

parts of the plate may be exposed for different periods without moving the source of light, a course which greatly simplifies the experiment.

In order to test in a rough manner whether a light shining on a plate for a unit of time produced the same effect as a light of double the intensity shining for half the unit of time, one half of a Wratten and Wainwright "extra sensitive" plate was exposed to the light of a paraffine candle shielded from currents of air at a distance of five feet for a period of forty seconds, and the other half of the plate was exposed to the light of two similar candles for a period of twenty seconds. On developing, the two halves of the plate appeared to be of about the same darkness. This experiment was repeated with different modes of development, but whether the developing process was carried so far as to cause the tints to be very dense and opaque, or whether the development was manipulated so as to give faint tints, the two halves of the plate appeared of about the same density.

In order to carry this experiment further an opaque screen was made, corresponding to the size of the photographic plates experimented with. A quarter of the screen was cut away, so that by placing the screen in front of the plate and turning it round, four successive exposures of areas touching one another could be made upon the same plate.

A Wratten and Wainwright "extra sensitive" plate was exposed in this manner to the light of a candle, protected from currents of air, so that the 1st quarter of the plate was exposed for 18 seconds to the candle at a distance of 2 feet; the 2nd quarter of the plate was exposed for 40½ seconds to the candle at a distance of 3 feet; the 3rd quarter of the plate was exposed for 72 seconds to the candle at a distance of 4 feet; the 4th quarter of the plate was exposed for 112½ seconds to the candle at a distance of 5 feet. The exposures were made with as great accuracy as possible, the driving clock of my telescope, which can be made to tick at periods of 1½ seconds, being used to measure the exposures. On developing the plate it was found that all four quarters of the plate appeared about equally opaque. It will be noticed that the durations of the exposures are inversely as the square of the distance of the source of light. Several other plates were exposed with longer and shorter periods of exposure, varying inversely as the square of the distance of the candle. The plates were always developed by being entirely immersed in the developing solutions, so that all parts would presumably be equally acted upon. In every instance the four quarters of the plate are so nearly equal in density that it is difficult to decide with certainty which is the darkest.

In one of the longer exposures, where the four quarters of the plate were exposed for 25 minutes, 9 minutes, 4 minutes, and 1 minute, at distances of 15 feet, 9 feet, 6 feet, and 3 feet, respectively, there is a slight difference of density perhaps due to the unequal burning of the candle, but the difference is so slight that a friend, to whom I showed this plate, selected the two upper quarters as being less dense than the two lower quarters, and when I removed the plate and turned it upside down, on presenting it to him a second time he again chose the two upper quarters as less dense than the two lower quarters.

These experiments seem to prove that for faint illumination, such as that derived from a candle, the following law of photographic action is either true, or so approximately true, that for all ordinary purposes the deviations from the law, if any, may be neglected.

*The photographic trace left upon a plate is directly proportional to the intensity of the light, and to the duration of the exposure.*

Having satisfied myself with regard to this law, I proceeded to apply it to testing the sensitiveness of commercial dry plates by various makers to slight differences of illumination. The plates were placed in dark slides and exposed in steps by withdrawing the shutter at intervals of seven and a half seconds, so that a narrow band across the top of the plate was exposed for seven and a half seconds; a band of similar width immediately below it was exposed for fifteen seconds; the band below this was exposed for twenty-two and a half seconds, and so on to the bottom of the plate.

On some of the commoner plates when developed only six steps can be counted. The density of the photographic action increases gradually to the bottom of the plate, but the places where the shutter has stopped cannot be recognized by any sudden change in the density after the sixth step.

I was able to count the greatest number of steps on a Wratten and Wainwright "extra sensitive" plate exposed to the light of a candle at a distance of 4 feet. On this eighteen steps could be counted with certainty, and possibly nineteen when the plate was examined against a background of clear sky.

The Wratten and Wainwright plate would not register a difference between the illumination given by 20 and 21 candles; and the difference of the density of the photographic tint produced by the illumination of 19 and 20 candles was only recognized with difficulty and doubtfully. The photographic plate is therefore much less sensitive than the eye for detecting small differences of illumination.

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[FOR THE CRITIC.]

MACAULAY AND CARLYLE.

THEIR STYLES, AS AUTHORS, COMPARED.

(Continued.)

Macaulay's sentences are, for the most part, periodic in their structure, and hence his writings are considered to be the finest specimens of this style in the English language. But in addition to his sentences being periodic, they are what are called balanced sentences. Most of his readers, however, will agree that he carries this balanced structure too far. For although this style of writing generally produces a pleasant and soothing effect, and renders the reading extremely easy, on account of the musical rhythm that is produced by

it, yet if indulged in to too great an extent, it is apt rather to weary the reader than otherwise. Now, Macaulay not only balances word against word in short clauses, but he even balances sentence against sentence, and clause against clause, and sometimes even paragraph against paragraph. Let a few examples suffice to show this marked feature in his style. He says of Tacitus:—"He tells a fine story plainly." In this sentence it may be seen that he balances one word almost against the other. Again, speaking of William the third's bearing towards Scotland, he says:—"He dared neither to refuse his assent to any English law injurious to the trade of Scotland, nor to give his assent to any Scotch law, injurious to the trade of England." And a little further on he says:—"Had there been an amalgamation of the hierarchies, there never would have been an amalgamation of the nations; successive Mitchells would have fired at successive Sharpes; five generations of Claverhouses would have butchered five generations of Camerons." In this sentence he balances one clause against the other, and it likewise affords an instance of the use of a favorite figure of speech of his, viz., the figure of Synecdoche, or using a part for the whole. But of this anon.

Now the readers of our two authors, cannot fail to observe the marked difference there is between the formation of Macaulay's and Carlyle's sentences respectively. Nor can this difference be sufficiently indicated by merely stating the fact that the sentences of the former are modeled on the periodic, and those of the latter on the loose structure. For there are other peculiarities in Carlyle's sentences, which the above technical term does not express. There is, for instance, a ruggedness, irregularity, and abruptness in his sentences, amounting at times to carelessness; for he coins words freely, he continually omits such parts of speech as the definite and indefinite articles, uses nouns sometimes for verbs over, and not unfrequently makes use of a new syntax of his own. These peculiarities caused one of his numerous critics to say, that "of his sentences, perhaps nine-tenths do not stand on their legs." In spite, however, of this ruggedness and irregularity which characterises his style, his sentences, nevertheless, seem to flow on in musical rhythm, as Macaulay's do, but with this difference, that the one represents as it were the melodious harmonies of a Mercadante, which flow on evenly and sweetly from bar to bar; whilst the other represents the bold, yet melodious harmony of a Bach or a Beethoven. This peculiar ruggedness of style is not so apparent in Carlyle's earlier essays, such, for instance, as his paper on Boswell, in volume IX of his miscellaneous, and especially his life at Schiller. This, no doubt, may be attributed to the fact that he studied them more carefully than his later writings. As an instance of this, I shall here quote two sentences taken at random, the one from his life of Schiller, the other from his history of the French Revolution. Speaking of Schiller, he says:—"His effect on the mind of his own country, has been deep, and universal, and bids fair to be abiding, his effect on other countries must in time be equally decided; for such nobleness of heart and soul shadowed forth in beautiful imperishable emblems, is a treasure which belongs, not to one nation, but to all." In his French Revolution, speaking of the Revolutionists as "Gaelic Fire," he says:—"The ready Gaelic Fire, we can remark further,—and remark not in Pichegrus only, but in innumerable Voltaires, Ricines, Laplaces, no less; for a man, whether he fight, or sing, or think, will remain the same unity of a man—is admirable for roasting eggs, in every conceivable sense." The bold manner in which the above parenthetical clauses are ruggedly placed between the principal parts of the sentence, is very remarkable.

Having thus seen more or less, how our authors stand to each other in the two great essentials of composition, viz., vocabulary, and structure of sentences, we will next consider them with regard to the embellishment of their respective styles, in other words, their use of figures of speech.

Macaulay is universally acknowledged to be a master of splendid imagery, and he enhances this power not only by painting in the most brilliant colors the scenes and events which he is describing, but also by suggesting thoughts to the mind of the reader congenial to the events thus described. I cannot explain my meaning better than by quoting one of the most renowned passages to be found amongst his writings, a passage which has been the subject of much criticism, and which, though all concur in pronouncing it to be a torrent of eloquent imagery, yet is considered to be overdone. Let each one judge for himself. In his essay on Warren Hastings, describing the appearance of Westminster Hall, and those present at the trial, he says:—"The grey old walls were hung with scarlet. The long galleries were crowded by an audience such as rarely excited the fears, or the emulation of an orator. There were gathered together from all parts of a great, free, enlightened, and prosperous empire, grace and female loveliness, wit and learning, the representatives of every science and of every art. There were seated round the Queen the fair-haired young daughters of the House of Brunswick. There the ambassadors of great kings and commonwealths gazed with admiration in a spectacle which no other country in the world could present. There Siddons, in the prime of her majestic beauty, looked with emotion on a scene surpassing all the imitations of the stage. There the historian of the Roman Empire thought of the days when Cicero pleaded the cause of Sicily against Verres, and when, before a senate which still retained some show of freedom, Tacitus thundered against the oppressor of Africa. There were seen, side by side, the greatest painter, and the greatest scholar of the age. The spectacle he had allured Reynolds from that easel which has preserved to us the thoughtful foreheads of so many writers and statesmen, and the sweet smiles of so many noble matrons. It had induced Parr to suspend his labors in that dark and profound mine from which he had extracted a vast treasure of erudition, a treasure too often buried in the earth, too often paraded with injudicious and inelegant ostentation, but still precious, massive and splendid. There appeared the voluptuous charms of her to whom the heir of the throne had in secret plighted his faith. There, too, was she, the beautiful mother of a beautiful race, the Saint Cecilia, whose delicate features, lighted up by love and music, art has rescued from the common