

THE INFLUENCE OF THE TECHNICAL SCIENCES
UPON GENERAL CULTURE.

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No student of the world's present state of general culture can have failed to observe the potent influence which the technical sciences of our day are exerting, nor the extent to which they have fitted us for incomparably greater achievements than were possible a few centuries ago. Be it in the field of rapid transportation, at sea or on land; be it that we tunnel mountains, that we rise into the realms of air or delve into the bowels of earth; that quick as the lightning flash we speed our brain images to the antipodes, or carry the very sounds of our voices through the length and breadth of the land; or, viewed in another way, that on one hand we subject to mechanical service the mightiest forces, while on the other we let the innermost processes of nature, actions so subtle as to escape all ordinary observation, operate for and accomplish our own ends—everywhere in modern life, all around us, about us, with us, beside us, technical science is the busy hand-maiden, the untiring companion, of whose presence we are only fully conscious when for a brief span her help is withdrawn.

But all this is well known, and even trite, and yet among the generality of educated people, and perhaps even within the narrower circle of professional men, it hardly seems to meet with the appreciation which it merits. The useful arts, scientifically developed, have not as yet been accorded a sufficiently extended and deserved recognition as a factor—aye, and more—as a powerful lever in elevating the standard of general culture. This lack of appreciation may be ascribed to the fusion of the technical sciences at certain levels with mere empirical knowledge of the arts, and conversely, to their frequently having sprung from such empiricism, and possibly also, to the fact that in their special sphere of activity these sciences abstain so largely from all ideality; that without the motive of gain, without the social ills which are still inseparable from industrial labor, they would not have found, would not attain to-day, their actual development. But interesting as this phase of the question is, it must not detain us now. Do not expect a panegyric on the technical sciences, nor a confutation of the argu-

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mients which would deny them their due acknowledgment. Both of these points are but of outward significance. Let us rather approach some of the weighty inner questions of the subject which appear to stand in need of special discussion.

In the first place: *What position do the technical sciences occupy in the active solution of the great problem of general culture?* This position has never been defined with half the precision that has marked our account of their social, political, and economic importance. A second question is: *What, in its leading features, is the general method pursued by the technical sciences in the accomplishment of their ends?* This method must underlie more or less distinctly all inventive effort, and the question is one which has excited, and will probably long continue to excite, lively interest among technists, jurists, and practical managers because of its connection with patent legislation. A third question that we may touch upon is: *What are the true ends and principles of technical education?* Investigation in this department has been very profitably forwarded by many professional bodies, but yet the subject has not ceased to furnish matter for controversy. If we consider the question here, it is because the answers to our foregoing queries may have an influential bearing upon its solution.

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To compare the civilizations of other races with our own, we must evidently disregard all those communities that stand upon the lowest steps of the social scale, those, for example, that have not yet aspired to a written language; for among such the cultivation of the sciences is not conceivable. But over and beyond these limits we soon come upon great nations that for centuries, and even millenaries, have been the possessors of an advanced degree of culture. Such are the races of Eastern and Southern Asia—the Chinese, the Japanese, the Indians, Persians, Arabians. If we regard their civilizations without prejudice, we must admit that they are in many respects of a high order, and were so, indeed, when Central Europe still lay mired in the slough of barbarism. Even then sciences and the arts blossomed among the nations of the East, nor have they ceased in their development to this day. In most exalted form did the Hindoo worship the Deity three thousand years ago; a full two thousand years ago, and Indian poets had produced their nation's *Odyssey*, the *Mahabharata*, and dramas too, in rich abundance, and among these one, the *Sakuntala*, whose delicate charm remains ever fresh as its sources which well

from the depths of the soul. Philosophy flourished, and philology, too, even to such degree that the Indian grammarian of to-day looks on an unbroken line of antecessors reaching upward to the idolized Panini. Mathematics, too, was fostered—do we not even now write our figures with Indian characters? And the industrial arts; how they flourished then, and how, in part, they flourish still in India, in Eastern Asia! And Persia; how brilliantly her poetry shone through ages! Her illustrious Firdusi, followed by her “Horace” of Shiras, Hafis, with his never aging songs, have both become endeared to us in excellent translations.* And, then, the literature of Arabia; what wealth of investigation has it not handed down to us; how profitable the cultivation of its Grecian heritage, and how it advanced astronomy, so that to this day we name half the heavens by its designations! And with what care did Arabians in Charlemagne’s time, under tolerant and enlightened rulers, foster numbers and many far profounder sciences; and did they not, indeed, anticipate our own chemists in divers essences and principles?

Where, then, is the difference in intellectual sphere which has allowed a separation between them and us? Are we not confessedly their inferiors in sundry arts? Valor is theirs, nobility and justice are priceless virtues with them, even as with us. Where do we mark the points of distinction in a purely human sense?

Or let us rather put the question otherwise, if comparison upon intellectual domain cannot solve the problem which is certainly presented. Let us ask, whence is the source of our material preponderance over them? How, for example, has it become possible that England, with a few thousands of her own troops, should rule supreme over a quarter of a milliard of the natives of India? How was it possible for her in 1857 to suppress their terrible, fanatical revolt? How has it come to pass that we Europeans, or, not to necessitate a special mention of America, settled as it has been by Europeans, that we Atlantic nations are the only ones who have girt the globe with lines of railroad and of telegraph, and furrowed the seas with powerful steamships, and that to these great achievements the other five-sixths of mankind have contributed not a jot—the same five-sixths that are for the most part socially organized and in some cases highly cultured.

In various ways an explanation, or rather a definition, of this stupendous fact has been sought.

* See “Characteristics of Persian Poetry,” *North American Review*, April, 1885.
—TRANSLATOR.

Klemm, the industrious Leipsic collector, an archæologist years before the discovery of the lake dwellings, proposed the distinction between *active* and *passive* races, and many at the present day still hold to his classification. In his conception we Atlanticists are the active races, and those others, downward to the entirely uncivilized, are the passive ones. We enact history, they endure it. This theoretic distinction, while seeming to have much in its favor, is none the less untenable. The chapters of history teach us that through long ages nations can be active, then passive, and then active again. Activity and passivity are not, therefore, inherent attributes of nations, but conditions into which and out of which they can come without essentially altering their intellectual status. But according to Klemm's view, with each of their transitions the nations altered their entire state as well. In fact, continual changes were going on, according as the adventitious fortunes of—let us say, secular—history superinduced them. This theory cannot stand the test of real experience. Europe might be subjugated, rendered passive, to-morrow by Asiatic hordes, without forfeiting those qualities which make the railroad, the steamship, and the electric telegraph her intellectual possession. The Arab might destroy the works of our technical science, as repute has it that Omar destroyed the books, without being able to reproduce, even in part, as he did, what his vandal hand had despoiled.* We must, therefore, discard Klemm's distinction, at least for all purposes of our research, as it fails to offer us any elucidation.

Some find in Christianity an efficient cause for the great difference that we have observed; but this, too, upon investigation, fails to meet the case. It is true that a considerable proportion of the discoveries and inventions which have shed their transmuting light upon our world of ideas was made in Christian countries, but by no means all. See in that brilliant galaxy the effulgence of the art of printing! Yet we know that the Chinese had invented it a thousand years before ourselves. The same is true of gunpowder, which was so potent an agent in the metamorphosis of our own civilization: Arabians used it long before the day of the Freiburg

* It is about time that we should cease from repeating the myth of Omar's destruction of the Alexandrian Library. In the first place, the capture of the city was not effected by Omar, but by his general, Amru. Further, the larger part of the library had long previously been destroyed—once, in the year 415, by a conflagration, which was fanned into flame by fanatical Cyrillians of the Academy at the time of unhappy Hypatia's murder; and earlier still, in the year 30 A.D., when the city fell into Roman hands, and when likewise a great number of the books were lost by fire.

