

**Lecture on the influence which the prevailing methods of education have on the production of deformity in young persons of both sexes / by Buckminster Brown.**

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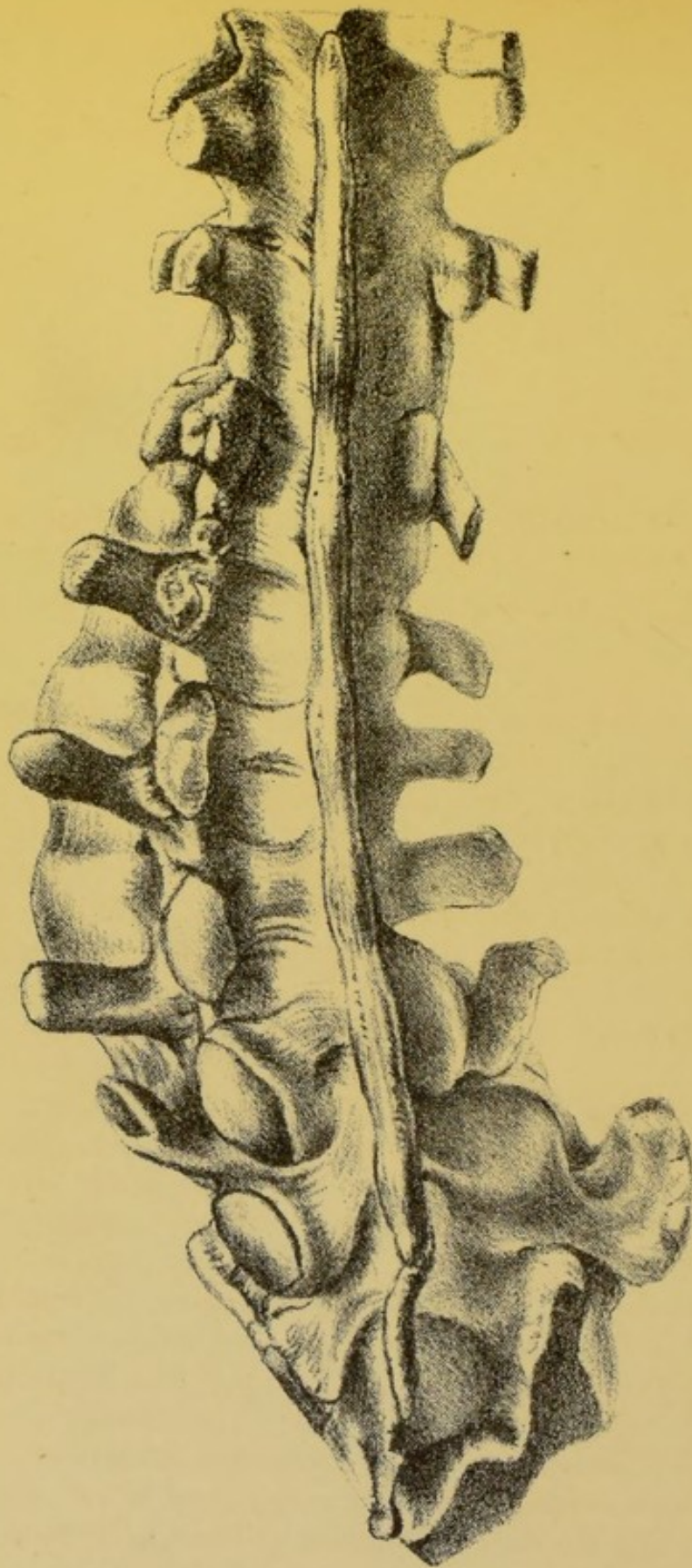


PLATE 1.

DRAWING OF THE SPECIMEN FROM WHICH THE CAST REFERRED TO IN THE TEXT WAS TAKEN, EXEMPLIFYING THE NEARLY STRAIGHT LINE OF THE SPINOUS PROCESSES WITH VERTICAL ROTATION OF THE VERTEBRÆ IN LATERAL CURVATURE OF THE SPINE. POSTERIOR VIEW.

(From Adams)



## LECTURE

### ON THE INFLUENCE WHICH THE PREVAILING METHODS OF EDUCATION HAVE ON THE PRODUCTION OF DEFORMITY IN YOUNG PERSONS OF BOTH SEXES.<sup>1</sup>

BY BUCKMINSTER BROWN, M. D.

I HAVE been requested to make some remarks, this evening, on the influence which the prevailing methods of education have on the production of deformity in young persons of both sexes.

What I have to say will be almost exclusively confined to the effect of position in causing scoliosis, or "Rotato-lateral curvature of the Spine,"<sup>2</sup> an affection which, as is well known, prevails to a great extent in the community. Lateral curvature is more commonly met with in girls than in boys. The dress-maker is far more cognizant of the extent to which it prevails than any one else, not excepting the physician.

To bad positions in writing, drawing, at the piano, etc., also while standing during recitations; to carrying weights, heavy books, for example, more on one arm than the other, to too much exercise of one arm, while the other is comparatively idle, can undoubtedly be traced the majority of these curvatures. But it is not malposition alone that causes the trouble. It is likewise due to long continuance in one position, which at first may be a good one, but which if continued for a considerable length of time becomes changed, from simple fatigue of a certain set of muscles, into a bad one. These relax; sometimes one muscle or set of muscles gives way; sometimes another set. The burden of support is consequently thrown, to a great extent, upon the ligaments which bind the vertebræ together. These in a young person are soft; their elasticity is soon overcome, and they are stretched. The chain of bones of which the spine is composed yields. The muscles and ligaments no longer do their work, and the superincumbent weight of the head and shoulders bends the chain, or perhaps the preponderance of other muscles, not so easily fatigued, disturbs the equilibrium,

<sup>1</sup> Delivered before the American Social Science Association, Department of Health.

<sup>2</sup> On Spinal Weakness and Spinal Curvature. By W. J. Little, London, 1868.



and a curve is the result. This curve may commence in the dorsal region, between the shoulders, or it may begin in the loins.

At first the bend is easily straightened. Afterwards the intervertebral substances, which may be spoken of as cushions between the vertebræ, become depressed on the side toward which the spine has curved, and this depression finally becomes permanent. The pressure being continued, the bone itself becomes implicated, and the sides of the bodies of the vertebræ become narrowed, wedge-shaped, and likewise the articulating processes are shortened.

Worse than this, partly from the effect of position, partly from peculiarities connected with the supports by which the vertebræ are united, a very curious change occurs in the relation of one bone to the other. A vertical flexion takes place, a cork-screw-like or spiral twist, which is probably synchronous with, or precedes the lateral curve, — a twist so decided that the proper anterior surfaces of the vertebræ are turned partly round upon their own axes, and look toward the convexity, and the spinous processes toward the concavity of the curve.

This, as primarily the effect of position, may be exemplified by the attitude generally taken while writing, drawing, etc.

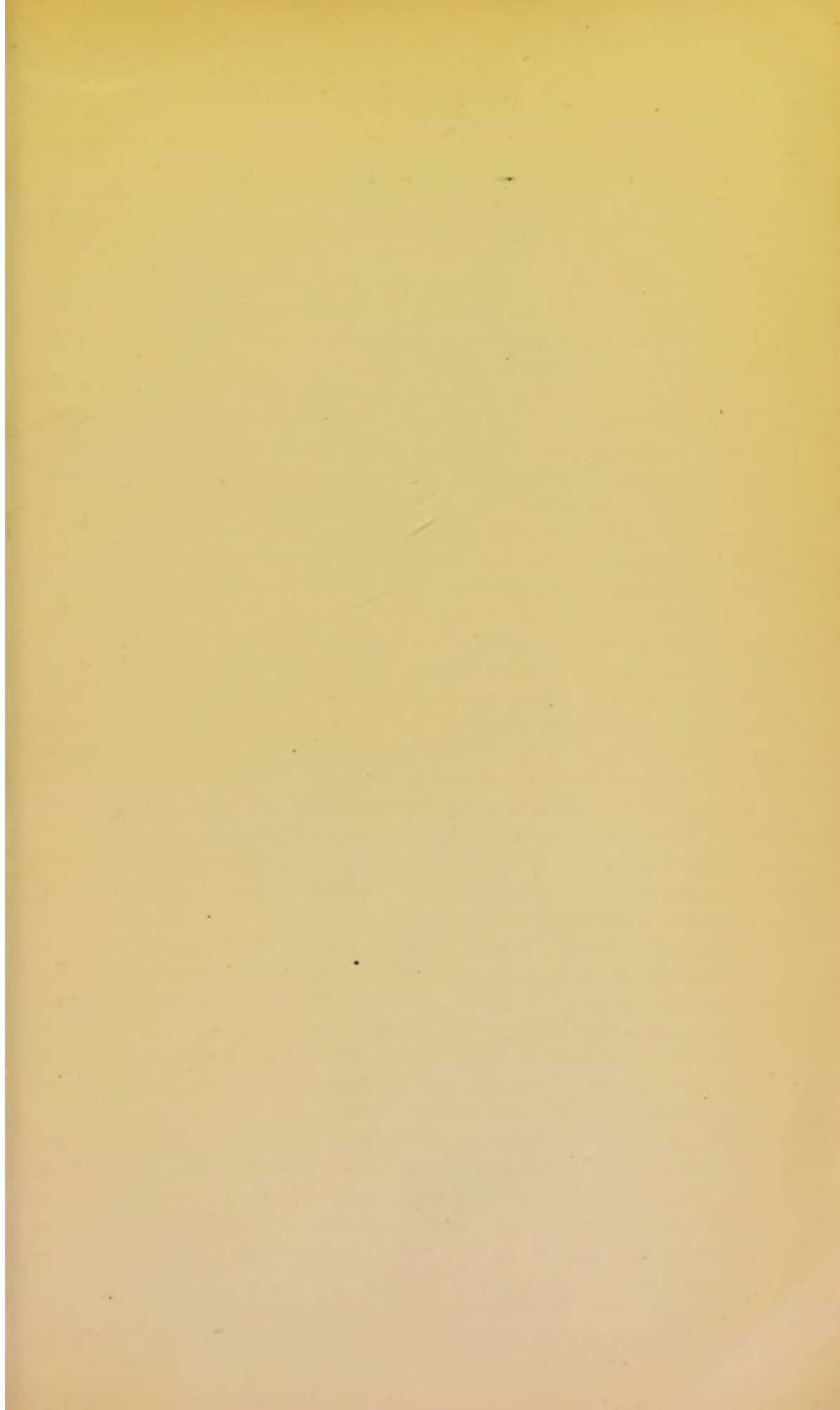
For example, in drawing, the right arm and shoulder are usually put forward; the hips remain square, or perhaps a little turned in the other direction. The right shoulder is elevated, the right shoulder blade projects, the head generally inclines towards the right side, and the upper portion of the trunk bends forward. Thus one part of the body fronts in a different direction from the other. I describe only one of the malpositions which are commonly assumed.

In this way a rotation of one or more of the small bones upon another takes place. This rotation is very insidious. As a rule it always accompanies scoliosis properly so called.

There is a simple lateral or serpentine curve of the spine which not infrequently takes place as a sequel to pleurisy, pneumonia, or other intracostal disease. In these and other rare cases arising from incidental causes there is, generally, no rotation of the spine upon its axis. They are so different in their origin and in their manifestations from the class with which we are now concerned, that they possess no especial interest for us at the present time.

The spiral twist may make great progress, and not show any signs by which a common observer will suspect that it exists, and often it will escape the notice of those much more accustomed to such things. It will be understood how easily a person may be thus deceived by looking at this plaster cast of a curved spine, which I procured in London some years since. (See Plate I.)

It is very interesting in many points of view. Looking at it from behind, we see that the projecting ridge of bone, the spinous processes,





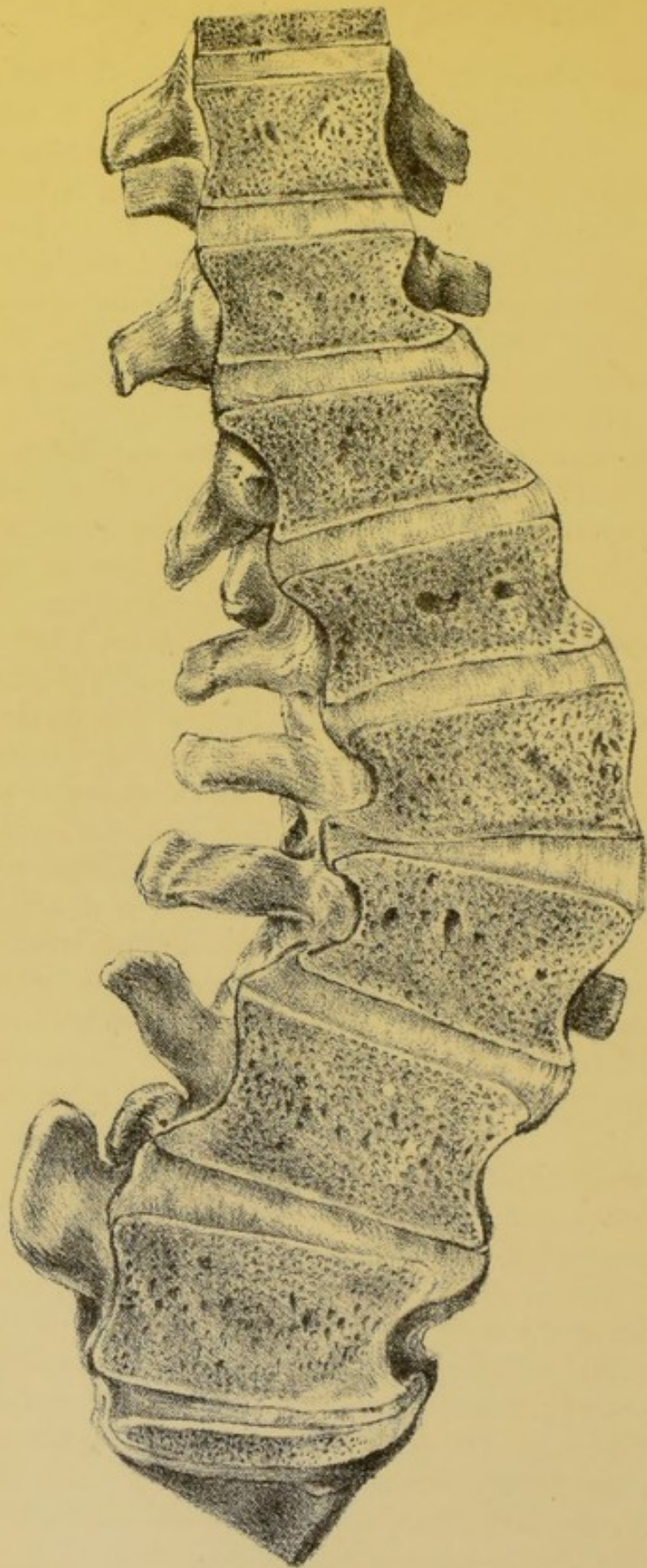


PLATE 2.

DRAWING OF THE SAME SPECIMEN FROM WHICH PLATE 1 WAS TAKEN. ANTE-  
RIOR VIEW. APPEARANCE AFTER SECTION OF VERTEBRÆ AND CARTILAGES.

(From Adams.)



is nearly straight. It is by this line that most persons judge whether the spine is straight or otherwise. In tracing it down it seems almost a straight line. (See Plate I.) If the model is turned round there is a great change in the appearance of the curve, showing how much more extensive the internal or anterior curve is than the external. (See Plate II.) Again, — I set it on the desk, — you notice that the spiral twist begins at the upper part, just where you would naturally expect that it would occur in the position usually assumed for drawing, etc. Then there comes the curve of compensation in the loins, and the corkscrew twists in the other direction.

This model demonstrates how straight a spine may appear, yet be in reality the subject of an extraordinary curvature. In the cast the rotation movement extends to a quarter of a circle in the centre of the curve. The alterations in the neighboring parts are, in a case as advanced as this, sufficient to indicate that great changes are taking place in the relations of the internal organs. These photographs, which I will pass round, will give an idea of these alterations in some cases. The cast also explains why it is that the shoulder blade on one side projects, and on the other sinks in. It shows that the ribs are thrown out on one side of the column by this vertical twist in the spinal bones to which they are attached, forcing backwards the shoulder blade as they bulge out. It makes plain why there is an appearance of swelling in the loins on the opposite side. This swelling may be noticed in the photographs. It frequently resembles a tumor or an abscess, and has sometimes been mistaken for one or the other. This prominence is due to the rotation of the transverse processes on that side. These points of bone which should be buried beneath the mass of muscles that lie on each side of the column push backward the muscles, and thus a factitious tumor presents itself.

This plaster mold explains also the projection of the hip, which, unfortunately, is often the first evidence that something is wrong which attracts the attention of the mother, when the curve is what is called a lumbar curve, that is, when it begins in the loins. In cases where it commences between the shoulders it is the displacement of the scapulæ which is first noticed. You will see that before either projection can take place, the curvature must have made considerable progress.

The changes in front are equally striking: the prominence of the ribs on the side the reverse to the one on the back; also the peculiar manner in which the arm appears to be attached to the shoulder, in consequence of the displacement of the shoulder blade.

These are some of the characteristic features of one class of spinal curvature which are exemplified by the specimens before us. The case from which the cast was taken was an unusual one, but some of the photographs present others nearly as severe.



What are the practical lessons which we may learn from what has been said? The great point is that the child or student should, while at school or at his studies, have frequent change of position, — that no one posture be kept up for any considerable length of time. This I consider of the first importance. The boy or girl who lives out-of-doors, playing, romping, climbing, etc., never has lateral curvature.

The reason that constant change of position is so important has been previously stated. The muscles of the back have much to do. Let their work be frequently varied. If they are unusually thin and undeveloped, let them have, from time to time, complete rest, either well supported in a comfortable chair, or in the horizontal position.

The spinal muscles — I repeat it — must not be allowed to become weary by long continuance in one position, especially if that position is not one in which the back is well sustained by properly adjusted support. The position in standing must be carefully watched. A most pernicious habit, and one which is very often to be noticed in school-girls (I think I have observed it in girls more frequently than in boys), is that while we are talking to them, or during recitations, especially if they are much interested in what is going on, they are standing upon one leg. This position is assumed involuntarily, and it is always, or almost always, one and the same leg upon which the weight is thrown. The effect of this is easily understood: one side of the pelvis is lifted up, curving the spine in the loins; the opposite leg is advanced in front of the other, twisting the pelvis and rotating the vertebræ. Of course the curve of compensation takes place between the shoulders. One is depressed, the shoulder blade gradually projecting, and with the change, and in fact assisting to produce it, again occurs the spiral twist.

The youth passes many hours at school. It is of great importance that the seats should be so constructed as to give support to the back. Equally or more important is it that the desk should be of proper height, and should not be at such a distance from the seat as to cause the pupil to stoop when writing or reading. It should be so arranged that it can be drawn towards the student when seated, thus enabling him or her to sit upright, with the back against the back of the seat while using the pen or pencil, or while studying.

At the piano the chief difficulty is again the same, — the long-continued effort to keep the back erect. Some muscles inevitably give way. In embroidery, in drawing, the same thing occurs, combined also with error in position. I have visited rooms in which drawing was taught, where all, — male and female, — with scarcely an exception, were sitting in a position not only to curve but to twist or rotate the spine, and in most the posture was such as to produce a triple curve. Horseback riding is a healthy exercise, but the seat of a girl upon the horse is not a natural one. Perhaps it can be so arranged as to have the pelvis



square with the horse, or directly across. I have been convinced that some of the worst and most indomitable twists in the loins with which I have had to deal, spiral twists I mean, have arisen from being too much in the saddle. In many instances there probably is constitutional debility, and perhaps hereditary tendencies, rendering certain individuals more liable to this complaint than others. But in persons who appear otherwise perfectly strong, healthy, even robust, I have seen severe rotary curves which could be distinctly traced to the operation of some one or more of the causes I have mentioned.

The theories which have been proposed to explain the cause or causes of lateral curvature are numerous. It may be well to refer briefly to some of the most prominent. Debility of the muscles which are attached to and which support the spine is one, and is perhaps the most generally received. Unquestionably, weakness and relaxation of muscles and ligaments are important elements in the formation of spinal curvature. Muscular contraction,<sup>1</sup> paralysis, hereditary tendency, the greater use of the right arm than the left, the unequal distribution of the internal organs, malformation or irregular growth of the vertebræ or of the ribs inserted into them, have each been adduced by writers on this subject as originating the complaint we are considering.

Various hypotheses have likewise been advanced to account for the vertical rotation to which I have referred.

One writer<sup>2</sup> has brought forward a complicated theory that would take pages to explain, in which he attributes the trouble chiefly or solely to the action of the serratus magnus muscle. He considers that the natural thoracic respiration of women, aided by the fact that one lung is larger than the other, and one arm is heavier than the other, is the real and efficient cause of the deformity. He maintains that the influence of these causes is greatly increased by tight lacing and by clothing compressing the abdomen. This author cites as a "crucial proof" of the correctness of his theory that among Arabs, Hindoos, and others who use a loose form of dress such deformity is all but unknown. The originator of this theory, confirmed by this remarkable crucial test, can hardly have taken into consideration the fact that Arab and Hindoo women not only do not lace tightly and clothe unnaturally, but also do not write much, or draw, paint, embroider, ride sideways on a horse, or occupy themselves in the innumerable arts, amusements, or employments to which the cultivated European or American is so much devoted, and in which, as usually practiced, the position is so unnatural. Likewise, this theory does not explain cases which from time to time present themselves in young girls who have never worn tight dresses, but who have

<sup>1</sup> Guérin.

<sup>2</sup> *The Causes and Treatment of Lateral Curvature of the Spine.* By Richard Barwell. 1868.



lateral curvature with severe lumbar rotary twist. This has been traced, even in children, to sitting through many hours of forced erectness at school; to sitting at needle-work, or, in one instance, to carrying weights mostly on one arm and with the elbow supported upon the ilium, thus causing rotation in the loins; or under rare circumstances to riding much on horseback. At the present time I have two such cases under treatment, occurring in children between six and nine years of age.

Another explanation of rotary action of the vertebræ has been founded upon the physiological lateral or circular movement possessed by the anterior portion of the spinal column, the posterior being more firmly held by ligaments and muscles. Connected with this explanation is the theory that vertical pressure is the direct cause of lateral curvature, and with it necessarily of rotation.<sup>1</sup>

The abnormally constrained attitudes which are assumed in many of the employments and amusements of civilized life, and which are involuntarily assumed when the spinal muscles are overfatigued, favor and increase the physiological action to which reference is here made.

The true ætiology of spinal deviations, lateral and rotary, can be found only in the peculiar yet very common faults of position which I have previously described. The alterations which take place in the form of the bones, by which the rotation is increased and rendered permanent, were well described by Mr. Alexander Shaw many years since. His portrayal of these changes can be best given in his own words:—

“If we attend to the natural structure of the spine, it will be seen that whilst we lean the body to one side, the pressure is thrown almost exclusively upon the articulating processes of that side; these processes, delicate as they are, being the only bony structures which check the lateral movements of the trunk. Hence, when a habit is acquired of inclining to one side, or of resting upon one hip, as in sitting, the sharp edges of these small joints of bone receive the weight of the entire body. But as the articulating processes are remarkably soft, and imperfectly formed at the age of puberty, it follows that they will become wasted by absorption when this position is long persisted in, and an inequality of the length of these two lateral props on which the vertebræ rest posteriorly will be the consequence, those of the concave side being shorter than those of the convex. Fifth, in lateral curvature of the spine we have a distinct demonstration that the articulating processes give way more extensively than any other parts of the column. This is evinced by the rotation which the spine makes in its perpendicular axis at the same time that it inclines laterally. The joints of the articulating processes being situated posteriorly, as well as laterally, the spinal column cannot yield in their direction without wheeling partially round;

<sup>1</sup> The Cause of Rotation in Lateral Curvature of the Spine. By A. B. Judson, A. M. M. D.



and it is owing to this rotation that the transverse processes and the ribs are directed obliquely forward upon the concave side, and obliquely backwards upon the convex side of the curvature, thus giving rise to a fullness or swelling on the one hand, and a depression or sinking inwards on the other.”<sup>1</sup>

Mr. Shaw accurately depicts the pathological changes in scoliosis, but his theory of the primary cause of rotation is not satisfactory. If the spinal column could not yield laterally without at the same time “wheeling partially round,” then the side curves, which are the occasional result of intracostal affections and of rachitis or spondylitis, would always be attended by this phenomenon. The fact that simple curvature or curvatures without torsion do occur we have previously noticed.

I must briefly refer to another side of this question, in regard to the effects of the present methods of education,—overaction of the brain. Too much mental stimulus has an undoubted effect as one of the predisposing causes of spinal curvature. Mental rest combined with other appropriate conditions will sometimes cure the trouble when in its incipient stage. That this physical result, this effect on the muscular and ligamentous system, should arise from overaction of the mind may appear to some a strange phenomenon. If we consider a few moments it will be a matter of no surprise. Scoliosis occurs most frequently at an age when the vital powers, the nerve force, so to speak, is concentrated to a great extent in the important work of bringing about that change in the system which is to result in maturity. In addition to this it has to keep in active working order all the usual complicated arrangements by which this wonderful machine, the human body, is enabled to perform its accustomed tasks. We must be careful not to call too much upon this vital power, this nerve force, not to divert it too much in other directions, not to concentrate it too much upon head work. If we do we shall most assuredly have cause for regret. In common with the rest of the organization, the intricate apparatus by which the spinal column is held in position will suffer, and all the more speedily will it become deranged from the fact that while the remainder of the organism is comparatively in repose, the spinal muscles are making a constant effort to retain the trunk erect.

It is impossible for me at this time to examine all the causes from which lateral curvatures may arise in our common methods of education. Our attention has been chiefly confined to those connected immediately with schools. I have not commented upon the debility of the system which originates in illy ventilated rooms, or, what is quite as bad or worse, draughts of cold air, etc. These do their part. Upon such matters others will speak to you more fully than I can do.

<sup>1</sup> Medico-Chirurgical Transactions, vol. xvii., London, 1832, quoted in Lectures on Curvature of the Spine. Adams, London, 1865. Pages 126, 127.



Gymnastic exercises, — calisthenics, military drills, — boat rowing, etc., are all serviceable in preserving health and symmetry, if used with moderation, and with special reference to the peculiarities of the individual. On the other hand, I have seen severe injury, and even disease of the spinal nerve or membranes, which has originated in their immoderate employment, or where due consideration has not been given to the pupil's idiosyncrasies.

There are other branches of this subject which should receive our attention. I had but a brief notice of preparation for this evening, and I have had only time to refer to some of the more prominent points of a theme which deserves serious consideration.