

WOMAN IN SCIENCE

WITH AN INTRODUCTORY CHAPTER ON WOMAN'S
LONG STRUGGLE FOR THINGS OF THE MIND

BY

H. J. MOZANS, A.M., Ph.D.

AUTHOR OF "UP THE ORINOCO AND DOWN THE
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America TO MRS. CHARLES M. SCHWAB A S A
SLIGHT TRIBUTE TO HER CHARMING
PERSONALITY GOODNESS OF HEART AND NOBILITY OF
SOUL THIS VOLUME IS RESPECTFULLY
DEDICATED WITH THE BEST WISHES OF THE AUTHOR.

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PREFACE

The following pages are the outcome of studies begun many years ago in Greece and Italy. While wandering through the famed and picturesque land of the Hellenes, rejoicing in the countless beauties of the islands of the Ionian and Ægean seas or scaling the heights of Helicon and Parnassus, all so redolent of the storied past, I saw on every side tangible evidence of that marvelous race of men and women whose matchless achievements have been the delight and inspiration of the world for nearly three thousand years. But it was especially while contemplating, from the portico of the Parthenon, the magnificent vista which there meets the charmed vision, that I first fully experienced the spell of the favored land of Hellas, so long the home of beauty and of intellect. The scene before me was indeed enchanting beyond expression; for, every ruin, every marble column, every rock had its history, and evoked the most precious memories of men of godlike thoughts and of

"A thousand glorious actions that may claim
Triumphal laurels and immortal fame."

It was a tranquil and balmy night in midsummer. The sun, leaving a gorgeous afterglow, had about an hour before disappeared behind the azure-veiled mountains of Ithaca, where, in the long ago, lived and loved the hero and the heroine of the incomparable Odyssey. The full moon, just rising above the plain of Marathon, intensified the witchery of that memorable spot consecrated by the valor of patriots battling victoriously against the invading hordes of Asia. Hard by was the Areopagus, where St. Paul preached to the "superstitious" Athenians on "The Unknown God." Almost adjoining it was the Agora, where Socrates was wont to hold converse with noble and simple on the sublimest questions which can engage the human mind. Not distant was the site of the celebrated "Painted Porch,"

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where Zeno developed his famous system of ethics. In another quarter were the shady walks of the Lyceum, where Aristotle, "the

master of those who know," lectured before an admiring concourse of students from all parts of Hellas. Farther afield, on the banks of the Cephissus, was the grove of Academus, where the divine Plato expounded that admirable idealism which, with Aristotelianism, has controlled the progress of speculative thought for more than twenty centuries, and enunciated those admirable doctrines which have become the common heritage of humanity.

But where, in this venerable city—"the eye of Greece, mother of arts and eloquence"—was the abode of Aspasia, the wife of Pericles and the inspirer of the noblest minds of the Golden Age of Grecian civilization? Where was that salon, renowned these four and twenty centuries as the most brilliant court of culture the world has ever known, wherein this gifted and accomplished daughter of Miletus gathered about her the most learned men and women of her time? Whatever the location, there it was that the wit and talent of Attica found a congenial trysting-place, and human genius burst into fairest blossom. There it was that poets, sculptors, painters, orators, philosophers, statesmen were all equally at home. There Socrates discoursed on philosophy; there Euripides and Sophocles read their plays; there Anaxagoras dilated upon the nature and constitution of the universe; there Phidias, the greatest sculptor of all time, and Ictinus and Callicrates unfolded their plans for that supreme creation of architecture, the temple of Athena Parthenos on the Acropolis. Like Michaelangelo, long centuries afterwards, who "saw with the eyes and acted by the inspiration" of Vittoria Colonna, these masters of Greek architecture and sculpture saw with the eyes and acted by the sublime promptings of Aspasia, who was the greatest patron and inspirer of men of genius the world has ever known.

I felt then, as I feel now, that this superb monument to the virgin goddess of wisdom and art and science was in great measure a monument to the one who by her quick intelligence, her profound knowledge, her inspiration, her patronage, her influence, had so

much to do with its erection—the wise, the cultured, the richly dowered Aspasia.

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This thought it was that started the train of reflections on the intellectual achievements of women which eventually gave rise to the idea of writing a book on woman's work in things of the mind.

The following day, as I was entering the University of Athens, I noticed above the stately portal a large and beautiful painting which, on inspection, proved, to my great delight, to be nothing less than a pictorial representation of my musings the night before on the portico of the Parthenon. For there was Aspasia, just as I had fancied her in her salon, seated beside Pericles, and surrounded by the greatest and the wisest men of Greece. "This," I exclaimed, "shall be the frontispiece of my book; it will tell more than many pages of text." Nor did I rest till I had procured a copy of this excellent work of art.

Shortly after my journey through Greece I visited the chief cities and towns of Italy. I traversed the whole of Magna Græcia and, to enjoy the local color of things Grecian and breathe, as far as might be, the atmosphere which once enveloped the world's greatest thinkers, I stood on the spot in Syracuse where Plato discoursed on the true, the beautiful and the good, before enthusiastic audiences of men and women, and wandered through the land inhabited by the ancient Bruttii, where Pythagoras has his famous school of science and philosophy—a school which was continued after the founder's death by his celebrated wife, Theano. For in Crotona, as well as in Athens, and in Alexandria in the time of Hypatia, women were teachers as well as scholars, and attained to marked distinction in every branch of intellectual activity.

As I visited, one after the other, what were once the great centers of learning and culture in Magna Græcia, the idea of writing the book aforementioned appealed to me more strongly from day to

day, but it did not assume definite form until after I had tarried for some weeks or months in each of the great university towns of Italy. And as I wended my way through the almost deserted streets of Salerno, which was for centuries one of the noblest seats of learning in Christendom, and recalled the achievements of its gifted daughters—those wonderful *mulieres Salernitanæ*, whose praises were once sounded throughout Europe, but whose names have been almost forgotten—I

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began to realize, as never before, that women of intellectual eminence have received too little credit for their contributions to the progress of knowledge, and should have a sympathetic historian of what they have achieved in the domain of learning.

But it was not until after I had visited the great university towns of Bologna, Padua and Pavia, had become more familiar with their fascinating histories and traditions, and surveyed there the scenes of the great scholastic triumphs of women as students and professors, that I fully realized the importance, if not the necessity, of such a work as I had in contemplation. For then, as when standing in silent meditation on the pronaos of the Parthenon, the past seemed to become present, and the graceful figures of those illustrious daughters of *Italia la Bella*, who have conferred such honor on both their country and on womankind throughout the world, seemed to flit before me as they returned to and from their lecture halls and laboratories, where their discourses, in flowing Latin periods, had commanded the admiration and the applause of students from every European country, from the Rock of Cashel to the Athenian Acropolis.

Only then did the magnitude and the difficulty of my self-imposed task begin to dawn upon me. I saw that it would be impossible, if I were to do justice to the subject, to compass in a single volume anything like an adequate account of the contributions of women to

the advancement of general knowledge. I accordingly resolved to restrict my theme and confine myself to an attempt to show what an important rôle women have played in the development of those branches of knowledge in which they are usually thought to have had but little part.

The subject of my book thus, by a process of elimination, narrowed its scope to woman's achievements in science. Many works in various languages had been written on what women had accomplished in art, literature, and state-craft, and there was, therefore, no special call for a new volume on any of these topics. But, with the exception of a few brief monographs in German, French and Italian, and an occasional magazine article here and there, practically nothing had been written about woman in science. The time, then, seemed opportune for entering upon a field that had thus far been almost completely

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neglected; and, although I soon discovered that the labor involved would be far greater than I had anticipated, I never lost sight of the work which had its virtual inception in the peerless sanctuary of Pallas Athena in the "City of the Violet Crown."

Duties and occupations innumerable have retarded the progress of the work. But not the least cause of delay has been the difficulty of locating the material essential to the production of a volume that would do even partial justice to the numerous topics requiring treatment. My experience, *parva componere magnis*, was not unlike that of Dr. Johnson, who tells us in the preface to his *Dictionary of the English Language*, "I saw that one inquiry only gave occasion to another, that book referred to book, that to search was not always to find, and that thus to pursue perfection was, like the first inhabitants of Arcadia, to chase the sun, which, when they reached the hill where he seemed to rest, was still beheld at the same distance from them."

Although I have endeavored to give a place in this work to all women who have achieved special distinction in science, it is not unlikely that I may have inadvertently overlooked some, particularly among those of recent years, who were deserving of mention. Should this be the case, I shall be grateful for information which will enable me to correct such oversights and render the volume, should there be a demand for more than one edition, more complete and serviceable. And, although I have striven to be as accurate as possible in all my statements, I can scarcely hope, in traversing so broad a field, to have been wholly successful. For all shortcomings, whether through omission or commission,

"Quas aut incuria fudit,
Aut humana parum cavit natura,"

I crave the reader's indulgence, and trust that the present volume will have at least the merit of stimulating some ambitious young Whewell to explore more thoroughly the interesting field that I have but partially reconnoitred, and give us ere long an adequate and comprehensive history of the achievements of woman, not only in the inductive but in all the sciences.

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Le donne son venute in eccellenza
Di ciascun'arte, ove hanno posta cura;
E qualunque all'istorie abbia avvertenza,
Ne sente ancor la fama non oscura.
What art so deep, what science so high,
But worthy women have thereto attained?
Who list in stories old to look may try,
And find my speech herein not false nor fain'd.
Ariosto, Orlando Furioso,
Canto XX, Strophe 2.
*Ad omnem igitur doctrinam ... muliebres animos natura
comparavit.*
Maria Gaetana Agnesi.

WOMAN IN SCIENCE

CHAPTER I

WOMAN'S LONG STRUGGLE FOR THINGS OF THE MIND

WOMAN AND EDUCATION IN ANCIENT GREECE

I purpose to review the progress and achievements of woman in science from her earliest efforts in ancient Greece down to the present time. I shall relate how, in every department of natural knowledge, when not inhibited by her environment, she has been

the colleague and the emulatress, if not the peer, of the most illustrious men who have contributed to the increase and diffusion of human learning. But a proper understanding of this subject seems to require some preliminary survey of the many and diverse obstacles which, in every age of the world's history, have opposed woman's advancement in general knowledge. Without such preliminary survey it is impossible to realize the intensity of her age-long struggle for freedom and justice in things of the mind or fully to appreciate the comparative liberty and advantages she now enjoys in almost every department of intellectual activity. Neither could one understand why woman's achievements in science, compared with those of men, have been so few and of so small import, especially in times past, or why it is that, as a student of nature or as an investigator in the various realms of pure and applied science, we hear so little of her before the second half of the nineteenth century.

To exhibit the nature of the difficulties woman has had to contend with in every age and in every land, in order

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to secure what we now consider her inalienable rights to things of the mind, it is not necessary to review the history of female education, or to enter into the details of her gradual progress forward and upward in the New and Old Worlds. But it is necessary that we should know what was the attitude of mankind toward woman's education during the leading epochs of the world's history and what were, until almost our own day, the opinions of men—scholars and rulers included—respecting the nature and the duties of woman and what was considered, almost by all, her proper sphere of action. Understanding the numerous and cruel handicaps which she had so long to endure, the opposition to her aspirations which she had to encounter, even during the most enlightened periods of the world's history, and that, too, from those who should have been the first to extend to her a helping hand, we

can the better appreciate the extent of her recent intellectual enfranchisement and of the value of the work she has accomplished since she has been free to exercise those God-given faculties which were so long held in restraint.

The first great bar to the mental development of woman was the assumed superiority of the male sex, the opinion, so generally accepted, that, in the scheme of creation, woman was but "an accident, an imperfection, an error of nature"; that she was either a slave conducing to man's comfort, or, at best, a companion ministering to his amusement and pleasure.

From the earliest times she was regarded as man's inferior and relegated to a subordinate position in society. She was, so it was averred, but a diminutive man—a kind of mean between the lord of creation and the rest of the animal kingdom. By some she was considered a kind of half man; by others, as was cynically asserted, she was looked upon as a *mas occasionatus*—a man marred in the making. She was, both mentally and physically, what Spencer would call a man whose evolution had been arrested,

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while man, as in the modern language of Darwin, was a woman, whose evolution had been completed.

When such views prevailed, it was inevitable that, so long as physical force was the *force majeure*, a woman should be relegated to the position of a slave or to that of "a mere glorified toy." Every man then said, in effect, if not in words, of the woman who happened to be in his power what Petruchio said of Katherine:

"I will be master of what is mine own,
She is my goods, my chattels; she is my house,
My household stuff, my field, my barn,
My horse, my ox, my ass, my everything."

Even after civilization had superseded savagery and barbarism, it

was still inevitable, so long as such views found acceptance, that woman should continue to be held in vassalage and ignorance and to suffer all the disabilities and privations of "the lesser man." She was studiously excluded from civic and social functions and compelled to pass her life in the restricted quarters of the harem or gyneceum. This was the case among the Athenians, as well as among other peoples; for, during the most brilliant period of their history, women, when not slaves or hetæraë, were considered simply child-bearers or housekeepers.^[1] A girl's education, when she received any at all, was limited to reading, writing and music, and for a knowledge of these subjects she was dependent on her mother. From her earliest years the Athenian maiden was made to realize that the great fountains of knowledge, which were always

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available for her brothers, were closed to her. Her duty was to become proficient in the use of the needle and the distaff, and, later on, to learn how to embroider, to ply the loom and make garments for herself and for the other members of her family.

Until she was seven years old, she was brought up with her brothers under the eye of her mother. During this period of childhood she had a certain amount of freedom, but, after her seventh year, she was kept in the gyneconitis—women's quarters—"under the strictest restraint, in order," as Xenophon informs us in his *Œconomicus*, "that she might see as little, hear as little and ask as few questions as possible." On rare occasions she was permitted to be a spectator at a religious procession, or to take part in certain of the choral dances that constituted so important a part in the religious ceremonies of ancient Greece. Whether in public or in private, silence was always considered an imperative duty for a woman.

But more than this. Not only was she expected to observe silence herself, but she was also expected so to conduct herself that no one

would have occasion to speak about her. Pericles, in a celebrated discourse, gave expression to the prevailing opinion regarding this phase of female excellence when, on a notable occasion, he addressed to a certain number of women the following words: "Great will be your glory in not falling short of your natural character; and greatest will be hers who is least talked of among men whether for good or for evil."^[2]

From the foregoing observations it will be seen that the

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general attitude of the Athenians toward woman was anything but favorable to her intellectual development, or to her exerting any influence beyond the limits of her own household. And what is said of the Greeks can be affirmed, with still greater emphasis, of the other nations of antiquity. Indeed, it can be safely asserted that, had they all entered into a solemn compact systematically to discredit woman's mental capacity and to repress all her noblest aspirations, they could not have succeeded more effectually than by the methods they severally adopted. In ancient Greece the condition of woman was little better than it is in India to-day under the law of Manu, where the husband, no matter how unworthy he may be, must be regarded by the wife as a god.

And yet, notwithstanding the dominant force of public opinion and the strange traditional prejudices that possessed for the majority of people all the semblance and commanding power of truth, woman was here and there able to break through the barriers that impeded her progress in her quest of knowledge and to defy the social conventions that precluded her from being seen or heard in the intellectual arena.

One of the first and most notable of Greek women to assert her independence and to emerge from the intellectual eclipse which had so long kept her sex in obscurity, was the Lesbian Sappho, who, as a lyric poet, stands, even to-day, without a superior. So

great was her renown among the ancients that she was called "The Poetess," as Homer was called "The Poet." Solon, on hearing one of her songs sung at a banquet, begged the singer to teach it to him at once that he might learn it and die. Aristotle did not hesitate to endorse a judgment that ranked her with Homer and Archilochus, while Plato, in his *Phædrus*, exalts her still higher by proclaiming her "the tenth Muse." Horace and Ovid and Catullus strove to reproduce her passionate strains and rhythmic beauty; but their efforts were

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little better than paraphrase and feeble imitation. Her features were stamped on coins, "though she was but a woman," and, after her death, altars were raised and temples erected in honor of this "flower of the Graces," of

"That mighty songstress, whose unrivaled powers
Weave for the Muse a crown of deathless flowers."

Second only to the "violet-crowned, pure, sweetly-smiling Sappho," as her rival, Alcæus, calls her, were Gorgo, Andromeda and Corinna. The last of these was the teacher of Pindar, the celebrated lyric poet, whom she defeated five times in poetic contests in Thebes.^[3] She was one of the nine lyrical muses, corresponding to "the celestial nine," who dwelt on the sacred slopes of Helicon.^[4] Telesilla and Praxilla were two others. The last named was by her countrymen ranked with Anacreon.

Scarcely inferior to Corinna were those ardent pupils of Sappho, who had flocked from the sunny isles of the Ægean

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and the laurel-crowned hills of Greece around "the fair-haired Lesbian" in her island home, which was, at the same time, a school of poetry and music. The most gifted of these were Danophila, the Pamphylian, and Erinna, whose hexameters were said by the

ancients to reveal a genius equal to that of Homer. She died at the early age of nineteen and has always excited a pathetic interest because, like so many others of her sex since her time—women and maidens of the loftiest spiritual aspirations,—she was condemned to the spindle and the distaff when she wished to devote her life to the service of the Muses. The following is her own epitaph:

"These are Erinna's songs, how sweet, though slight!
For she was but a girl of nineteen years.
Yet stronger far than what most men can write;
Had death delayed, whose fame had equaled hers?"

Never before nor since did such a wave of feminine genius pass over the fragrant valleys and vine-clad plains of Greece. Never in any other place or time shone so brilliant a galaxy of women of talent and imagination; never was there a more perfect flowering of female intelligence of the highest order. According to tradition, there appeared in the favored land of Hellas, when the entire population of the country was not equal to that of a fair-sized modern city, within the brief space of a century, no fewer than seventy-six women poets. When we remember that the Renaissance produced only about sixty female poets, though in a more extended territory and with a much larger population, and that none of them could approach the incomparable Sappho, or even many of her pupils, in the perfection of their work, we can realize the splendor of the achievements of the female intellect in the Hellenic world during the golden age of feminine poetic art.^[5]

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One would think that this phenomenal outburst of mental vigor, and especially the marvelous achievements of Sappho, Corinna and those of their pupils and followers, would have compelled the world for all subsequent time to recognize the innate power of the female mind, and perceive the wisdom—not to say justice—of according to women the same advantages for the development of their inborn gifts as were afforded to men. They had proved that,

under favorable conditions, there was essentially no difference between the male and the female intellect, and that genius knows no sex. And this they demonstrated not only in poetry, but also in philosophy and in other branches of human knowledge as well.

Among those who had especially distinguished themselves were Hipparchia, the wife of the philosopher Crates; Themista, the wife of Leon and a correspondent of Epicurus, who was pronounced "a sort of female Solon"; Perictione, a disciple of Pythagoras, who distinguished herself by her writings on *Wisdom* and *The Harmony of Woman*, and Leontium, a disciple and companion of Epicurus, who wrote a work against Theophrastus, which was pronounced by Cicero a model of style.

And was not the school of Pythagoras at Crotona continued after his death by his daughter and his wife, Theano? And did not this fact alone manifest woman's capacity for abstract thought, as effectively as the Lesbian school had demonstrated her talent for consummate verse?^[6]

But it was all to no purpose. The comparative freedom

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and advantages which Sappho, Corinna and their friends had enjoyed was soon—for some reason scarcely comprehensible by us—taken from all the women of Greece except the peculiar class known in history as *hetærae*—companions. These we should now rank among the *demimonde*, but the Greek point of view was different from ours. The *hetærae* were the friends and companions of the men who spent most of their time in public resorts, and they accompanied them to the gymnasium, to banquets, the games, to the theater and other similar assemblies from which the wives and daughters of the Athenians, during the golden age of Greece, were rigorously excluded. For so great was the seclusion in which the wives of the Greeks then lived that they never attended public spectacles and never left the house, unless accompanied by a

female slave. They were not permitted to see men except in the presence of their husbands, nor could they have a seat even at their own tables, if their husbands happened to have male guests.

It was by reason of this strict seclusion and the enforced ignorance to which they were subjected that we hear very little of the virtuous women of this period of Greek history. We have records of a few instances of filial and conjugal affection, but, outside of this, the names of the wives and daughters of even the most distinguished citizens have long since passed into oblivion. Only the hetærae attracted public notice, and only among them, during the period to which reference is now made, do we find any women who achieved distinction by their intellectual attainments, or by the influence which they exerted over those with whom they were associated.

But strange as it may appear, these extra-matrimonial connections, far from incurring the censure which they would now provoke, received the cordial recognition of both legislators and moralists, and even those who were considered the most virtuous among men openly entered

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into these relations without exposing themselves to the slightest stigma or reproach. Many of the hetærae, contrary to what is sometimes thought, were "of highly moral character, temperate, thoughtful and earnest, and were either unattached or attached to one man, and to all intents and purposes married. Even if they had two or three attachments but behaved in other respects with temperance and sobriety, such was the Greek feeling in regard to their peculiar position that they did not bring down upon themselves any censure from even the sternest of the Greek moralists."^[7]

The most famous men of Greece, married as well as unmarried, had their "companions," many of whom were as distinguished for

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