

—as, for instance, in the case of Bacon— attract one's attention. But space permits of no extended indication of these points.

Next to the shortening of the sentence, a decrease in predication is a striking fact in the evolution of the prose-style. While in earlier writers the per cent of simple sentences is small, it rises rhythmically to a high average in modern stylists. The following examples will illustrate:—

	Per cent Simple Sentences.		Per cent Simple Sentences.
Chaucer,	4	Shaftesbury,	27
Spenser,	11	DeQuincy,	14
Hall,	7	Macauley,	39
Sidney,	10	Channing,	31
Hooker,	12	Newman,	16
Barrow,	15	Emerson,	57
Addison,	12	Lowell,	23
Bacon,	19	Grant,	31
Bunyan,	10	Everett,	32
Bolingbroke,	13	Bartol,	45

The laws of shortening and simplifying the English prose-sentence may be derived from comparative morphological studies in styles, or better by the assistance of ontogenetic or embryological work. The latter method is called in by Dr. Sherman in the series of comparisons between the style of speech of the child and the literary styles in the phylogenetic series. The stages in either case are found to be (a) monosyllabic exclamation, (b) predication, (c) co-ordination of predications, (d) sub-ordination of some predications to others, (e) suppression of less important predications. Examples from the early lisps of childhood are brought side by side with others selected from the field of English prose and a statistical enquiry, most subtle and ingenious, is instituted into the various percentages of illative, temporal, causal interior and exterior conjunctions in different writers. The result, simple as it seems when once fairly grasped, is no less splendid an achievement of the biological method in its new application. There is in the child, as it learns to talk, a recapitulation of the phases through which the English writers of prose have passed in their development of the modern style. The record of the palæontological series tallies with that of the embryological and one can explain the changes from the earlier styles to the later by the same laws that one sees at work in the child as he learns the art of speaking and of writing.

In the discussion of poetry the same scientific method may be used, and its employment is indicated, but somewhat less fully, by Dr. Sherman. In the portion of the "Analytics of Literature," which is particularly devoted to the poetic side of English, the most notable discovery is doubtless the law of intensification, through which, when associations were few, the poetic idea demanded a whole sentence for its vehicle, as in Chaucer; but as the association value of words increases the poetic idea can be carried by clauses, as in Shakespeare, by phrases as in Keats or Shelley, and, finally, by single words, as excellently illustrated in Browning. This discovery is made the basis of a scientific analysis of different poetic styles and the results obtained while new are of the deepest value. Things before mysterious and the subjects of vatic utterance by the various critics, become suddenly transferable to the solid ground of experiment and calculation. Poetry is no longer presented to one as something to be intuitively appreciated but as an object of experience and of analysis after the ordinary methods.

On the whole, it is not possible to commend too highly this new departure in a field which has long lain in darkness, awaiting the light of science to make its laws and phenomena generally apparent. The adoption of such clear-cut, substantial, experimental foundation in rhetorical courses in colleges and schools cannot but be of the highest utility. It is evident, furthermore, that a vast untried territory is now discovered to those who wish to engage in useful research. It becomes apparent how halting and poor is former critical method when one notes what tremendous conquests of unknown facts are possible through this

single pioneer work. The study of literature—after the usual objection and oburgation from those not yet in sympathy with the unifying power of the scientific method—promises to take its place not as an art, but as a science of the biological series. Too much praise can hardly be laid upon the writer of this work which so definitely hands literary criticism over into the hands of scientifically-minded men.

#### IN REGARD TO COLOR-BLINDNESS AMONG INDIANS.

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THE fact that blindness to certain colors exists among civilized people, is well established; also the percentage of cases to be found among males has been determined with considerable probability for the races of Europe and America. There has been much diversity in methods of testing, and the results of many reported determinations might well be called in question. Still, it is probably not far from the truth that four out of every hundred males are more or less deficient in color-sense. Of females, there have been reported (B. J. Jeffries, M.D., "Color-Blindness," p. 85) as examined in Europe and America, 39,828, and of these only 60 were color-blind, or two-tenths per cent. Of both males and females, 156,732 have been tested, and of these 5,417, or 3.52 per cent, were color-blind. These statistical facts have naturally excited interest and discussion. If so large a number as four out of every hundred are unable to distinguish colors, there arises, of course, a practical question, important to the railroads, marine, etc.

The gravity of this fact is already recognized more or less in all countries, by the test-examinations for color-blindness among employés. But there is in these statistics also much of interest to scientists.

Most cases of color-blindness are found to be congenital and are incurable. Many have been produced by disease, some by violent concussions in accidents, and some by excessive use of tobacco and alcohol. Temporary blindness to violet may be induced by santonine. From these facts several interesting questions have suggested themselves to us. If color-blindness follows the laws of heredity, is it on the increase or decrease? Further, is it a product of civilization? The first of these queries can be answered only by statistical data extending over long periods of time. The second naturally suggests a comparison: first, of the color-sense of civilized nations among themselves; and second, of civilized with uncivilized peoples.

Of tests on native tribes, we can find but two recorded—those of Dr. Favre on some tribes in Algiers, and those of Dr. Fox on 150 American Indians, but where we do not know.

First, for the comparison of civilized tribes among themselves we have calculated the following percentages from tables reported by Dr. Jeffries:—

Countries.	No. Examined.	Per Cent Color- Blind.
Austria	5,250	3.79
Denmark	5,840	3.74
Belgium	8,106	4.13
Holland	2,300	1.43
Finland	1,200	5.00
Norway	205	4.88
Sweden	32,504	3.73
Switzerland	3,024	5.36
Germany	6,344	4.12
Russia	12,830	3.30
Italy	2,065	2.32
England	16,431	3.75
United States	44,844	3.64

Average per cent, 3.76.

No great reliance can be placed upon these results. The numbers examined are too small, the methods of testing not uniform or equally reliable. However, the probabilities of error are almost equally distributed, so that the conclusion is fairly well

established, even without great accuracy of data, that among civilized nations color-blindness is almost equally common.

Second. Among uncivilized people Dr. Favre's results from Algiers, already alluded to, show 414 examined, and only 2.6 per cent color-blind.

Dr. Fox reports 161 young Indians in the United States tested, and only 1.81 per cent are color-blind.

These percentages, so low compared with those for civilized people, suggested to us the thought that color-blindness may be a product of civilization, and these have led to our own tests, here reported.

At the Haskell Institute, at Lawrence, Kansas, are several hundred Indians, representing many tribes. These we have recently tested by Holmgren's method, with Berlin worsteds. 418 have been examined—285 males and 133 females—only three cases of color-blindness exist, or only  $\frac{3}{418}$  of 1 per cent. These were males, and all full-blooded Indians. The tribes were Pottawatomie, Pawnee, and Cheyenne. Of these two had defective color sense for red and one for green.

The Indians were almost evenly divided as full-bloods and half-breeds. It seemed to us that the half-breeds showed more instances of blunted color-sense than the full-bloods. This was evidenced in more frequent and prolonged hesitation among them in comparing the colors, than among the full-bloods. If this be confirmed by more extended examinations, it would, in conjunction with the low percentages obtained as above, be a strong argument for the theory proposed by us, that defective color vision is in some way the product of civilization. To this conclusion, our tests, at least, seem to point. The data are too meagre at present to propose any explanation why defective color-vision comes with civilization. It is not accidental that nearly every case of color-blindness is for red, fewer for green, and seldom one for violet.

What is the meaning, that the defects are thus limited at present, at least, to the lower end of the spectrum? The Helmholtz-Young theory of color perception will locate the affection in the layer of rods and cones responding to the first of the three primary sensations of color. But why this special layer is, with few exceptions, the only one affected, has at present no explanation. Also why the percentage among females is so small, has no explanation.

The law of heredity indicates increased sensitiveness in those nerves which are subjected to special use through many generations. It seems reasonable to look for an explanation of the more perfect color-sense in females, to this fact,—but whether this law of heredity will increase the percentage among males cannot be foretold without an enormous increase of data.

The theory here proposed is that defective color-sense is a product of civilization with the use of tobacco as a possible factor. The non-use of tobacco would explain also the low percentage of color-blindness among females. This theory leads to the thought of increase of color-blindness in males in the future generations.

#### THE VERTICAL SCRIPT.

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I PRESUME that most of the people of this country were taught to write the slanting script, according to a code of rules such as that given by Spencer, DeGraff, and others. It would be interesting to know what proportion have continued consciously or unconsciously to observe those rules, and what proportion have forsaken them for a position of body, pen, and book more suited for rapidity and ease, and no doubt in many cases better from an hygienic standpoint.

Little observation will be required to convince us that there are but few who observe the rules they were taught.

Some years ago I had charge of about one hundred and twenty-five pupils in writing, who had been taught the slanting script according to Spencer's rules. After using that method a short time, I became convinced that the collapsed position which very many assumed was due to the methods. When allowed to write

as they pleased, about 5 per cent of them observed all the rules, about 70 per cent observed part of them, but not all, and the remainder apparently observed none of them. Those pupils placing the book directly in front, with about an equal amount of both forearms on the desk, sat most erect and wrote a script varying but little from the vertical, and those turning the right side, placing the right forearm on the desk parallel to its edge, sat least erect. Observing this, and my own experience having taught me that with paper directly in front I must sit more erect, could write faster, and with a good deal more ease than with it at the right, I directed the pupils to place their writing-books in front of them, and found beneficial results follow in that the body was kept more erect and the writing on the whole much improved. At that time I had not heard of what is now known as the *vertical script*.

It, together with the many evils resulting from the methods so commonly used in this country, was first prominently brought to my mind while attending a course of lectures given by Dr. W. H. Burnham at Clark University in 1891-92. The substance of which is contained in an invaluable paper published in the *Pedagogical Seminary*, Vol. II., No. 1. Dr. Burnham has made a thorough study of the subject of school hygiene, and his paper gives, besides a comprehensive bibliography, the opinions and conclusions of the best writers and investigators of different countries, and should be in the hands of all teachers and school boards.

The following are some of the rules given by Schubert for writing the vertical script:—

1. Straight-central position of the tablet or copy-book.
2. Two-thirds of both forearms should rest on the desk in symmetrical positions, meeting at right-angles and forming an angle of 45° with the edge of the desk. The elbows should be about a hand's-breadth from the body.
3. The hand should rest on the outer edge of the nail of the little finger. The index finger should form a slightly convex bow.
4. The pen-holder should be long and grasped not too near the pen. Its upper part should not rest against the index finger, but on the middle of the hand between the thumb and index finger, and should point towards the elbow rather than towards the shoulder or breast.
5. The arm as it moves toward the right in writing should be moved as a whole, so that all positions that it occupies will be parallel.
6. After each line the paper should be correspondingly raised, so that a proper distance between the point of the pen and the edge of the desk be preserved.
7. The lines should be short.
8. The lines joining the eyes and the shoulders should be horizontal, and the eyes from 30 to 35 centimetres from the paper.

Since hearing the lectures and reading the paper, I have made some observations to ascertain whether those placing the book directly in front of them sit more erect than those who place it at the right, and though I did not find many who used the straight-central position, yet I found that a larger per cent of those placing the book in front sit erect than of those placing it at the right.

Since so many evils are due to poor methods in writing, it would seem that the subject should receive far more attention than has heretofore been given to it, and the vertical script be given a thorough test at least. The fact that no two hand-writings, like no two faces, are exactly alike would indicate that, after a few general instructions to secure a healthful position of the body, no complex set of rules should be given. Each person will then develop that particular hand-writing most suited to him.

#### DISINFECTANTS AND DISINFECTION.

BY DAVID BEVAN, M.D., PHILADELPHIA, PA.

THE question of disinfectants and disinfection has come to be of as great practical importance as it is of scientific interest. The term disinfectant is by the laity, and to some extent by the medical profession, grossly misused in being considered as synonymous with antiseptic and deodorant, since science has so ably demonstrated the nature of the contagium in infectious and contagious diseases, only such agents as are capable of destroying