand of the lower flask. The mold of the upper flask is made in pieces, rather than by the simple procedure used for the lower mold. The object resting in the lower flask is dusted with French

chalk or blacklead and the surplus is blown away. Sand is carefully pressed into the hollows of the model. Again, the mold (really, piece-of-mold) is only of such extent as will allow its easy removal. This piece of the mold is built up to considerable height and strength by alternately placing and tamping sand with a mallet. The edge, or seam, of the mold is trimmed until even and smooth. The piece of mold is then lifted off and dusted with finely powdered charcoal.

After dusting, the piece is replaced in its original position, and the piece, or pieces, on the opposite side are made in exactly the same manner -- care being taken to comply with the freedom necessary for the release of the model. The upper flask is then fitted on the lower flask and filled with sand well rammed in with a mallet. The sand is leveled with a straight edge and is covered with a board. The whole is carefully reversed and the under (now upper) flask is lifted off. The two pieces are discovered lying in position in the upper flask. The model is removed and the "pour gates" and hot air vents are arranged as before (as in the casting of a simple object). The flasks are fitted together and the mold is ready for the liquid bronze. This, however, assumes the cast required is a solid one. Should a hollow cast be desired, it is necessary to make a core.

Once the hollow cast is made, a support of iron wire is needed to prevent the core from falling against the mold. (In

order to give the core material a better grip, a thin copper wire is wound tightly round the iron wire. Both are then smeared with thick paste.) The mold is opened and the pattern is removed. The iron wire is laid in position, and the front half of the mold is tightly filled with sand and loam. This causes the front half of the core to be an exact reproduction of the removed pattern. More sand (as nearly as possible of the same bulk and shape as the back portion of the pattern) is pressed on the back of the front half of the core. The lower flask (containing the mold of the back) is pressed on to this. Thus, a complete replica of the pattern is obtained. The wire passes through the center of the core. Since the center of the core fits exactly inside the mold it is impossible for the molten bronze to penetrate. It is therefore necessary to pare away the outer portion of the core to the depth of the bronze desired. The space left between the core and the outer mold, which is to be filled with metal, determines the thickness of the wall of the casting. The core is sometimes burned before paring; sometimes it is pared in the green state. The core is replaced in the mold (the core is supported at either end by the projecting wire), the flasks are fitted together, the boards are replaced above and below, and the whole is fixed with screw clamps. The mold is dried as before, and the metal is poured.

RELIEF CASTING

Relief modelings, such as portraits in low relief, may be cast in the following manner. A plaster cast is taken of the relief, is dried, and is coated with shellac. The plaster cast is brushed with blacklead, ensuring a smooth surface and facilitating easy removal from the sand. An empty flask is placed about the plaster cast. Fine sand is carefully pressed over the surface of the plaster cast. When the flask is filled, the sand is leveled with a straight edge. A board is placed on top the sand and is struck evenly with a mallet (to consolidate the mold). The mold is then turned over on its back. The cast is lifted from the mold, and the reversed replica of the relief modeling is revealed. A thin sheet of clay, even and smooth in texture, is rolled out to the thickness desired for the bronze casting. The sheet of clay is pressed gently and evenly into the reversed replica of the modeling. After dusting the clay with charcoal dust, the second flask is placed in position on the first flask and is rammed full of sand. The sand is leveled as before and the second flask is lifted away. The clay, which is carefully removed, leaves a space between the two molds later to be occupied with bronze. Grooves (ingates) are scooped from the pouring hole to the hollow. Vents to prevent the escape of air are constructed. The surface is dusted with powdered charcoal and rotten stone. When the mold has dried, its inner surfaces are smoked with a torch. After the flasks are bound together, the liquid bronze is poured.

There is another method of casting which is similar to the waste wax process. A plaster cast is made of the relief. The plaster cast is dried and coated with shellac. A coating of wax, corresponding in thickness to the bronze casting, is given the plaster cast. When thoroughly hardened, this coating of wax is removed and is molded in the sand the same way as with the preceding example.

II. LOST WAX PROCESSES

As each portion of the mold must leave the work, or "draw," without hindrance, the process of figure casting by the sand method is a very complicated one. A description is hardly necessary since this method of reproduction has now been almost entirely superseded by the lost wax, or cire perdue, process. The lost wax process is very much the same today as it was in the time of Benvenuto Cellini. A plaster cast is prepared by the modeler and from this a piece mold (or a gelatin mold) is taken. (Gelatin is better because it leaves fewer seams for the sculptor to touch up.) Molten wax is painted in successive coats over the interior face of the mold until a thickness equivalent to that desired for the metal is obtained. This wax, when melted out, is replaced by bronze. When the individual pieces of the mold are coated with the required depth of wax, they are fitted together and securely bound. The advantage of this method is that the thickness of wax may be varied so that the bronze, which

ultimately replaces the wax, is thicker where weight and strength are required, and thinner where an extended limb or other portion requires lightness. The cavity inside the wax is filled with a mixture of plaster and powdered brick (about one-third plaster to two of brick dust, or silica and brick dust mixed) in a liquid state. This is known as the core, which, if the casting is large, requires iron supports fixed inside. When the core has set, the outer mold is taken off. A wax replica of the plaster figure, supported by the core, remains. The surface of the wax is remodeled at the seams and such other places as are necessary, after which small bronze rods are inserted through the wax into the core. These rods are allowed to project somewhat beyond the figure. Their purpose is to keep the core and the outer mold in their relative positions when the wax is melted out, and being bronze (the same metal as the casting) they may later be cut off and filed level without affecting the surface.

The next stage is the arrangement of ducts for the outflow of wax, and the "ingates" through which the bronze enters the mold. The ducts are so arranged as to allow the escape of air which would otherwise become trapped, perhaps causing an explosion. For instance, molten bronze poured into the base of a figure flows down by the way of feet and legs to other sections. Eventually the flow reaches the arms, which, if free of the body, lead the bronze flow upwards, forcing the air ahead to accumulate in the fingers. The

air, failing to find an outlet, will explode the mold, or at least will cause air bubbles. Such mishaps are prevented by ducts formed by fixing rods of wax to such parts of the figure as the occasion demands. These, when melted out, leave channels for the escape of air. The ingates are also rods of wax and need very careful consideration when fixing. The bronze is sometimes carried to the bottom of the mold (outside) before it is allowed to enter the figure. Then the molten bronze gradually rises, forcing the air upwards and out through the ducts designed for such purpose. When the ducts and ingates are determined, the mold is made. A fine coating of clay, powdered brick or silica, and plaster is carefully brushed over the wax model. This coating excludes air bubbles and ensures a faithful representation of the model. The first coat is of fine texture, the succeeding coats are coarse. Sufficient coats are applied to create a good strong shell. The bronze rods remain imbedded in the core, the center portions of the rods pierce the wax, and the ends of the rods project into the shell.

The wax is then melted out. The whole is either placed in the casting pit and heated until the wax runs from the mold, or it is placed in large ovens and baked at a temperature of 1200° F. In the latter case, when the wax is melted away, the mold is removed from the oven and packed in a pit of foundry earth provided in the floor. From there on the process is the same. Both the core and

the outer shell absorb a certain amount of wax and are thereby strengthened. The mold is quickly built up with sand, care being taken to bring all the air ducts to the surface and to see that none are choked. The mold is not permitted to cool, for a cold mold chills the molten bronze as it enters and subsequently causes gaps in the casting. The bronze is then poured from the crucibles, and the molten metal runs through the gates and vents and fills the space left empty by the wax figure. The air escapes via the vents, allowing the metal to rise freely through all the spaces. When cool the mold is removed, the core raked out, and the casting is dipped in nitric acid for proper cleansing. Under no circumstances is hydrochloric acid used (for reasons given later under "Cure of Malignant Patina"). Then all projections — rods, ducts, etc. -- are sawed off and the bronze is chiseled and finished by a process known as "chasing."

III. FOUNDRY TECHNIQUE: PREPARING AND CASTING BRONZE METAL

The method of preparing or melting bronze is only secondary to its correct composition. Although the author has never participated in the actual casting of bronze he has through various studies, learned of several practices, including furnaces and appliances necessary to these practices, that contribute to satisfactory bronze casting. Among these practices is the following list of rules:

1. Cupola furnaces should never be used for any bronze castings. Cupola furnaces are those constructed of cylindrical

iron segments lined with fire brick, the lowest segment containing an entrance for the blast of air and the release of metal. There is no special charging door, the fuel and the metal being thrown together into the open top of the furnace. If coke is employed as a fuel the metal will be contaminated with sulphurous anhydride (SO_2), and the casting will be vesicular. This undesirable condition may be avoided by the use of charcoal, but with either fuel the bronze will be of uncertain composition.

2. For all sized castings the bronze should be melted in plumbago crucibles (crucibles made from lead ore). For large castings, a large capacity vessel should be provided to carry the molten metal to the mold. The bronze should be stirred with plumbago, not iron, rods.

3. The fuel used should be charcoal or specially selected coke, each free of sulphur as possible.

4. For colossal castings reverberatory furnaces must be used. In a reverberatory furnace the flame is reflected from the roof of the furnace onto the bronze. A point apt to be neglected in these furnaces is the proper mixing of the alloy. An improperly mixed alloy allows its tin properties to cling to the sides of the crucible.

5. Formation of the suboxide of copper (Cu_2O) must be prevented. This occurs during the melting of copper before the

addition of tin and other metals. Whenever suboxide of copper is formed, its reaction to tin and zinc creates practically infusible oxides, which diminish very greatly the fluidity of bronze. The formation of suboxide of copper may be prevented by the process of "poling." Before the addition of tin and other metals, the end of a pole of green wood is placed below the surface of the molten copper. The green wood gives off much gas which in turn violently agitates the copper. Every particle of copper is brought into contact with the charcoal (previously sprinkled on the surface of the molten copper), and all traces of the suboxide are removed.

6. For very large size castings, ladles should not be used. Instead, the bronze should be run into a receptacle lined with fire clay, and from this into the mold. The outflow should be regulated by means of a plug, so that considerable depth of metal is always retained in the receptacle (to prevent oxidized scums from entering the mold).

7. The blowing machines for producing the blast must be efficient, otherwise the high temperatures required for perfect fusion of the molten metals will never be obtained. Some of the makes of blowers recommended are Baker's and Root's.

8. The founders must protect themselves from the intense heat by wearing face shields, aprons, mittens, and leggings of asbestos.

In professional foundries the operations for casting colossal works follow a general pattern. The bronze is melted in a reverberatory furnace at temperatures from 1500 to 1900 degrees Fahrenheit. Charcoal or coke is used as a fuel, and the blast of air is produced by electric blowing machines. While the melting proceeds, the rest of the staff (usually five or six in number) engage in preparing the molds for the reception of the metal. This is accomplished by heating the molds to redness. (This may be done by the previously mentioned process, when the wax is melted away in specially built ovens. The ovens are prepared to bring the mold to a red heat after the release of the wax.) Then, by means of overhead cranes and pulleys, the mold is swung into position in the pit. To steady it, sand is quickly built up around the mold (the sand also aids the mold in retaining its heat). The mold is then ready for receiving the metal. The bronze, having been prepared in the meantime, is run from the reverberatory furnace, first into the receptacle lined with fire clay, and then into the ingates of the mold. The quantity of metal has been very accurately estimated and there is just enough to fill the ingates, the space left empty by the wax figure, and the air vents. The mold is allowed to stand for five or six hours before it is broken away from the casting.

A subsidiary but often necessary part of the founder's work is the repairing of any defects the castings may show on their

removal from the molds. Thus, for example, occasionally the rim or other part of a vase may be imperfect owing to the retention of air (in the mold) when the metal was poured in. In such a case, the imperfect part is carefully remodeled in wax on the defective casting, a clay mold is made over the wax in the usual way, and the wax is melted out. A quantity of metal is then poured in the clay mold; the metal is allowed to run out until the edges of the defective part have been partially melted. The outlet is then plugged with clay and the mold is allowed to fill. When the metal has solidified, the clay mold is broken away and the excess metal is filed off. Handles and ornamental appendages, which have been separately cast, are frequently attached to objects in this manner. Separate parts of complicated groups and of colossal figures are similarly united, and often this is done so skillfully that it is impossible to say whether the whole is a single casting or is composed of several pieces which have been separately cast.

Other methods of attaching separate casts are bolting and welding. Electric machines drill holes and bolt corresponding sections together, or two sections are welded together with a compressed air blow torch. In the welding method, the parts to be joined are cleaned and set end to end on fire bricks. The metal ends are washed with a borax paste and are heated white hot.

The bronze, held over the hot ends, melts and runs along the joint. After cooling, the excess bronze is filed off.

Sometimes, in order to support exceptionally large or complicated castings, or, to repair old castings, hermetically covered iron frameworks are bent to follow the inside contours of the castings. Such frameworks are also often used for mounting castings on bases.

IV. COMPOSITION OF BRONZE METAL

A Greek manuscript of the eleventh century gave the composition of the alloy bronze as one pound of copper combined with one ounce of tin. The percentage of copper in Greek bronze remains is found to vary from sixty-seven to ninety-five per cent, the remaining percentage consisting of one or more of the metals zinc, tin, lead, or silver. The word bronze in the Greek language meant red, glittering, and shining -- terms which first applied to copper.[61]

Tin added to copper produces an alloy more fusible and thus more suitable for casting. Gun-metal, a soft bronze, is composed of sixteen parts copper to one of tin, its tenacity and hardness being increased by cold rolling. Bronze of seven parts copper and one part tin is hard, brittle, and sonorous, and can be tempered to take a fine edge. Bell metal bronze varies from three to five

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61 William Walter Watts, "Composition of Bronze," Encyclopaedia Britannica, 1947 edition, IV, 240

parts of copper to one of tin. Speculum metal consists of two to two and one-half parts of copper to one of tin. French and British copper coinage consists of ninety-five per cent copper and five per cent tin and zinc. Babbitt's metal, used for machine bearings, consists of twenty-four parts of tin, eight parts of antimony, and four parts of copper. Phosphorous fluxed with bronze improves the quality of the latter, though only a trace of phosphorous is necessary. Manganese in very small quantity is combined in bronze that is used for mechanical engineering tools. Aluminum bronze, though nearly destitute of tin, offers strength, and resistance of corrosion. The tensile strength of copper is increased by the addition of silicon. Silicon bronze is often used for telegraph wires.

Statuary bronzes may have from eighty to ninety per cent copper and the rest tin, or tin with zinc and lead. Zinc is generally omitted from castings having very delicate lines of ornament. The formula popular with foundrymen in this country is bronze composed of ninety per cent copper, seven per cent tin, and three per cent zinc. Bronze of this formula is often called United States Standard Bronze (even though not officially approved by the Government). The composition of bronze metal is seldom the same in any two statues, though the matter of formula for bronze is often tradition with the individual foundry. Foundrymen are careful to obtain the purest copper possible, frequently insisting

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that the copper to be used in bronze casting have an electric conductivity of not less than ninety-eight per cent on Matthiessen's Scale.

V. PATINING METHODS

There are two quick methods of patining bronze. Each method uses acids, one on a heated surface, and the other on a cold surface. The first method consists of opening the pores by heating the surface with a blow-torch. Acid is applied with a brush, after which the surface is washed with water to prevent an over thick application of the acid. The water also serves to check the pores. The second method is more often used for large out-of-door castings. The acid is applied directly on a cold surface until the desired patina is obtained. (For receipts for patining bronze see TABLE II, page 100).[62]

VI. WAX

The ingredients and preparing of wax used in the cire perdue process is explained in TABLE III, page 102.[63]

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62 Malvina Hoffman, Sculpture Inside and Out (New York: W. W. Norton and Company, 1939), pp. 302-5

63 Ibid., p. 305

TABLE II

RECEIPTS FOR PATINING BRONZE (90% COPPER, 7% TIN, 3% ZINC)

Yellowish green:	Color is obtained by using a solution of	
	Ammonium chloride	3 1/2 lbs.
	Copper acetate.....	2 lbs.
	Water	1 gal.
Apple green:	Sodium chloride 20	oz.
	Ammonia 16	fluid oz.
	Ammonium chloride 20	oz.
	Vinegar	1 gal.
Bluish green:	Sodium thiosulphate	1 oz.
	Nitrate of iron	8 oz.
	Water	1 gal.
Antique green:	Copper sulphate 12	oz.
	Ammonium chloride	2 oz.
	Water	1 gal.
	Rinse in cold, then hot water	
Shades of brown:	Potassium sulphide	2 oz.
	Barium sulphide	4 oz.
	Ammonia	8 fluid oz.
	Water	3-5 gal.

Antique effect: Wash the bronze over with nitrate of copper. Let it dry. Add a thick coating of nitrate of copper. Stipple over with sal ammoniac and pulverized modeling clay. Add a little powdered chalk. Atomize entire surface with milk. Let this dry, and the colors will be set.

Renaissance black: Cover bronze with nitrate of copper and let it oxidize and dry a bit. Lightly heat surface over smoking straw fire until the desired color is obtained. Keep turning the bronze in smoke. Clean the surface with chloride of ammonia. Bury bronze in container of sand. Pour milk into this to soaking point every two days. After two weeks take out bronze, cover it with chalk, and rebury in the sand; pour milk in every two days for two or three weeks. Take out bronze and brush off surface.

In spite of the given exact formulas for "patination" the results rest with the individual.

TABLE III

AVERAGE INGREDIENTS OF WAX FOR BRONZE CASTINGS

1.	Pure yellow beeswax	1 lb.	
	Turpentine of Venice	4 oz.	
2.	Pure yellow beeswax	1.3	
	Pure bleached wax (white)	0.1	2 kg.
	Paraffin	0.4	
	(Colophane) resin	0.2	
3.	Pure yellow beeswax	10 g.	
	(Colophane) resin	10 g.	
	Carbonate of lime	90 g.	
	Olive oil	90 g.	

Each one of these compounds can be colored with green or red stearate or with English vermillion. Add until wax is colored to the desired shade. Melt the wax and add the coloring matter. Stir well. In order to melt and prevent the wax from burning or taking fire, use a double boiler on a very slow fire. In case a double boiler cannot be secured, a sheet of asbestos is put between the flame and the pot. The correct consistency is determined by rubbing a bit of cooled wax between fingers. The wax should have a very fine plastic quality.

VII. PRESERVATION AND RESTORATION OF ANCIENT BRONZES

Many ancient bronzes are well preserved and, beyond cleansing, call for no special treatment. Others, which have been long buried in contaminated soil or long subject to the action of impure or mineralized waters, are seriously corroded, and much of their value has been lost. They require treatment to restore, as far as possible, the original form. In many of them the corrosive action continues so that even under the best of conditions their complete destruction is only a matter of time. For such as these, treatment is imperative, and restoration is easy or difficult according to the stage to which the decomposition has advanced.

CLEANING

The Fink process reverses corrosion by electrolytic methods.[64] It reduces the oxidized copper minerals of the incrustation to metallic copper. This copper forms an incoherent slime which can be brushed away to expose the original surface of the bronze. The apparatus used is much like that employed in electroplating. The object to be treated is suspended as a cathode between insoluble anodes in an electrolyte of dilute caustic soda. A weak direct current is passed through the cell until the crust disintegrates. The object is taken

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64 Henry W. Nichols, Restoration of Ancient Bronzes and Cure of Malignant Patina (Oliver C. Farrington, editor, Museum Technique Series, No. 3; Chicago: Field Museum of Natural History, 1930), pp. 12-35

from the electrolyte and the disintegrated crust is removed with the aid of scrub brushes. The cleaned specimen must be washed thoroughly. The caustic soda from the electrolyte is persistently retained in the pores and can be removed only by prolonged washing. If the caustic soda is not removed, a carbonate of soda is formed which effloresces as a white bloom. The efflorescence may continue to form for years and during that time may damage the new surface. It is a good practice to leave the bronzes for at least twenty hours in cold running water. When the bronze is large or has an unusually porous center, it must be washed even longer. Acid cleaning is never tried except as a last resort. The method is uncertain and likely to injure the bronze.

PATINING

After washing, the bronzes are repatinated by allowing the finely divided cement copper crystals to oxidize spontaneously. At a certain stage in drying the oxidation begins suddenly, proceeds with vigor, and is completed in a few minutes. During the process of oxidation the specimen often becomes too hot to handle. This oxidation forms a patina which is sometimes sufficient, though often little better than tarnish. After washing, the patina must be strengthened. Reinforcement of the patina is secured by providing conditions which favor the slow oxidization of the large particles of cement copper. (Small particles of

copper suffer the first quick oxidization.) The conditions can be simply provided by placing the wet bronzes near a window where they will be in the direct sunlight. If necessary, they can be left there for several days. They soon acquire a dark brown coating of good thickness, texture, and color. This is true patina, which is derived from the substance of the bronze by the same natural processes as those which produced the original patina.

The best patinas are the products of the slow corrosion of the surface by atmospheric agencies. This corrosion is so slow that years pass before it attains perfection. It is probable that the best patinas owe much of their beauty to a slight impregnation by oily substances coming from handling and polishing. These oils or greases fill the pores and, though minute in quantity, affect the luster and to a lesser degree the color. There is another patina, corrosive in its nature and unattractive in appearance, which is not only undesirable, but must be eliminated whenever present. This, the malignant patina or bronze disease, will in time utterly destroy any bronze infected with it. It is due to the presence of a copper salt. Copper salt has the property of extracting oxygen (from the air) and transfering it to the solid bronze without destroying itself in the process. It has no relation to ordinary decay. There are a number of copper compounds which could possibly act in this manner, but the only proven one is chloride of copper. As this compound constantly

renews itself, the most minute quantity is theoretically capable of destroying the largest bronze. The smallest speck of it must be eliminated if the prospect of serious damage is to be avoided. There are three principle ways by which bronzes become infected with this chloride. If they remain long buried in salty soil, the salt attacks the copper and forms the objectionable compound. It may come from cleaning with hydrochloric acid. Serious infection also occurs when a plastic containing chlorides is used for restoration. Malignant patina is erratic in action. It may remain inert for years and then, for no known reason, may suddenly become active. There are three recommended methods of cure for malignant patina: (1) A small area of malignant patina may be sometimes cut away without materially mutilating the bronze. (2) The electrolytic treatment is sure, is universally applicable, and is the only known successful treatment in many cases. (3) When the malignant salts are confined to the surface, chemical treatment with silver phosphate is recommended. Treatments depending upon lacquering or impregnating may retard corrosion for a time, but will eventually fail.

PART IV: PRACTICAL PART OF THESIS

CHAPTER IX

EXPOSITION OF PRACTICAL PART OF THESIS

I. DESIGN

The motif of the practical part of the thesis was chosen for its adaptability to circumstantial settings. During the course of planning the statue the author (in this case, the sculptor) was forced to admit certain convictions which heretofore had been temporal. One conviction stemmed from the sculptor's experience with two dimensional art -- painting. With sculpture, as with painting, subjectmatter is frequently a question of sentiment. Seldom is there an occasion which, in the interest of aesthetics, demands restricted motifs. Subjectmatter is too often confused with the merits of a work. Specified motifs are the delight of the clientele who obviously view art in the light of a philosophy peculiar to themselves. It is true that the sculptor projects his own ego in his work and that such ego is novel in itself, but too often there is little or no sympathy between the sculptor and his clientele about the purpose of sculpture. Both factions are at fault if they compromise without first agreeing in philosophical intent. For the sculptor, if deprived of his spiritual freedom, can seldom do more than effect face-value fact. However, this sculptor was fortunate -- this was <u>his</u> problem. He was

CHAPTER IX

EXPOSITION OF PRACTICAL PART OF THESIS

I. INTRODUCTION

encouraged by forces and factors sympathetic to his own purpose, and thence was able to approach the problem with a free mind.

Concerning the possible setting for the proposed sculpture, the sculptor was forced to admit (in view of his conviction about subjectmatter) that the success of the problem again rested with the merits of the sculpture itself. The sculptor recognized the fact that unusual settings might have some effect in determining the size of the sculpture. But such a fact was of little consequence when the purpose of the thesis project was brought into mind "To give this work an atmosphere of reality, a site on this campus would be chosen to be adorned with a work of sculpture."[65] There was no doubt that almost any site on this campus, even if chosen by happen-chance, would demand a work of heroic size. The sculptor, already free in his choice of subjectmatter, conceived a work which he hoped would be harmonious in all its aspects. The work was to be a manifestation of the sculptor's discernment of universal reality.

Numbers of drawings and a few small models were made of the proposed work. But most of the planning existed within the finished work. The sculptor is at loss to explain why this was so, other than the fact that he felt convinced of himself. The

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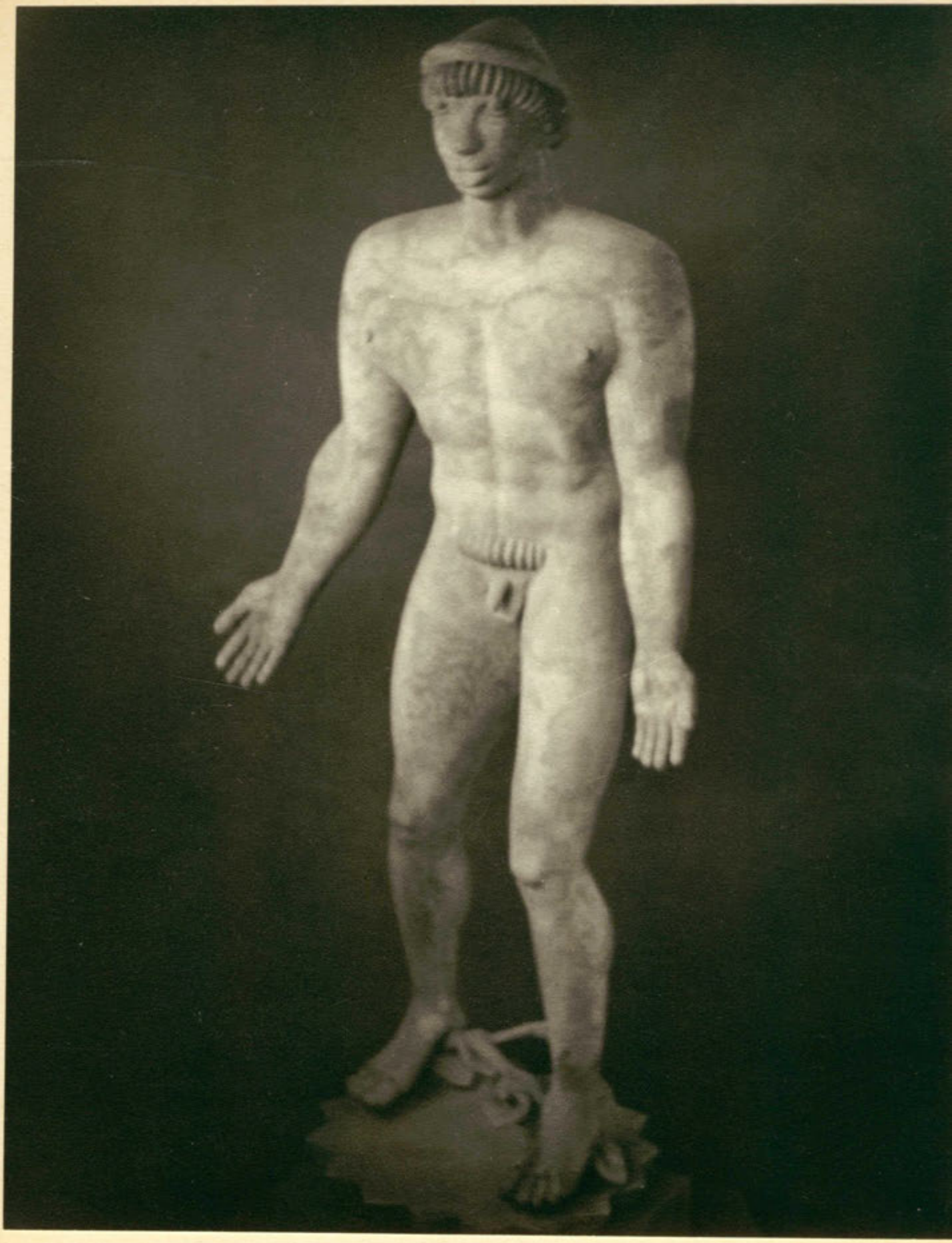
65 Cf. "Proposed Thesis"

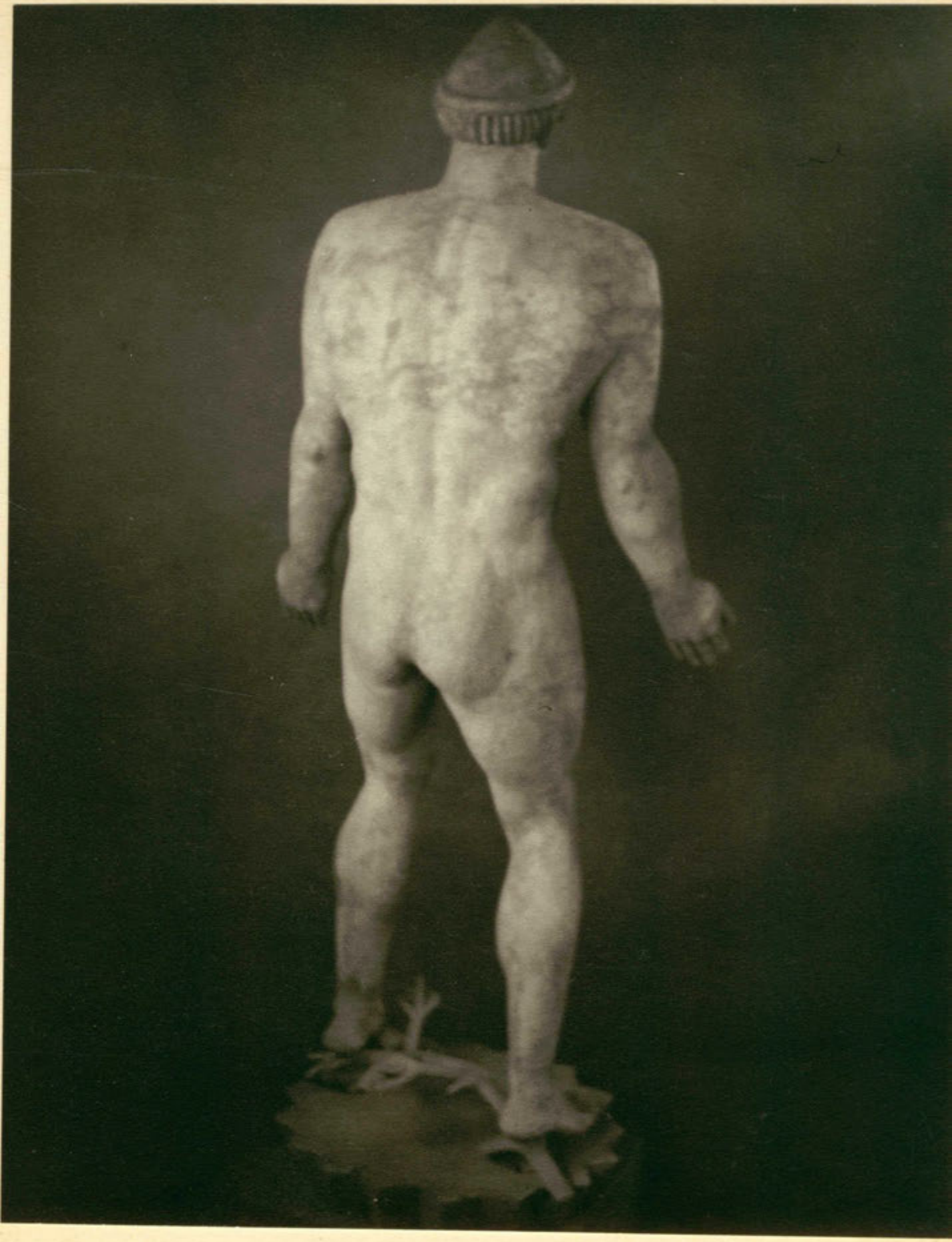
execution of the work covered an approximate period of five months. There were many occasions when the sculptor questioned his approach to the problem, as in contrast to the approach that might be made by a more experienced sculptor. Even so, it was seemingly impossible for the sculptor to "demagnetize" himself from the conviction that the answer lay within the finished work.

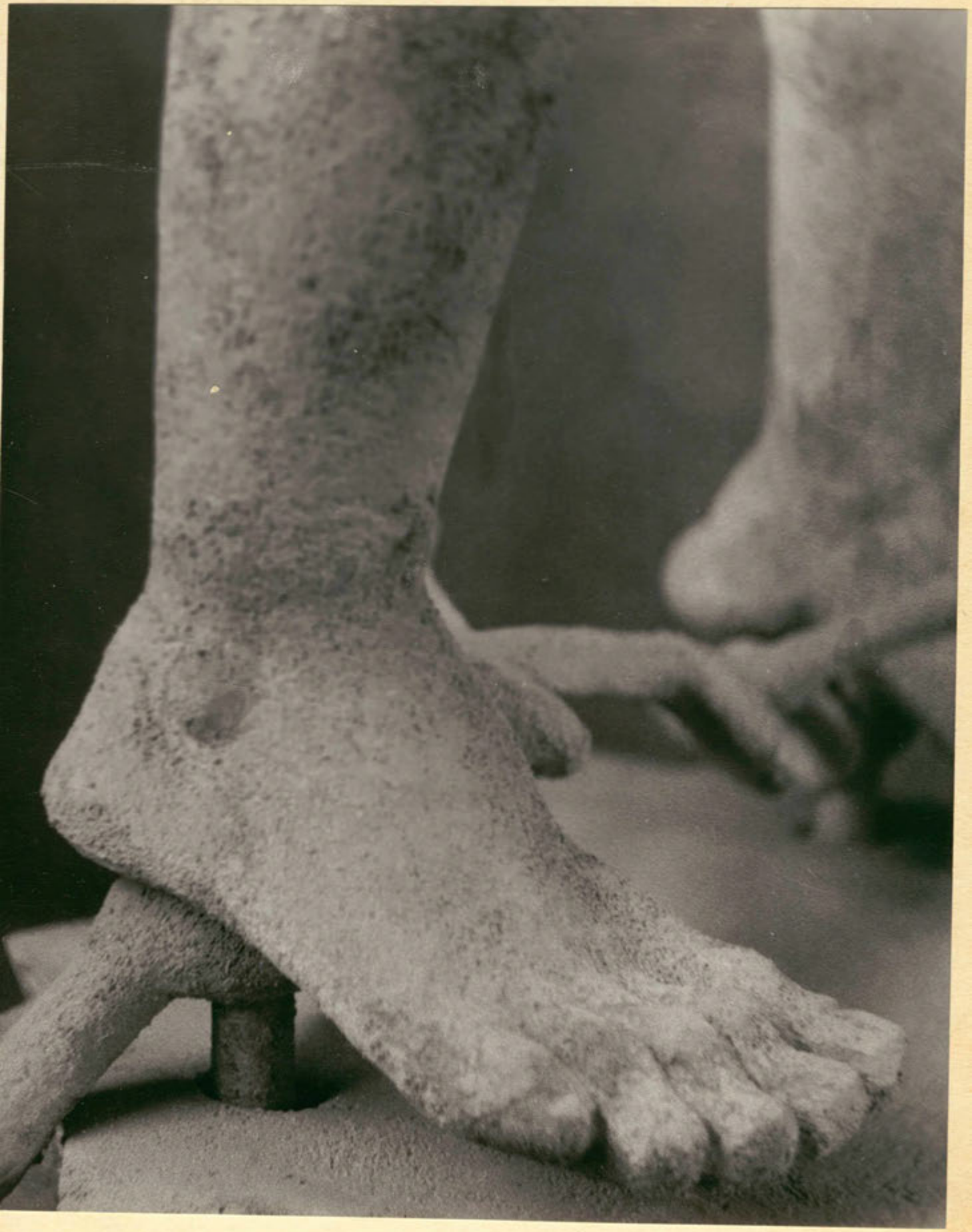
II. EXECUTION

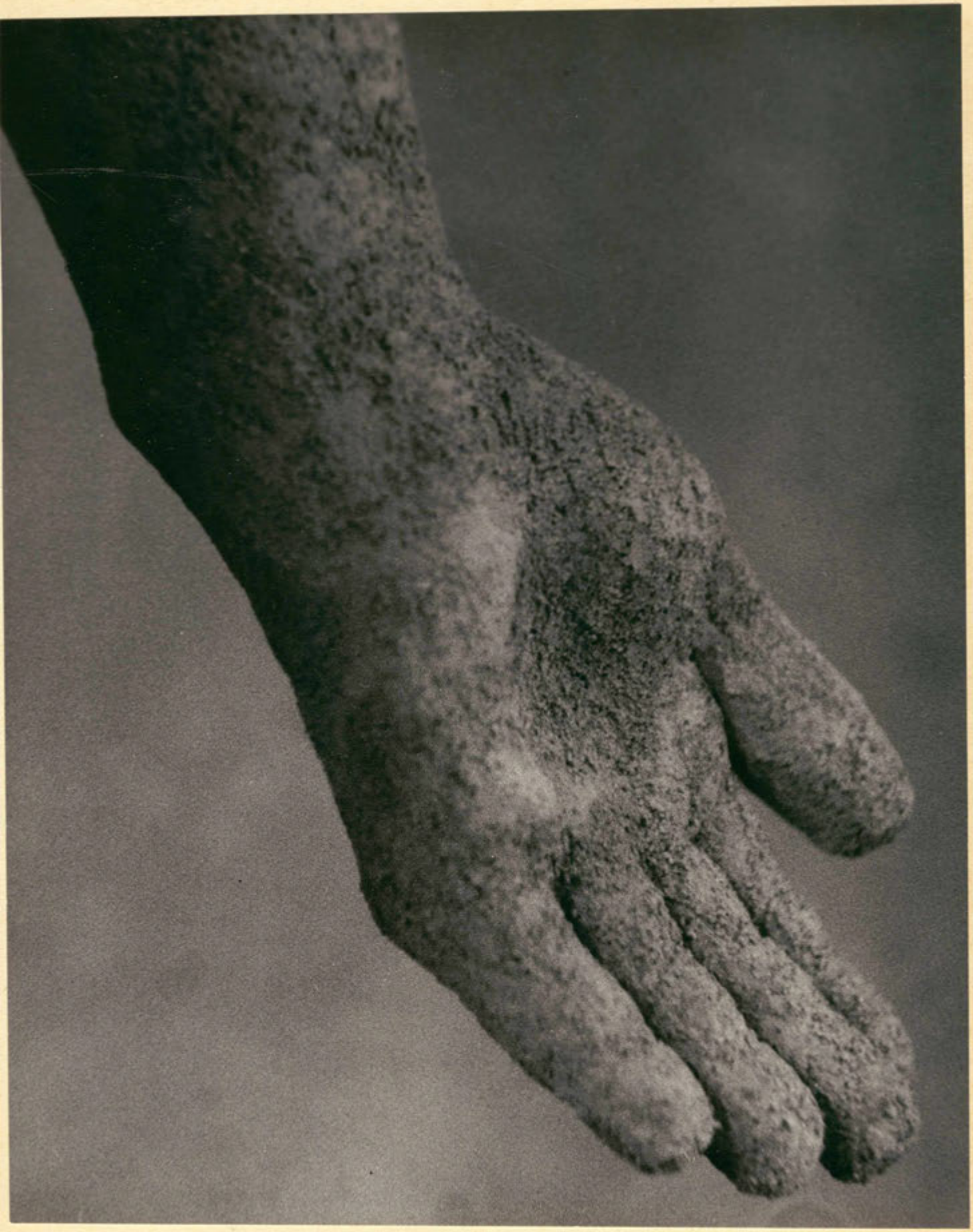
Some particulars of the work should be noted. The framework consisted of one and one-fourth inch iron pipes. Along the courses of these pipes, at six inch intervals, holes one fourth inch in diameter were drilled. The pipes were bent to the desired shape by heating with an acetylene torch. Sudden bends in the pipes were reinforced by welding. Appendages, such as arms, were united to the armature by couplings. These couplings gave the armature a certain mobility which was convenient in determining the pose of the statue. The armature was mounted on a reinforced wooden base. As the base was only of a temporary nature, flanges were screwed on the ends (at the feet) of the armature which was then bolted to the base. In the one-fourth inch holes (along the courses of the pipes) heavy wires were anchored. These wires were bent to form concentric circles whose perimeters reached within one to two inches of the three-dimensional surface of the statue.

The allowance of one to two inches offered the freedom necessary to the execution of the final surface. The concentric wires were then covered with metal lathe and the two were tied with light wire. Over the metal lathe was spread a mixture of one part graded pumice to one part gray Portland cement (mixed to a proper consistency with water). The mixture was applied in layers until the final surface was attained. A considerable amount of dead weight was avoided by the use of pumice rather than sand. The finished statue was so constructed that it would have a limited amount of freedom in relation to its base. The pipes extended through the feet for a distance of seven inches, thus direct contact with the base was avoided. The top of the statue may swing as much as four inches without breaking the more slender appendages near its base.









PART V: SUMMARY AND CONCLUSION

CHAPTER X

SUMMARY AND CONCLUSION

I. ROLE OF BRONZE IN THE HISTORY OF SCULPTURE

The Art of Bronze Sculpture includes two main facts: the role bronze has played in the world history of art; and the technique of bronze sculpture. The role bronze has played in the world history of art can be subdivided into two main phases: the development of bronze as a medium, and the history of bronze sculpture. Similarly, the technique of bronze sculpture includes two phases: the processes of bronze casting, and the execution of bronze sculpture (in this case, the execution in cement of a three-dimensional work, no less than six feet in height, made ready for the bronze foundry).

The development of bronze as a medium has been made known through the interpretation given archeological findings. Fact has been combined with surmise so that man may satisfy his curiosity about the "order" of things. The history of bronze sculpture reveals that bronze served a divided world art, viz., the philosophical intent of the Orient as opposed to that of the Occident.

The process of bronze casting explains modern man's analyses and syntheses of scientific facts which are subservient

to philosophical intent. The execution of bronze sculpture reveals the author-sculptor's assimilation of scientific facts which are subservient to his philosophical intent.

II. CONCLUSION

This brief account of the art and execution of bronze sculpture can serve only one purpose -- to reveal by innumerable degrees that which is believed real or true. Hence, the history of bronze art is apparent to the average man. The face-falue of the facts is determined by the crude and naive reports of his five senses. The average man is satisfied with the face-value of facts. In his mental poverty he refuses to go behind the actual experience. He refuses to push his inquiry into a wilderness where all familiar landmarks are lost. He will not devaluate the personal factor and thus fails to discover that there are really two types of thinking -- which might be termed the lower and the higher stages of reasoning. In the first, the power of analytic judgment is applied to the external world in an effort to distinguish what is substantially real from what is merely apparent. When this is carried as far as possible -- and not until then -- thought must critically return to itself and unhesitatingly examine its own nature. Such a task is of immense difficulty because it requires the utmost concentration of the subtlest kind. When such concentration has finally fulfilled its object, the knowledge of reality dawns -- marking the successful conclusion of thinking, not the successful abolition of thinking.

Mathematics is only a kind of shorthand whose symbols yield conclusions from given data with a quickness unknown to logic. It abbreviates syllogistic procedure by the substitution of formulae and equations. Albert Einstein's formulation of the Theory of Relativity not only summed up two thousand years of mathematical research and passed in review three hundred years of physical research, but it opened new pathways for pioneer Western thinkers. It is impossible for the physicist to contemplate the question of relativity (with the thoroughness such an important principle deserves) without rising to ultimate questions.[66] The highly mathematical character of Einstein's calculations need not frighten the student away from the hypothesis itself. Relativity has taken the unalterable fixity out of time and turned it into a variable dimension. Put in plainer language, time has no particular meaning that is always fixed and the same for all human beings. Those who would limit it to their clocks or to the revolutions of starry bodies are merely airing a prejudice. For the senses time is not an absolute actuality, but is an interpretation of both clock and star made by a conscious being. It is the way sensations arrange themselves in the mind. There is no such thing as an absolute measurement of time. Einstein's analysis reveals that all measurements based on planetary revolutions are ultimately nothing else than a relative impression. But Einstein is a mathematician and a physicist and wishes to keep strictly to his trade. Hence, he refuses to consider the further implications

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66 Brunton, op. cit., pp. 177-206

of his work, i.e., he refuses to philosophize. He will not carry his doctrine to the realms where thought runs deeper. In his abhorrence of metaphysics he has sought to confine his thought within well-defined limits of his work. But, he never could have evolved his hypothesis by mere experiment alone. To the extent that he indulged in rigorous reflection, he was unwittingly a philosopher. In the West only a few (Eddington[67] and Whitehead[68]) have ventured to follow up the consequences of carrying his doctrine to the realms of philosophical psychology and philosophical logic. Only in the Orient has the path of complete analysis been followed to its furthest extent.

The conceptual essence of Einstein's discovery was known to the vanished sages of Hindustan, and the Hindustani were not trained mathematicians. The Jaina thinkers of India formulated a similar philosophic doctrine, which resembled Relativism, more than two thousand years before Einstein formulated his scientific doctrine. The Indian was confronted with a world of relativism where all views were both false and true, where what could be affirmed from one standpoint could also be affirmed from another, where there seemed to be no final meaning. They proved it was all a matter of standpoint, of climbing sufficiently high until the summit of all possible peaks was reached.

The great mass of religions represent a projection of the

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67 Arthur Stanley Eddington, "The Theory of Relativity and Its Influence on Scientific Thought," The Romanes Lecture Series (Oxford: The Clarendon Press, 1942), pp. 3-32

68 Alfred North Whitehead, The Philosophy of Alfred North Whitehead (v. III, Paul Schilpp, ed., The Libraries of Living Philosophers, 8 v.; Chicago: Northwestern University Press, 1941), pp. 127-239

collective ego. The collective ego represents the attitudes (of any group) which correspond to the individual attitude. The ego "represents that part of the individual's awareness -- of his 'I' — which is concerned with his immediate interests, with his known private desires and motives, with his possessions, and with the selfish projections he makes on other people. In human beings, the ego represents most of what they recognize as themselves. Consciousness is what is known to the individual; unconsciousness is that which he does not know and which is true of him and exists in his personality."[69] The individual becomes aware of his consciousness and his unconsciousness and thereby believes he knows himself, that he has discovered all his purposes and even the meaning of eternal peace. He then believes that he owes a duty to his fellow man; he is unaware that the duty he has conceived is subjective. With this conviction, he possesses the supreme egoism. He sacrifices himself to impose an ideology. Thus a religion is born. Time and free-will have not been comprehended. Man has failed to own his own unconsciousness. The results of this failure are well known to the observant historian. The individual — with a little insight -- seizes the opportunity to serve mass egoisms and thence projects a religion. The rest of the story is simple. Humanity invests in the principles and practices of that religion. Such principles and practices are acknowledged by the artist, and his work

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69 Philip Wylie, An Essay on Morals (New York: The Ferris Printing Company, 1947), pp. xiv-xv

is subsequently but a reflection of the merit of his religion. It is to the credit of the Oriental mind that recognition was given that false property of the ego -- that the will is and is not, and that the question conquers him who fails to understand. The real doctrine of Buddhism acknowledged the appropriateness of existence, that meaning is not achieved by idealistic mysticism, that meaning culminates with the philosophical discernment of universal reality. This was what the author meant when he explained that "the inhabitants of the lands of the West were of common heritage with those of the East, but differed with their cousins and themselves in attitude."

Knowledge of these things clarifies the question of differences existing between the arts of the East and the West. It is seen that religion, which dominates philosophical intent, is largely responsible for the condition of the arts. Such conditions also make impossible a definition of "good" art. A line between "good" and "bad" art can be drawn only when the critic is willing to invest in a philosophy which is similar, or dissimilar, as the case may be, in purpose with the objects of art he surveys. Within those limits, the critics may quarrel over the merits of art, and even then they must guard against the projection of their own ego.

The author is wary of verbal definitions of art. To him, sculpture in itself is a manifestation of the sculptor's discernment of universal reality. That sculpture speaks for itself.

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