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(Illustrated articles are marked with an asterisk.)



## THE MONEY VALUE OF EDUCATION.

Says an English writer, whose remarks have been widely quoted in this country: "There was a time when what is generally understood as a good education had a pecuniary value of some importance both to men and women; but its day has gone by with the general spread of education. Men and women do not succeed nowadays simply by being well educated, but because they possess certain faculties which superior education may or may not have enabled them to turn to a more or less remunerative account."

If the favor with which these assertions have been received among us betokened merely a widespread scepticism in regard to what is "generally understood to be a good education," we should have no objection to make. It is only too true that the traditional culture, which the schools aim chiefly to give, rarely proves of much direct pecuniary value, even where it does not have the contrary effect of unfitting the recipient for the conflicts of productive life; but it is a grievous error to suppose, as many do, that the same holds true of what is really good education: an error that has already done much mischief, and is likely to do more, in leading the rising generation to despise instruction.

So far from having its money value lessened, education, properly so-called—that is, the fitting of the man or woman to meet the demands of modern life—has a higher value than education ever had before. There never was a time when proper culture gave a man greater power or better opportunities for gathering to himself the good things of life. It is quite another thing to say that what is commonly understood as a good education fails to prove so advantageous to its possessors. Not all knowledge is power; nor is the same knowledge equally powerful at all times. There is a wide range of culture which merely fits a man for the highest enjoyment of life, enabling him simply to be an appreciative observer of the progress of humanity and the vicissitudes of Nature. This adds value to life, but does not increase its market value; accordingly we leave it out of this account. There is again a wide range of knowledge which simply puts a man on a level with his neighbors, and therefore conveys no relative advantage, though the lack of it might prove a serious disadvantage: a range of knowledge which necessarily widens with the general spreading of education.

For instance, among illiterate people, the man who has penetrated the mystery of letters may gain thereby a signal superiority, as in mediæval Europe. The exercise of the arts of reading and writing under such circumstances brings him money: at least they may secure to him the "benefit of the clergy" in case of necessity, not, as often supposed, the unsubstantial benefit of being prayed over when condemned to death, but complete exemption from civil trial and conviction. With us, where nearly everybody reads and writes, these arts are relatively of lower value.

A few years ago a tolerable knowledge of arithmetic, with a good handwriting and some acquaintance with the art of keeping accounts, was a certain passport to profitable employment. The useful art of bookkeeping was then a mystery to the multitude, and therefore had a considerable money value in the markets. To-day, when nine boys out of every ten are more or less familiar with these elements of a business education, and too large a proportion vastly over-estimate the importance of them and expect to thrive by them alone, such knowledge gives a young man no special distinction. He will find the knowledge very useful on many occasions; but it will rarely prove to him such a certain road to fortune and fame as the business colleges would have him believe.

In like manner, the trumpery information to be had from the old style school books once had a certain money value. However useless in itself, it at least enabled the possessor to "keep school" and flatter himself that he belonged to a learned profession. Now that such knowledge is as common as common schools, its special value is gone.

Shall we say, from facts like these, that the money value of a good education is declining? Not at all; but merely that the elements of a practical money-making education have changed. Given these elements, with sufficient force to use them, and there is no end to their money value.

Of course this does not imply that the scholar of little force will always be able to compete successfully with the untaught or, more properly, self-taught man of superior native talent. An ounce of mother wit is worth a tun of learning without wit to-day as it was when the proverb was coined: nevertheless the man (whether naturally weak or strong) with proper education is sure to surpass a man of corresponding force without such education, other conditions being equal. Everything hinges, however, on what we regard as a good and proper education.

If we dignify by that term the veneering of hearsay knowledge and useless accomplishments which so often passes for culture, then it is right enough to say that "a good education" helps one very little in the battle of life. But restricting the term, as we ought, to a training calculated to make the most of the child's powers of sense and intellect, to set him on the right road to his highest development as a thinker and doer, while making him actively acquainted with the best results of human effort, especially in the department to which his life work is to be directed—then, we say, the money value of a good education is immensely greater than ever before.

To circulate unqualified condemnations of education is about the worst thing our newspapers can do. Perhaps the best is to insist continuously on a closer adaptation of school work to the needs of the times, and the encouragement of out of school work fitted to make our youth apt and skillful and intelligent as productive workers.

## PHOTO-MECHANICAL PRINTING.

There is perhaps no more inviting and fruitful field for scientific discovery and invention than in the line of photography, and but little attention to the subject is required to convince one that this field is fast yielding up its treasures to patient and successful investigation. Though the sun is as swift and reliable as time itself, it is too slow and too uncertain to command the full confidence of the artists who wish to form permanent impressions of the varied objects that now come within the scope of the photographic art. Instead of the slow method of waiting for the sun to shine, and then for it to transfer from a negative, one by one, the pictures which will continually fade by the action of light, this work can now be done by the ordinary printing press and with durable carbon printer's ink. Yet the results thus speedily reached are not like the cheap woodcuts that issue in almost fabulous numbers from the press, but have more the character of the finely cut lithographic pictures.

In 1839 Mungo Ponton, a chemist of Bristol, Eng., announced the fact that sized paper, treated with a bichromate, was subject to an alteration, by the action of light, which rendered insoluble the sizing which the paper contained. In this fact lies the germ of all the processes of which it is our purpose to speak. The following are some of the many which are modifications of this principle: Carbon printing, in which each picture is itself a sheet of gelatin of required thickness, permeated with the coloring matter, and each impression is made by the direct agency of light; photo-lithography, in which the transfer is made on stone by means of gelatin; photo-zincography, which differs from the last by using zinc instead of stone; photo-galvanography, in which a sheet of gelatin—with the parts not acted on by light swollen by water—is made to serve as a basis of electrotyping; Woodburytype, in which a sheet of gelatin—with the parts unacted on by light washed away—is used as a means of obtaining, by hydraulic pressure, a metal mold. This mold is filled for every impression with gelatin containing coloring matter, and the print is really an embossing, so to speak, of colored gelatin on the paper. From the impression on the metal—which is an alloy of zinc and antimony—these types are printed on prepared paper, by a small hand press resembling the printing press.

In 1855 M. Poitevin, a French engineer, discovered that bichromatized gelatin, acted on by light, had the properties of a lithographic stone, and might be used as such. Since the parts on which the light has acted are impervious to water, upon moistening the plate some of it will be dry, some wet; and where light partially acted, it will be part dry and part wet. Now, as oil and water repel each other, by putting grease upon this plate, it will adhere entirely to the dry parts—those which were exposed to light,—partially to those under partial light, and not at all where it took up moisture. And now, by rolling over this plate a cylinder of lithographer's ink, the plate is ready to make a lithographic print. This idea, with modifications in its mode of application, has its representatives in various processes now employed. Among these we will briefly notice only two.

Mr. Joseph Albert, court photographer of Munich, has shown great ingenuity in perfecting what is now called the Albertype process. He commenced in 1868; and after numerous experiments for fixing, to the plate on which it is spread, the film of gelatin from which the pictures are printed, the happy thought occurred to him to use the sensitive qualities of the chromic gelatin itself for a cement. He consequently used a plate of glass, spread upon it a coating of gelatin, then—while the front surface was protected by an underlayer—exposed the back or glass surface to light, which rendered it insoluble; and hence adhesive to the plate in presence of water. He hardened the sensitive surface by chrome alum, chlorine water, and other coagulating solutions; and to make it as tough and hard as possible, he spread several films one upon another, hardening each in its turn till he had made a sensitive plate so hard and durable that thousands of impressions could be printed from one plate. For printing the impression transferred under a negative, he uses a lithographic press and the ink commonly made to accompany it. After this, no washing, toning, etc., is necessary, but the picture is complete when it leaves the press. Any kind of paper and any colored ink may be used; titles, descriptions, dates, etc., can be printed at the same impression; and one negative can be stereotyped *ad infinitum*. The Photo-Plate Printing Company, of New York, and the Albertype Printing Company, of Boston, are sole proprietors of this patent.

In the heliotype process, some perfectly flat surface is first coated over with wax; upon this is then poured a hot solution of gelatin, after which bichromate of potassa is added, then burnt alum or tannin, to make the surface fine and durable. After it has hardened, the sheet is stripped off and set up in an achromatic chamber to dry. Then the wax is removed, and the sheets are ready for the reception of light under the ordinary photographic negative in the ordinary photograph printing frame. The sheet of gelatin is then forced by pressure under water upon a flat plate of metal; and when the water has been pressed out, it is ready for printing in any ordinary printing press. Several thicknesses of ink are used, and for the deepest shades a little oil is added, which will adhere only to the deeper shadows. The plate must be kept moist in printing; and if moistened with colored water or Indian ink, a picture resembling a Rembrandt or Indian ink picture can be obtained.

These two processes, with that of the Woodburytype briefly mentioned above, have lately been used with great profit and satisfaction by Mr. Alex. Agassiz and others, for representing natural history specimens, in the Illustrated Catalogues of the Museum of Comparative Zöology, Zöological Results of the Hassler Expedition, etc. The negatives of these plates were all taken by Mr. A. Lowell, as they are ordinarily made for silver prints. By each of these processes very satisfactory results were secured, as well in regard to expense and correctness of plates as in their general execution. And the prospect is cheeringly encouraging that, ere long. Natural Science will find in photography one of her most profitable allies. The expense of plates representing results of the naturalist's investigations has long been a serious hindrance to the advancement of Science; for a correct figure is often more expressive and instructive than pages of verbal description. By these methods, the cost of a quarto plate, including paper, mounting, lettering, etc., and exclusive of the negative, is only ten or fifteen cents per copy; and this is hardly more than the mere cost of lithographic press work, to say nothing of the artist's drawings on stone. The Woodburytype is a little more expensive and cumbersome than the other two, because, on account of the method of preparing the plate from which the impression is taken, it must be mounted for protection. Notwithstanding this, it will not preclude its use, for its pictures have a remarkable resemblance to good silver prints, with all their brilliancy and sharpness.

Another very important advantage those methods have over lithography is in their greater accuracy. By them the original sketches of investigators can doubtless be reproduced, and "subsequent observers will be better able to judge of what has actually been seen, and not of what has actually been added by the pencil of the artist who copies original drawings on stone." Mr. Agassiz finds it less trouble and expense to employ the carbon processes, even when it necessitates occasional visits to New York and Philadelphia, than to superintend, in the Museum itself, the lithographic plates. Again, Mr. Agassiz says: "On account of time required to complete a large number of plates, either as engravings or lithographs, it would be utterly impossible to