

and stretched forward beyond the head, the opposite knee is raised, and the leg is stretched backward and lifted as high as possible.

SYSTEM OF YOGA. It will be appropriate at this place in the text to discuss briefly a whole system of exercise which has been built up on held positions or postures. It is the system of Hatha Yoga, which scholars and scientists in India are trying to revive.¹⁰ The physical exercises are called *asanas*. They are really held positions or poses, and a discussion of them fits neatly into our consideration of exercises to improve tonus of muscles.

If we place emphasis upon asanas here, and do not mention the other forms of Yogic practices, it is because these held positions are directly applicable to the part of our own program which we are discussing. They are in conformity with some of the principles which guide us in selecting activities for body building.

Asanas are divided into two principal groups: cultural, so called, and meditative. The cultural asanas, or poses, according to Kavalayânanda, are practiced for training the circulatory, nervous, and endocrine systems, whereas the meditative poses are undertaken to eliminate physiological disturbances from mental activity. In connection with a discussion of ways of increasing tonus in muscles, the "cultural" poses are of greatest interest.

Actually, the literature about Hatha Yoga gives far too little attention to the value of these held positions for increasing the strength in many muscles which are needed to hold the body efficiently and esthetically. For example, the upside-down positions are of value in training the extensor muscles. Man has developed in such a way that it is possible for him to balance on his feet, with-

¹⁰ In the following pages, several statements are taken directly from the writings of S'rîmat Kavalayânanda of Bombay, a very wise and well educated Swami, who is trying to analyze the Sanskrit sources of Yogic literature in the light of his modern scientific knowledge of anatomy and physiology. Another Swami, whose ideas are also incorporated in the following discussion, is Prakash Dev of Delhi.

Books:

Behanan, Kovoov T.: *Yoga, A Scientific Evaluation*. New York, The Macmillan Company, 1937.

Dev, Prakash: *Yoga as the System of Physical Culture*. Lahore, India, Lahore Art Press.

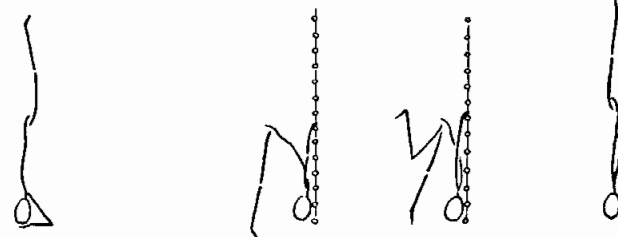
Dev, Prakash: *Yogic System of Exercise (Full Course)*. Lahore, India, Lahore Art Press.

Kavalayânanda, S'rîmat: *Āsanās*, Part One. Bombay, India, Kaivalyadhâma, 1937.

Kavalayânanda, S'rîmat: *Prânâyâma*, Part One. Bombay, India, Kaivalyadhâma, 1935.

out too much muscular effort, if he thrusts his weights against the cruciate ligaments of the knees, the iliofemoral ligaments of the hip joints, and certain ligaments of the spinal column. He cannot stand on his head, however, without considerable use of the antigravity muscles, because ligaments were not developed to support the weights of the body in this position. Therefore, the upside-down position will develop the extensor muscles.

The upside-down position should not be assumed quickly. Students using this book will know how to teach a person to take a position on his head, with the head cupped in the locked hands and with part of the weight borne on the elbows. The important thing is for the hips to be well balanced above the head before the legs are raised. Then the feet should point directly to the ceiling. The thighs should be in maximum extension. There should be absolutely no bend at the hip joints. (Teachers of physical education will know, also, how to help a person to take an upside-down position on stall bars. This position will be easier for those who do not have strength or ability enough to balance the body on the head. It is not part of Yoga, of course.)



Head stand

Upside-down at stall bars

The "neck stand" or upside-down position, with the weight resting on the back of the head and neck, is a little easier to assume than the "head stand." In both poses, the remaining parts of the body are maintained vertical to the ground, by the action of the extensor muscles.¹¹ One may be inclined to criticize the "neck stand"

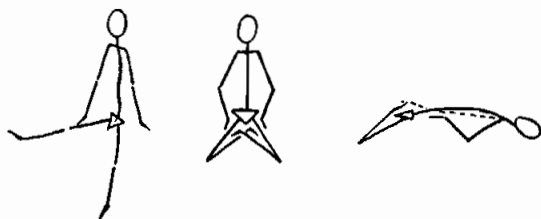
¹¹ In Yogic practice, the student must see that his chest presses against the chin in the "neck stand," because the principal body-building and therapeutic advantage of this asana, according to that system, lies in the maintenance of a healthy thyroid. Whether that contention be true or not, a definite result of this chin lock is that it prevents too much blood from surging into the head, another reason why the "neck stand" may be a little more comfortable than the "head stand."

because it increases flexion in the upper thoracic region of the spine. One should not lose sight of the fact, however, that it tends to force the cervical spine out of hyperextension, and to flex the occiput on the atlas. This position, in itself, will feel good to a person whose neck has been thrust forward and whose head has been tilted backward in incorrect posture. If exercises to extend the thoracic spine are used to complement the "neck stand," no harm to the thoracic spine can possibly accrue. It is much safer than an attitude with the weight of the elevated part of the body resting lower on the thoracic spine, while the legs make swaying or kicking movements—an exercise frequently used in America, but not to be advocated.



Reaching the "neck stand"

An asana which may be used to complement the neck stand has been called the "fish pose," because a person can float on water for a considerable time if he steadily lies in this posture. The subject first takes his "seat" with his legs fully stretched out. He then bends one of his legs in the knee joint and, folding it upon itself, sets it in the opposite hip joint, so as to allow the foot to lie with its sole turned upward. The other leg is similarly



Fish pose

folded and the foot is set in the opposite hip joint. Both the heels he adjusts in such a way that each of them presses on the adjacent portion of the abdomen. After forming this foot lock, the subject lies supine. Then, resting his weight on the elbows, he raises his trunk and neck and, throwing the head backward with an arched spine, makes a bridge of his trunk. Subsequently he makes hooks of his forefingers and with these takes hold of the opposite big toes.¹²

An asana which further complements the "fish pose" has been called the "plough pose," because the body is made to imitate the shape of the Indian plough. Both the "fish pose" and the "plough pose" help to keep the spinal column fully flexible. When we remember that real youth is invariably characterized by a flexible spine and old age always renders the spine more rigid, one can understand why such exercises are of value. In Yogic practice there are never any jerks. This warning is in order, if these asanas



Plough pose

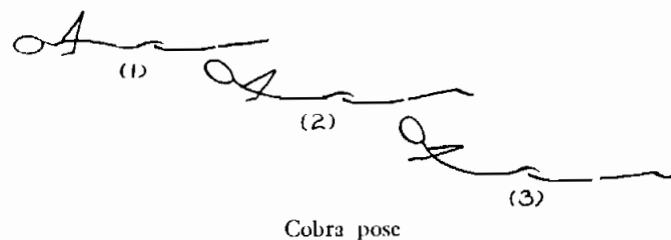
are to be embodied in any other program. To jerk the spine into flexion may do it a great deal of harm. (See p. 38.) Furthermore, what amount of bend is possible at first in any of these asanas should first be secured and maintained for some time before a greater bend is attempted.

In assuming the "plough pose," the subject lies supine, with his arms at his sides. Then he slowly raises his legs through the hip joints, curling the spine up to follow them, until the toes touch the floor beyond the head. The knees should be kept straight, thus fully stretching the hamstrings. The position of the feet can be adjusted to put the maximum pressure on the lumbosacral region, on the lower thoracic region, or on the upper thoracic region of the spine. Finally the hands can be removed from their original positions

¹² Photographs of this pose, and the following ones, are to be found in *Yoga, A Scientific Evaluation*, by K. T. Behanan.

and locked above the head, while the toes are pushed farther away from the head, so that pressure is experienced at the cervical part of the spinal curve. These more difficult phases of the plough pose should be attempted only under supervision and after the previous ones become easy of accomplishment.

An asana which reverses the curve of the spine has been called the "cobra pose" because it gives one the appearance of a hooded snake under irritation. The subject lies prone, with his forehead touching the floor and with his hands placed either side of his chest.



Cobra pose

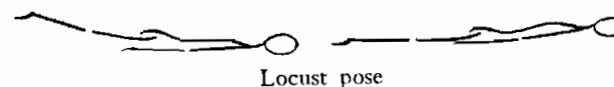
"The student then raises his head and bends the neck backward as far as possible, completely throwing out his chin. During this attempt his chest is kept close to the ground, the trunk, so to say, taking no part in the movement. When the head is fully swung backward, the student begins to work the deep muscles of his back. By their contraction he slowly raises his chest. When the student is only a beginner, he supports his rising thorax with his hands, gradually increasing the angle between his arm and forearm. But, as he becomes accustomed to this practice, he tries to depend upon the muscles of the back alone for raising his chest, and though the hands are allowed to work as previously, comparatively little burden is now put upon them.

"After maintaining the pose for the prescribed time, the student begins to efface the spinal curve and bring down his chest. Here, too, he proceeds gradually in his work. First, the lumbar curve is obliterated, each vertebra being relieved of its pressure which now travels upward. The thoracic and cervical curves are effaced in the same way, till the whole spine lies in a horizontal line and the forehead touches the ground as it did originally. While the full pose is being maintained the abdominal muscles and especially

the two recti are stretched, and the intra-abdominal pressure is greatly increased."

All these Yogic poses take advantage, not only of conscious efforts to contract specific muscles which should be strengthened, but of reflex aids to increasing tonus by stretching other muscles. The stretch on the anterior abdominal muscles in this and the next exercise to be described are to be recommended. (See discussion of the "stretch reflex" on page 69.)

An asana which should be used after or before the "cobra pose" is the "locust pose" because it powerfully contracts the remaining extensors. "The student lies prone with his soles looking upward and his fingers clenched. He stretches his hands along his body so that his shoulders and the backs of his fists touch the ground. He either rests his chin, mouth and nose on his mat, or his chin



Locust pose

alone, the head being thrown a little backward. Then with a full inspiration he stiffens his whole body and tries to raise his lower extremities backward, putting his whole weight on the chest and hands. The wrists especially feel the burden of the lifted legs. Throughout the exercise the breath is held in and the knees are kept stiff and straight. In this practice the sacrum shares the fate of the legs and is a little raised with them. No violence should be done to the legs or back. When the student finds that he can no longer hold in his breath, he slowly lowers his legs, relaxes his muscles and gradually proceeds to exhale. When respiration becomes normal, the student is ready for the next attempt."

Besides fully contracting the extensors of the lower leg, thigh, and lower back, and putting a stretch on the abdominals, this pose demands a full, powerful inhalation. It is really a more difficult exercise than some of those described above, although it looks more simple. Lead-ups to this exercise can be single leg raising backward from the prone lying position, or curving the body backward by grasping the ankles with the hands and forcibly bowing the body backward, by downward pressure of the legs. This "bow pose" is not as difficult as either the "cobra pose" or "locust pose," but it



Bow pose

has an especial advantage in that it more powerfully stretches the recti abdominis and the two psoas muscles.

There are several ways in Yogic physical culture to achieve a twist of the spine. The one shown in the drawings is a little more



Twisted pose

difficult than the one to be described in words. To start this one the student sits on the floor with his legs fully stretched out and placed close to each other. He then bends in the knee of one of his legs, say the right, and folding it upon the thigh, sets its heel tight on the perineum. When properly adjusted the right sole will closely touch the left thigh. Then the student withdraws his left leg and, bending it in the knee, arranges it in such a way that the left foot rests on the right side of the right thigh. The steps taken up to now are only a preparation for securing this twist with mechanical advantage derived from particular arrangements of the extremities. The left hand is now placed on the right knee, and the trunk is rotated all the way to the right, as the right hand aims to rest at the bend of the left thigh on the trunk. The head should be turned as far to the right as possible, to ensure a twist in the cervical spine. The left thigh should remain in the vertical position, and the trunk erect. The same pose is to be tried using the opposite extremities so that the two twists would move, between them, the different vertebrae through all the rotating space available.

Some American critics of this book will say that these Yogic asanas do not warrant the space allotted to them. Some Indian critics will say that the descriptions are too brief and that other advantages than the one of increasing strength in muscles should

have been stressed and, also, more asanas described. To both sets of critics the answer is the same. In this book we have set down certain principles upon which to base a broad body-building program. Whenever we discover technics that advance these principles in practice we should accept them, and weave them into the fabric of a corrective physical education program divorced from any particular system.

Although we recognize in these Yogic practices certain technics which may be used with benefit in a program of corrective physical education in the United States, we are fully aware of the fact that nowhere in America is there a physical, psychological, and cultural environment where Hatha Yoga, as a system of exercise, can be used to full advantage. The asanas selected for description in the previous pages are to be recommended as any exercises may be for specific therapeutic results. They do not constitute the Yogic system, nor would one wish to advocate such a system for adoption in the United States.

Combined Actions of Muscles—Reflexes.¹³ As one studies the actions of muscles, one is impressed by the fact that they rarely contract individually. Apparently there is no arrangement patterned in the nervous system for the natural or "primitive" contraction of a single muscle. Instead, the brain and higher nerve centers control several muscles at the same time and make them contract synergistically.

WALKING REFLEXES. In walking, as the left leg strides forward the right arm swings forward. This is not only the result of an effort to keep the body correctly balanced, but affords a means for making the movement more vigorous. The body is actually pulled forward by the swing of the arm.

Walking involves many other reflex relationships also. If the trunk muscles are strong and if the lateral muscles at the hip joints and pelvis—the gluteals medius and minimus and the quadrati lumborum—are well developed, a person may walk with considerable grace even when the leg and foot muscles of one side are very weak indeed. What he has to do is to balance himself properly on the strong leg and let the weak leg swing into position, as he makes a step onto that side. Either he must have some strength in the quadriceps femoris

¹³ The "stretch reflex" applies to single muscles. It has been discussed on p. 69 and p. 222.