

"Bunsen was a striking instance of the eccentricity of genius. The stupendous egotism of genius had no existence in him. He never betrayed a feeling that he was one of those perfect productions for the sake of which the evolution of the universe had originally been set in motion. On the contrary, he gave up the whole of an ordinary man's working day to his students—his own researches being conducted in the hours that remained over—those of the early morning and of the night. He entered into his students' aspirations with his whole heart. He cared for all his students, and seemed to be as much interested with the difficulties of one who might be in the A B C of the art as with those of another who might be pursuing some original investigation. He was so helpful that what a man had accomplished in the way of unraveling a difficult question while in Bunsen's laboratory could not be taken as any indication of what he would be able to do by himself. The personal success of the men seemed to be the matter of prime importance in Bunsen's eyes. His own scientific work he seemed to rate as a fascinating amusement; but to any credit that might thence accrue, he was all but indifferent. The unanimity with which his scholars, of all ages and nationalities, were moved to affectionate veneration for him, is a conclusive sign of his extraordinary unselfishness.

"When we add to this the buoyant self-reliance of the man, his Mark-Tapley-like love of difficulties, his love of life, his fondness for travel, his interest in everything human, his delight in novels, we have a picture of moral health quite unusual. As human being, he ranks high. But intellectually he was by no means equally sane. He was afflicted with that incipient aphasia which attacks every man who habitually does his thinking otherwise than with words, as every man whose thought is not shallow must. No psychologist can peruse the works of Bunsen with a view of collecting indications of the machinery of his mind, without finding much to support the opinion that he mainly did his thinking with a piece of apparatus by him, or vividly before his imagination. Words were not used in his self-communings. The consequence was the usual one of a derangement of the cerebral organ of speech. He would give a course of lectures on calcium, for instance, and call calcium barium every time throughout the course. This defect would be considered as a sufficient reason for his dismissal from many an American college, and would have insured his being rated as a poor teacher, although, in fact, he was one of the greatest developers of scientific intelligence that ever lived. But this was the least of his intellectual faults. Because he did not think in words, his thoughts were not awakened at verbal suggestions. He could not answer verbal questions, whether oral or written. He could not have passed a decent examination in his own discoveries. But the question come in the shape of an emergency in a chemical operation, and a wealth of knowledge would be poured out; but let it be put in words, and he could not answer it. A student once asked him about a certain substance. He replied: 'I don't know anything about that substance. You will have to look up the literature.' What is called 'literature' in laboratories is, we may explain, the aggregate of record of observations on any particular question. The student hunted up the 'literature' of the substance in question, and found it to consist of a single paper, and that paper by R. W. Bunsen.

"In consequence of his inability to regard questions of scientific authorship in a very serious light, his papers contain many misstatements on those matters, and his judgment about them was easily warped. He is the only author we know of who shows an entirely honest and unaffected liability to give to others credit that really belongs to himself. The success of his own students he had at heart, and he was continually persuading himself, and trying to persuade them, that their part in researches really conducted by him was the principal part. It is after much sceptical examination of a good deal of testimony that we have reached the conclusion that he was honest in his singular renunciations. He would have the same feeling in milder degree about any other young chemist. In this way he seems to have contracted a habit of self-depreciation which he carried into cases where the altruistically interested motive was absent.

"When Dr. Becker in 1878 called attention to the paper of Berzelius describing in 1844 the researches of Bunsen in spectrum analysis, Bunsen endeavored, by an extraordinary wrench put upon the interpretation of the language of that paper, to deprive himself of all credit in the matter; and no doubt ninety-nine out of a hundred chemists (being unfamiliar with the pure line spectra) adopted the interpretation without reflection, simply because it was his own. But whoever will go to the trouble of making the necessary experiment will find that forced interpretation is utterly inadmissible; and the only possible interpretation is the natural one. In this case, the question is whether the credit for the first origination of spectrum analysis is to go to Bunsen or to Stokes, who, in any case, worked quite independently, and who (even without this credit) is one of the very few men of science of our time who would, in the judgment of most physicists outrank Bunsen."

#### LIQUEFIED CO<sub>2</sub> AS A FIRE EXTINGUISHER.\*

It frequently happens that fires occur in enclosed places which are difficult to approach and which are supplied with abundant fuel, such as coal mines, for example. Mr. Spencer has taken this case and advocates the use of a gas which will not support combustion—carbon dioxide, for example—and describes its successful application to a mine fire within his own experience. Six cylinders of gas were sufficient to check combustion. He gives the following interesting information upon the subject:

Liquefied carbon dioxide is supplied in drawn-steel cylinders of three sizes, containing 20, 30 and 36 pounds. The gas is collected from the fermentation vats of breweries, and liquefied by means of pressure assisted by low temperature. The writer found the 30-pound size convenient for use, but the smaller size would be found more suitable for application in confined places. That size, when empty, weighs about 90 pounds, and measures 43 inches in height by 7 inches in diameter. The bottom is made concave, like an ordinary bottle, and the top is drawn to a neck, in which a screw-plug is fitted. A detached coupling is supplied to screw to the neck, by means of which the screw-plug is turned on or off, and the escape of gas regulated.

The pressure of gas in the cylinders varies according to the temperature. If, for instance, the cylinder and its contents have a temperature of 32 degrees F., the corresponding pressure will be 509 pounds per square inch; with 50 degrees, the corresponding pressure is 664 pounds per square inch; at 68 degrees, 849 pounds, and at 86 degrees, 1,065 pounds.

One pound of the liquid will produce 8 cubic feet of carbon dioxide at atmospheric pressure and temperature. The temperature of the escaping gas is, however, much below freezing point, which is a great advantage in cooling down the heated mass after extinction. Any number of cylinders may be connected to a main pipe, to give a continuous flow or a large quantity. The writer has connected six cylinders at one time to a 2-inch pipe, with 3/4-inch branches placed at intervals of 1 foot. The cylinders may be placed upright and connected to the 3/4-inch branches by short pieces of flexible tube, and from the end of the main pipe a flexible tube of larger diameter may be carried to any desired point. By means of a small tap at each branch, the connection between the branch and the corresponding cylinder may be closed and another substituted as required. The whole series of cylinders, therefore, is under perfect control and a continuous flow of gas is readily maintained. The liquid carbon dioxide costs in England 4 cents per pound, delivered in quantities of not less than 300 pounds, or ten cylinders.

According to Dr. F. Clowes, air containing 15 per cent. of carbon dioxide will extinguish flame, and probably the same mixture will fail to support the combustion of the material usually met within underground fires. To extinguish a fire (whether above or below ground), all that is necessary is to keep it immersed in a bath of an extinctive mixture of the above proportions, for a length of time sufficient to allow the mass to cool down. Such a mixture may be obtained by means of liquefied carbon dioxide at a cost of 2 cents per cubic yard, exclusive of labor. It must, however, be borne in mind that in practice a large amount of carbon dioxide is given off from a burning mass, so that the figures quoted may be regarded as the maximum in estimating the cost of the process. The rate of discharge of the gas varies greatly according to the surrounding temperature. During evaporation, intense cold is produced, and the valves are partly closed by the frozen gas. To increase the rate of discharge, the cylinders are sometimes laid on their side and the liquid gas slowly discharged into the pipe.

The foregoing may be suggestive in several ways to a gas-works superintendent.

*Brightness of White Surfaces.*—In the Ann. d. Physique und Chemie, 1898, p. 1,182, P. Jenks compares a piece of white paper, when lighted with the brightness of a meter-candle (about 0.1 foot-candle) and finds that the brightness of a candle is 12,000 to 22,000 times, and the Violle unit 1,008,200 times as great as the paper. Comparing the brightness of various surfaces when lighted by the same light source, he finds the ratio to be as follows:

Bristol board.....	1
Photometer paper.....	0.698
Freshly fallen snow.....	1.05 to 1.11
Zinc oxide, with 5 per cent. gypsum.....	1.169
White lead.....	1.207
Magnesium carbonate.....	1.29

The last gives a matt surface which is equally brilliant at all illumination angles.

\* Extracts from a paper read before a recent meeting of the Federated Institute Mining Engineers, by George Spencer.

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# THE BOOKMAN

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*"I am a Bookman."*—JAMES RUSSELL LOWELL

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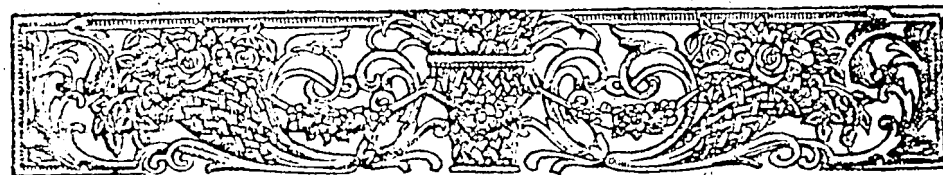
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JULY, 1900.

# THE BOOKMAN

*A Journal of Literature and Life*



## CHRONICLE AND COMMENT

Stephen Crane, whose death took place in Baden, where he had gone as a final hope the fifth of last month, was, during the last two or three years of his life, as a literary figure conspicuous not so much because of what he was then doing as on account of what he had already done and of what he might in the future do. During his last years his work showed no marked diminution of his literary powers, but to those who had intelligently followed his career it was obvious that some years must elapse before he would be ready to give the work of his maturity. Robert Barr, less than two years ago, ventured the opinion in a magazine article that Stephen Crane among all the writers before the public was the one most likely to produce the great American novel. Mr. Barr's suggestion was a happy one; because on receiving it one realised that it was a very strong possibility, and at the same time felt utterly unable even to guess what this novel's theme might be or from where would come its inspiration. Mr. Crane's later work, while excellent, was in no way remarkable, and it would be absurd to deny that a good deal of the notoriety achieved by his letters as a war correspondent was due to the fact that his style offered such delicious "copy" for the parodist.

Mr. Crane was born in Newark, New Jersey, in 1870. He was educated in Lafayette College and Syracuse University. While an undergraduate he used to spend much of his spare time in the typesetting rooms of local newspapers. It

was this atmosphere that first inspired in him the ambition to write, and when in 1892 he came to New York, it was with the idea of doing newspaper work. His first experiences were those of nine hundred and ninety out of every thousand young men of a like ambition. He tramped Park Row day after day, climbing grimy stairways, timidly approaching "city editors," until at length, when



STEPHEN CRANE.

was also a huge myth, for the prisoners seemed to have been pampered in this respect to an astounding degree. Renneville, who wrote a book denouncing the administration of the Bastille, thus describes his first meal:

The turnkey put one of my serviettes on the table and placed my dinner on it, which consisted of pea soup, garnished with lettuce, well simmered and appetising to look at, with a quarter of fowl to follow; in one dish there was a juicy beefsteak, with plenty of gravy and a sprinkling of parsley, in another a quarter of forcemeat pie, well stuffed with sweet-breads, cock's combs, asparagus, mushrooms and truffles; and in a third a ragout of sheep's tongue, the whole excellently cooked; for dessert a biscuit and two pippins. The turnkey insisted on pouring out my wine. This was good Burgundy, and the bread was excellent. I asked him to drink, but he declared it was not permitted. I asked if I should pay for my food, or whether I was indebted to the King for it. He told me that I had only to ask freely for whatever would give me pleasure, that they would try to satisfy me, and that His Majesty paid for it all.

The governor saw that the prisoners had some means of diversion. The poorest were provided with pocket money and tobacco. About the beginning of the seventeenth century a library was founded for the use of those incarcerated in the fortress. The prisoners, who lived several in one room, played at cards, chess and backgammon. In 1788 a dozen Bréton noblemen were shut up in the Bastille. They lived together, and asked for a billiard table with which to amuse themselves; and the table was given them. Finally when a detention was recognised as unjust, the victim was liberally indemnified. Thus, the notorious Latude, according to these pages a whimpering, insensate scamp, received an annuity of four hundred livres; Louis XIV. guaranteed to Pellisson at his liberation a pension of two thousand crowns; while to Voltaire when he left the Bastille a pension of twelve hundred livres was granted by the Regent.

Arthur Bartlett Maurice.

**THE SPIRITUAL LIFE.** Studies in the Science of Religion. By George A. Coe, Ph.D., John Evans Professor of Moral and Intellectual Philosophy in Northwestern University. New York: Eaton & Mains. 1900. \$1.00.

**INTRODUCTION TO ETHICS.** By Frank Thilly, Professor of Philosophy in the University of Missouri. New York: Charles Scribner's Sons. 1900. \$1.25.

The same persons will be interested in these two books, though one relates to the most practical thing in the world and the other to a question of pure theory. For Professor Thilly's book is not a treatise on Ethics. Ethics is a practical science, and is wholly

nugatory, unless it helps us to form an ideal of conduct, and to make of our lives artistic creations embodying our ideals. This work does not pretend to do that. It is only an introduction to Ethics—that is to say, it follows the discussion of the ground of right and wrong through a long succession of thinkers who have gradually unearthed the secret, showing how some have made right conduct to be that which is approved by an inborn faculty, intellectual, emotional, or perceptive; some have wished it to consist in contributing to our own pleasure or the greatest pleasure of the greatest number; some in pursuing some other definite end, objective or subjective; some in conforming to those principles which the influences of evolution have implanted in the hearts of the dominant races. The different theories are set forth and criticised. Two general types are discussed at some length. Finally, two chapters are appended upon Optimism *versus* Pessimism, and upon the Freedom of the Will. The whole makes a handy compendium of the outlines of the different opinions, without examining their niceties or entering into minutiae. Sufficient references are given. A comprehensible view is set before the reader of the entire course of development of the theory.

The doctrine that Professor Thilly himself embraces may be said, in a general way, to be that which has been accepted by the best recent authors. It may be described as a washed-out, blurred and decolourised variant of the theory so forcibly set forth in Leslie Stephen's brilliant work. It certainly affords rational explanations of many moral phenomena. How many years shall elapse before a serious flaw is detected in it we can only wait to see. No subject calls for a keener analytic razor than the general theory of ethics. Professor Thilly comes from a school not distinguished for turning out just that type of mind. His thought, like his style, is hardly screwed up to concert pitch. This is not the place to plunge into the depths of the subject; two very minute examples of what is meant must suffice. In order to find an instance to prove that conscience is sometimes regarded as the voice of God, it was hardly necessary to travel so far back as Professor Thilly's most recent case, the *dæmon* of Socrates. Nor, after all, do we find that to be a case in point. In none of the seven reported interventions of that *dæmon* did it say, like conscience, "that was wrong or right," but always, "do this" or "refrain from doing that," without giving any reason or referring, as conscience always does, to a

standard of one kind or another. The general accounts of its mode of action which Socrates is reported to have given are of the same description. It was simply the familiar phenomenon of a prompting.

On page 79 the author "must emphasise the fact that conscience is a mere general name used to designate a series of complex phenomena, and not a special faculty." But on turning the leaf, we learn that "Moral obligation is a peculiar kind of obligation, a unique mental process. We cannot describe it, we must experience it in order to understand it. . . . It is as impossible to describe obligation to a being that does not feel it as it is to talk to a blind man of colours." Is the sense of colour, then, not a special faculty? A man must have the logical audacity of a Herbart to take such ground. Since the phrase "special faculty" is used, Professor Thilly presumably attaches some definite idea to it. It is doubtless a doctrine, not an empty phrase, that he is condemning. But it is difficult to imagine what kind of a thing a special faculty would be if the sense of colour is not one. That conscience is a special faculty is a doctrine held, it would seem, by men of sufficient weight to call for Professor Thilly's emphasis in dissenting from it. But who, I should be glad to know, is the writer who makes conscience to be a special faculty in any sense in which the sense of colour is not truly such? In days when nominalism held such a monopoly of thought that it had become a little careless in its expressions, it was common enough to hear that a general term for objects of the same description was a "mere" name, whatever "mereness" may be. But to assert this of the general designation of objects so peculiar and unique that no general description could be given of them, such as "colour," would have been considered a mark of loose thought, even in those days. These are very small slips of Professor Thilly's, but the reader will find that they are characteristic.

Professor Coe is a modern psychologist, following well-approved methods, and, like dozens of his brethren throughout the country, occupied with proving scientifically things that any good observer of human nature could have told him at the outset. It is, no doubt, a satis-

faction to have them put upon a scientific footing. It is also gratifying to find ordinary observation in agreement with results that, standing alone, might not command quite so much confidence. Professor Coe finds that a considerable proportion of young fellows experience a religious awakening at an average age of sixteen or seventeen. About equal numbers report that they felt, at that time, fear of God's wrath and that they felt sorrow for sin; but in something like half the cases neither emotion was marked. He further finds that temperament is a leading factor in striking religious transformations. In twelve out of seventeen persons who expected such a transformation, and were not disappointed, sensibility predominated over intellect and will; while in nine out of twelve who expected a transformation, that did not come at all, intellect was predominant. Of seventy-seven young collegegraduates—fifty-two male, twenty-five female—twenty-six per cent. were found to have had at some time hallucinations or to have performed automatic actions; but among those of them who had undergone striking religious transformations this percentage amounted to fifty-six, while for those who had vainly sought a transformation it sank to eight. Still more striking was the contrast between the same classes in respect to susceptibility to external suggestion. I need not say which the susceptible ones were.

Another statistical inquiry of a widely different kind makes it appear that the Methodist Church places too much stress upon feeling and too little upon definite objective aims as elements of spirituality. Faith-cures form the topic of another chapter. In a third, nerve-fatigue is considered in its relation to bad temper and to other faults. All these matters are handled in a scientific spirit, with the utmost good sense and calm, and in a style calculated to make the book useful. Anecdotes are so much to the purpose in inquiries of this nature that Professor Coe is able, without ceasing for a moment to be as gravely "scientific" as befits a modern psychologist, to make his matter decidedly readable, even entertaining.

Jordan Brown.