

(editor's note: This paper was transcribed from a handwritten cursive copy with various difficulties. For a perfect rendition, the reader might wish to consult the original, itself a copy, in the volume entitled *Literary Club Papers I*, 1885 – 1886 Oct 3, '85 to May 29, '86) The original is very badly faded.

Mirror-writing

German writers, and among them particularly Dr. Erlenmayer, in an interesting monograph entitled "Der Schrift" published in 1879, call attention to an uncommon mental anomaly which is been termed *Spiegelschrift* or mirror-writing. It is manifested by certain persons both in a state of health and also the result of disease of the brain. A person so affected inverts the characters of ordinary writing and unconsciously offers the inverted symbols as a correct and faithful representation of his attempt to express in writing an idea or a series of ideas, and he even reverses written characters, letters, or figures, if he tries to copy them. It is evident that only a person affected with the same anomaly, or one who has gained proficiency by practice and experience in interpreting the reversed signs, can intelligently read this inverted writing. But as this special peculiarity is a rare one, & the necessity to interpret this curious writing is not of much practical value, the number of persons who are expert in reading reversed writing, is also small, and more especially so for the reason that a ready and available method can be resorted to decipher it without difficulty by all persons, simply by the use of the mirror. By holding the writing in front of the mirror, it will at once be transformed into ordinary writing, and all will be intelligible.

It is not uncommon to find this peculiarity among children learning to write. In most instances it is transitory, and for it are soon substituted the ordinary written symbols. It is, perhaps, not a little singular that among those who are left-handed, or prefer for all ordinary and special purposes the left hand and foot that the manifestation of this peculiarity is more frequently with. In most instances after the attention of the child is directed to his writing and it is compared to similar attempts and productions on the part of the teacher or fellow-pupils, he can, if he is intellectually so qualified, soon correct his first or earlier efforts, and in time produce written characters in conformity with the accepted representations. In those instances of this infrequent anomaly in which nature has withheld essential and important mental factors, and where imbecility or idiocy exists, this can not be accomplished and in spite of the most careful training, the child, if it is capable of writing or copying at all, produces such symbols as can only be readily interpreted by the aid of the mirror, or by a person familiar with or trained by experienced in reading

these inverted characters. It is met with among adults who never before have been able to write in this way, and who have never attempted to become adepts in this method as a direct result of disease of the brain, and notably if that region which, by psychologists, has been located as the center of speech. Pathological and physiological (*sic*) investigation assigns this important function in most human beings to the left side of the brain. The exact location is in the anterior or frontal lobe, expressed in technical language as the region of the left posterior frontal convolution. It is necessary here to refer to an established anatomical fact that a crossing of nerve fibers occurs in the nervous system of man, is that the right side of the body has its representative centers in the left side of the brain, and the left side of the body is represented by the right side of the brain. The left side of the brain therefore ministers to all the important functions of the right side of the body, moves the right hand and foot, and performs the countless acts which occur as a result of the prompting of the will, or reflex activities; it also, as already mentioned, harbors the important function of speech. These well-established facts are supposed to explain why the majority of human beings are right-handed, and prefer the right hand for writing, and all special purposes.

This is furthermore corroborated by pathological observations among persons who are known to have been right-handed, in which disease destroyed the important speech region on the left side of the brain, and disorder and loss of speech with impairment of motion of the right side of the body developed. In these cases, after loss of speech had existed for some time, a gradual restoration occurred and also improved use for practical purposes of the left hand, which is considered conclusive proof that the corresponding region of the right side of the brain which, however is always, in some inexplicable manner connected with the left side had compensated for the loss on the left side, and had merged from a latent inactive state into one of most useful activity. Another interesting feature of this reductation or return to active duty on the part of this region of the brain on the right side, is that not infrequently persons so affected unconsciously reverse these written signs, and can only write with their left hands in mirror-writing. Instances are also on record where it must be assumed that this important function of speech has its seat in the right side of the brain. Such persons are left handed and preferred the left hand for ordinary and special purposes. Without doubt many transitory instances of mirror-writing during early life, occur among this class. Such persons will write from right to left, and then writing will be reversed. By attention and training, they however soon learn to write, not centrifugally, as all right-handed persons do, from left to right,

but in order to make the characters correspond with ordinary or accepted writing, they must reverse that which would appear for left-handed writing and commence from left to right, therefore acquiring, as it appears an altogether different mechanism. — One of the best illustrations of mirror-writing is the celebrated one of Leonardo da Vinci. The ms. Of the Codex Atlanticus at present in the Ambrose Library in Milan is written in this singular style.

It was said that it was the object of the celebrated artist to preserve his work for the ages of superficial readers. Dr. Erlenmayer who mentions this information and doubtless more correct explanation. In the national library at Naples is the diary of a priest who in 1517 traveled in the train of the Cardinal of Aragon through Germany and northern Europe. The Cardinal visited Leonardo da Vinci and the following is the note made in this priest's journal. "That nothing more of value could be expected of him as he had paralysis of the right hand" Dr. Ireland, in his interesting paper on mirror-writing refers also to Leonardo da Vinci's case, and suggests that the great artist, not being able to use his right hand wrote [with] his left, and fell into the practice of writing from right to left and consequently produced a perfect illustration of mirror-writing. Mirror-writing with the left hand is the exact counterpart of ordinary writing with the right hand.

The fact that a co-relationship and interdependence exists between the right and left side of the brain & vice versa the left and the right, must be admitted. Is upheld by countless illustrations of disease. It offers as already stated the most plausible explanation why the majority of persons are right-handed and a limited number are left-handed. Whether we believe with Dr. Ligerson that man was originally ambidextrous, or with Mr. Reade that he will eventually become so, as evolution carries to a higher and higher degree his mental and physical traits, it certainly appears more rational to coincide with Dr. Ireland's remark that "the fact that all nations and tribes without exception have in all times of which we know anything given the preference to the right hand and leads us to believe that there must be some natural reason for so doing independently of arbitrary usages and various explanations having been suggested. Mind is admitted the highest faculty of man. It is an inscrutable indefinable something which we can only associate with brain or nerve action. It is known to us only by its complex manifestation. What mind is we can not know and probably will never know. Of the manifold manifestation of mind or mental action we must regard as among the highest speech. If the brain is imperfectly developed, the result of obscure hereditary

causes or conditions incident to embryonic development; or if disease destroys, either as a result of imperfect intuition or organic changes of hardening or softening, important regions of the brain one or more of the functions will be disordered or arrested and the general harmony or unity of action will, to a greater or less degree, be disturbed. Depending on the locality of the brain affected, and the extent and character of the lesion, the most varying disturbances of mental activities will become manifest phenomena.

The most unlooked for activity activity of idiation, the most startling, sudden exposition of intelligence manifested by the repetition of interminable verses of poetry either long forgotten, or imperfectly or not at all remembered as ever having been read, quotations in unfamiliar languages which have only been overheard but not understood, are repeated with accuracy during the existence of some lesions of the brain. Whilst others induce the most lethargic and apathic (*sic*) conditions of the emotions and ideas. Again, in other instances paralysis or loss of motion or sensitive of the upper or lower extremity or both, or the loss of one or more of the special senses, sight, hearing, taste, or smell supervene.

This references (*sic*) to the physical causes which produce these mental disturbances will enable us to appreciate some of the more intricate connective of the subject of this paper: i.e., left handedness with or without mirror-writing and gradual more or less perfect recovery of speech preceded by loss of speech, and paralysis of the right arm and leg occurring among persons who have always been right-handed. In this instance compensatory activities occur in the corresponding locality of the right side of the brain, and it assumes the functions of the left side. The reverse occurs among left-handed persons, who perchance, in early life may have practiced mirror-writing. In such cases, the right side of the brain is the active half. If disease destroys the speech region of this (right) side of the brain, the subjects become aphasia (*sic*), or have a disorder of speech, and the left side of the body becomes useless. Such persons may become right-handed, and in time may become expert in using the right hand and foot, and also regain more or less perfect speech.

What is known as aphasia is a disorder or a total loss of speech. It may be an early or a late manifestation of a disease process affecting the speech region; it often precedes disturbances of motion in the extremities. In the most frequently met with variety of aphasia, the patient loses the power to initiate

or control the automatic mechanism necessary for speech. He knows what he wants to say, but cannot do so. He understands what is said to him. He may be able to say a few words, but soon stops, owing to a complete and powerless inability to express a certain word he wishes to use. If the word is suggested to him, and pronounced by another person, he nods yes or no, but he can not himself repeat the word.

In another variety of aphasia, the patient can talk, but he is utterly unable to understand what is said to him. He can not even understand his own words, and is, therefore, not conscious of his errors. His speech is so defective, that it is generally unintelligible; associated with both varieties, and complicating both is what is known as word-blindness or word-deafness. The site of the word no longer arouses the proper symbol in the center of speech, to afford the necessary stimulus, and to permit of its expression or the sound of a word and spoken language fails to impress the patient; it has, as it were, then erased or blotted out from his memory as words formerly so promptly aroused by its sound alone. It is no longer capable of being aroused; the automatic mechanism is interrupted, and no response is excited.

Writing is either the written representation by symbols & signs, and constitutes the expression of ideas or of verbal speech. Most anomalous disturbances occur one patient may be able to write his name only, and others can not write at all. Their attempts consist of meaningless strokes and lines. In copying, the order of letters may be reversed, or the spelling faulty. Mistakes in writing are generally greater than speech. I have referred to this more to point out the great rarity of mirror-writing the result of disease of the brain, and will now call your attention to a most interesting recent communication on this subject by Dr. Ireland, in which he details many new observations.

(Editor's note: nothing follows)

Robert Sattler
January 23, 1886