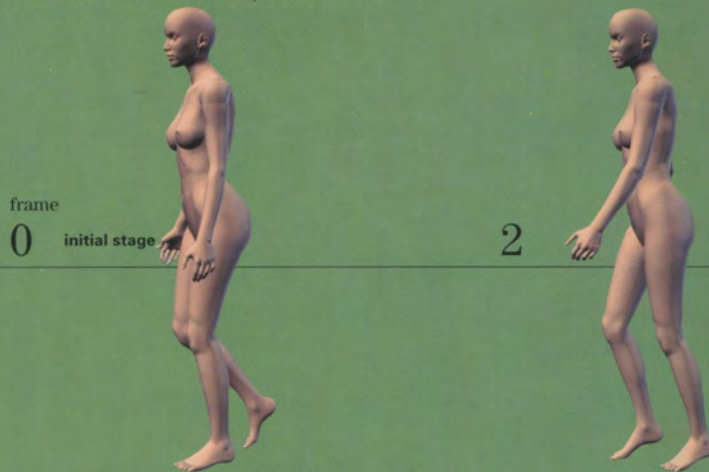




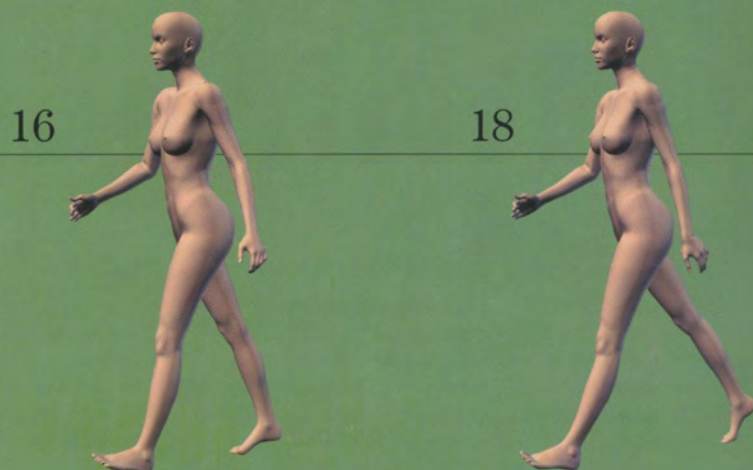
The movement pattern used here is two steps of a "brisk walk" that lasts 1 second. The 1-second movement is replaced with 30 frames from which approximately every two frames out of 24 have been selected for close inspection.



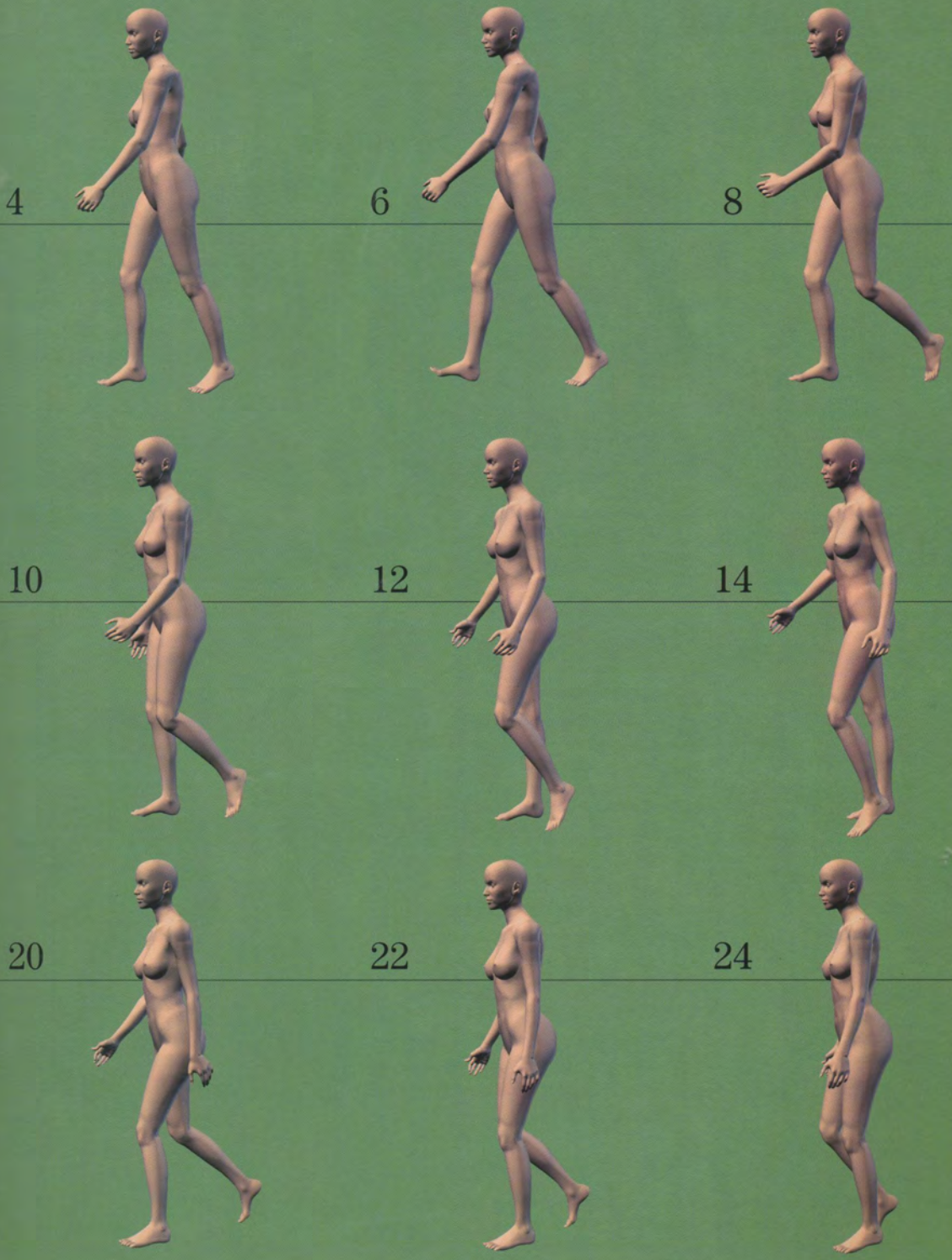
# walking

## continuous tumbling and its control

The bipedal walk is inherently unstable, unlike the quadrupedal walk, which can be halted in any position. It is built on continuous tumbling and its control. The head is stable while the body moves. Walking is based on a steady rhythm that differs from person to person. This chapter analyzes the walking movement produced by alternately putting the right and left foot forward.





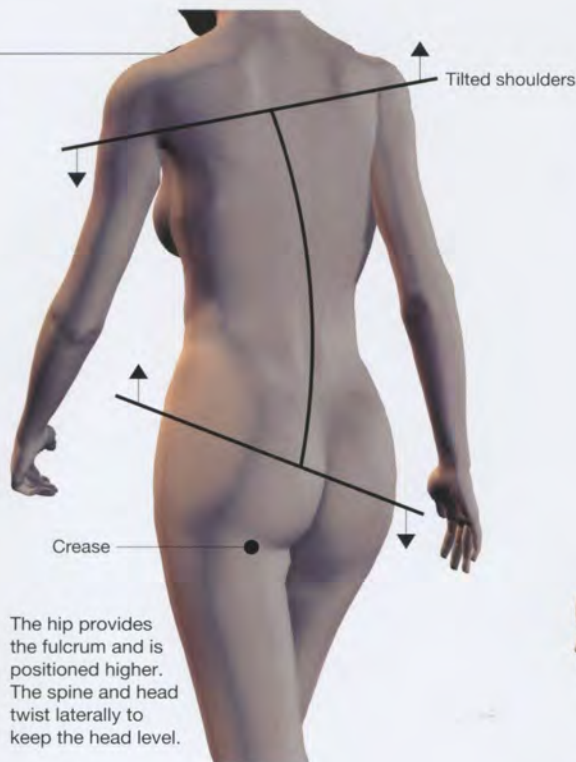




0

## sending the right leg forward

Walking is a steady repetition of tumbling and control. The position starts the moment the right leg is sent forward. The head faces directly forward and the arms hang loosely. The left leg tenses and supports part of the body weight. The right leg is bent and brought forward. The left leg's hip, which forms the fulcrum, is positioned higher and faces to the right. A crease forms below the left buttocks as shown by the right side's extension. At the same time, the spine and head twist laterally to keep the head level. The upper body faces and bends forward, just before the center of gravity is thrown forward and the balance is upset.



2

## getting off balance

The head is positioned more forward than the heel, but the right foot has not yet arrived on the ground, which shows that the body is losing its balance. To keep the body from turning as a counteraction, the left arm swings forward and remains relaxed while the elbow naturally bends with it. Energy is put into the left leg to carry this position. Its upper thigh tenses slightly when the right leg is lifted and brought forward. The toes are flush against the ground.



### The walking motion

Bipedal walking allows human beings to stand upright and walk on two legs, while the more stable quadrupeds have four fulcrums. The human spine creates efficient movement in walking or running—we are able to stand easily and run faster than animals—but we do get

backaches. So why did we become *Homo erectus*? An erect posture supports a heavy brain that enlarges when greatly cushioned by the spine.

### The walking rhythm

Walking is based on a steady rhythm: alternately putting the right and left foot forward to create a two-

beat cadence. Adding a “stop” produces the three-beat waltz cadence. Such rhythm differs from person to person.



4

## advancing the right leg

The right leg with its mobile lower part below the knee is propelled forward, but has not yet landed on the ground. The greater the degree of fatigue (careless motion) or hurriedness (the leg quickly pushes forward), the more prominent the kicking motion becomes. While the left leg remains still, the heel is lifted up as the body and arms advance forward. The right arm swings in reverse to keep the upper body from twisting.



Advancing the leg with a kicking motion

8

## landing and its impact

The body weight is almost relieved from the left leg, and borne by the right leg, which is firmly planted on the ground. The sole of the sliding foot lies flat and momentarily bears the weight to allow the left leg to bend at the knee, which is perpendicular to the ground. The right foot's large impact on the ground generates a brief vertical jolt in walking. The chest, buttocks and other areas with excess flesh jiggle as an aftereffect. A woman's chest momentarily drops and her arm moves backward. Thus, the left elbow becomes more bent like the left knee and is lifted slightly to move forward. The right foot, which points upward rapidly descends, creating a conspicuous impact.



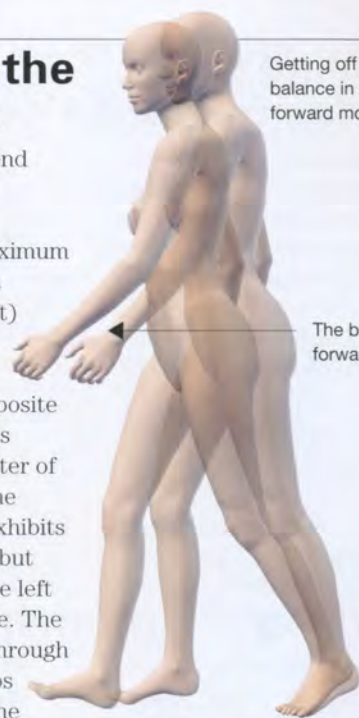
The foot is planted with the leg perpendicular to the ground

Impact

6

## carrying on the momentum

The leg and hand extend fully forward in a sliding motion. The arm swings approximately until a maximum point. The hips (the right raised higher than the left) and shoulders (the left raised higher than the right) twist slightly in opposite directions, while the areas around them and the center of the head do not move. The head remains level and exhibits an up-and-down motion, but the neck does not tilt. The left hand and leg stop in place. The nonparallel lines drawn through the shoulders and the hips cross each other. Thus, the spine is slightly flexed laterally. The area around the belly button and the middle of the forehead remains aligned to the center. If these two points swing, control over the center of gravity is lost, either from front to back or from side to side.



Getting off balance in a forward motion

The body slides forward.



The control point for the center of gravity does not move.

10

## on to the next tumbling

The first step is now completed. As the first countermove, the body's center of gravity shifts to the right leg while the left leg moves forward to attain a posture. The sole of the left foot is also lifted and the thigh is sent forward past the perpendicular line. The right foot is immobile. The muscles tense to support the body's weight and both arms return in position. The hips and shoulders twist similarly in reverse.



12

## sending the left leg forward

The action is half completed. The position is practically the flip side of the action at the very beginning, with the arms swaying lazily. The left leg is comfortably in front, with the bottom of the foot looking back and the toes slightly raised. The left side of the waist is still lower because the left leg is acting as the pivot to propel the body forward.

14

## getting off balance

This is the flip side of frame 2. From here on out, let's examine some of the finer details of this action and study aspects of different walks. There are all sorts of walking styles. One striking example is the big restrictions inflicted on a person wearing high heels.

restrictions from wearing high heels while walking



16

## advancing the left leg farther

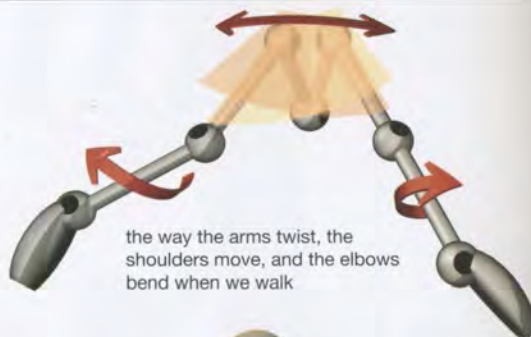
This is the flip side of frame 4. Women have restrictions inflicted on their walking by not only high heels, but also the shape and length of their skirts. In this frame, the material of the skirt would press against the top of the thigh, and from there down, horizontal wrinkles would be seen.

18

## carrying the momentum on

This is the flip side of frame 6. Let's check out the movements of the arms in more detail. The left arm is returning forward. The elbow is straight, and the fingers are bent back. The arm is slightly farther out than the shoulder. The right arm is swinging forward. The elbow is bent and the forearm is

thrown forward and is twisting slightly inward. The palm is facing down, and the wrist is bent slightly downward. Neither hand is exerting itself and is just going with the flow—slightly rounded and spread out.

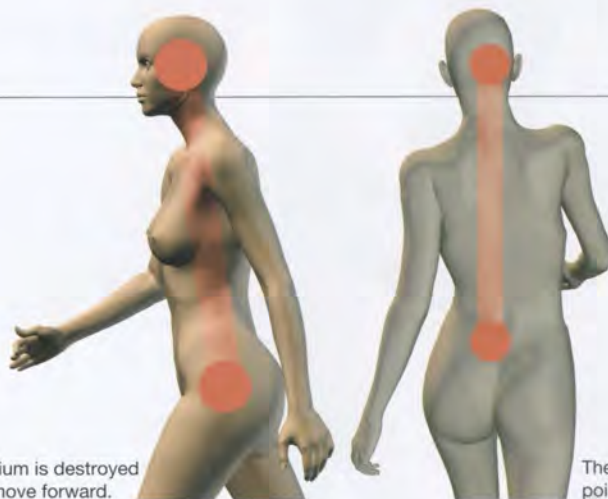


the way the arms twist, the shoulders move, and the elbows bend when we walk

20

## landing and its impact

This is the flip side of frame 8. The thigh muscles on the left leg are flexing. The spine is slightly bent to the side, but the navel and the middle forehead are still in a straight line. From the side, the head looks like it is out in front. The waist is a little bit to the left and forward, and the right shoulder is slightly in front.



Equilibrium is destroyed as we move forward.

These gravity-controlling points do not move.

### 1-2. Restrictions on walking

We naturally change our posture and speed when walking, depending on whether we are tired, in a hurry, etc.

### • Women's high heels

High heels inflict a big restriction on women who wear them. These

shoes narrow the length of a step because they limit the movement of the heels. We can also see the importance of the toes when we watch someone walk in high heels. The reason women can't take bigger steps when wearing high heels is that the toes are already fully extended and can't stretch anymore. The

reason the feet can't stay behind longer is that the toes are bent and can't support the body's weight. It is more difficult to balance in high heels as well, which is why women take smaller steps when wearing them.

### • Women's skirts

Tight skirts that come to just above

or below the knee do not hinder a woman's walk as much when they have a slit in the side. Tight skirts enhance the bend of the back leg and keep the front leg from advancing much. It is worth the time and effort to study the construction of skirts and know how creases appear on them when a person is walking.

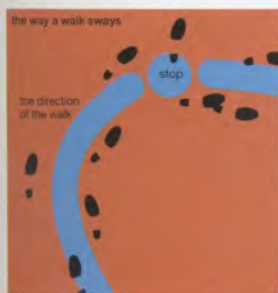


## on to the next tumbling

This is the flip side of frame 10. Let's investigate the head. It stays level, though it goes up and down a little because it can't stay at the same height while the legs alternately take steps. The neck is not straining, but it is ready to suddenly lean to either side if it needs to absorb a blow. That's why the head can stay still during walking, as long as there are only small movements from the shoulders down. Of course, the head is not completely immune to reactions; it moves just enough to not affect its field of vision. Note that the head is usually leaning a little bit forward.

## again with the right leg

This is the same as the first frame. But this is not the end. Like in the other frames, the body is ready to lead into another action. This frame can link with the second frame if the walk continues.



## ETCETERA

### Walks change according to the physique and age of the person

There are all sorts of walks. They change according to people's figure, age, and personality. Fat people place more burden on their legs. To shift their body weight, they control their posture in a very different way. The arms create a big half circle as they swing along the fat spilling over the sides of the stomach. The body weight is constantly pulling forward, so the upper body leans backward. Because the range of vision around the feet is limited, movements tend to be slow.

But age is probably an even bigger factor in walking than physique. Infants who can't control their posture and

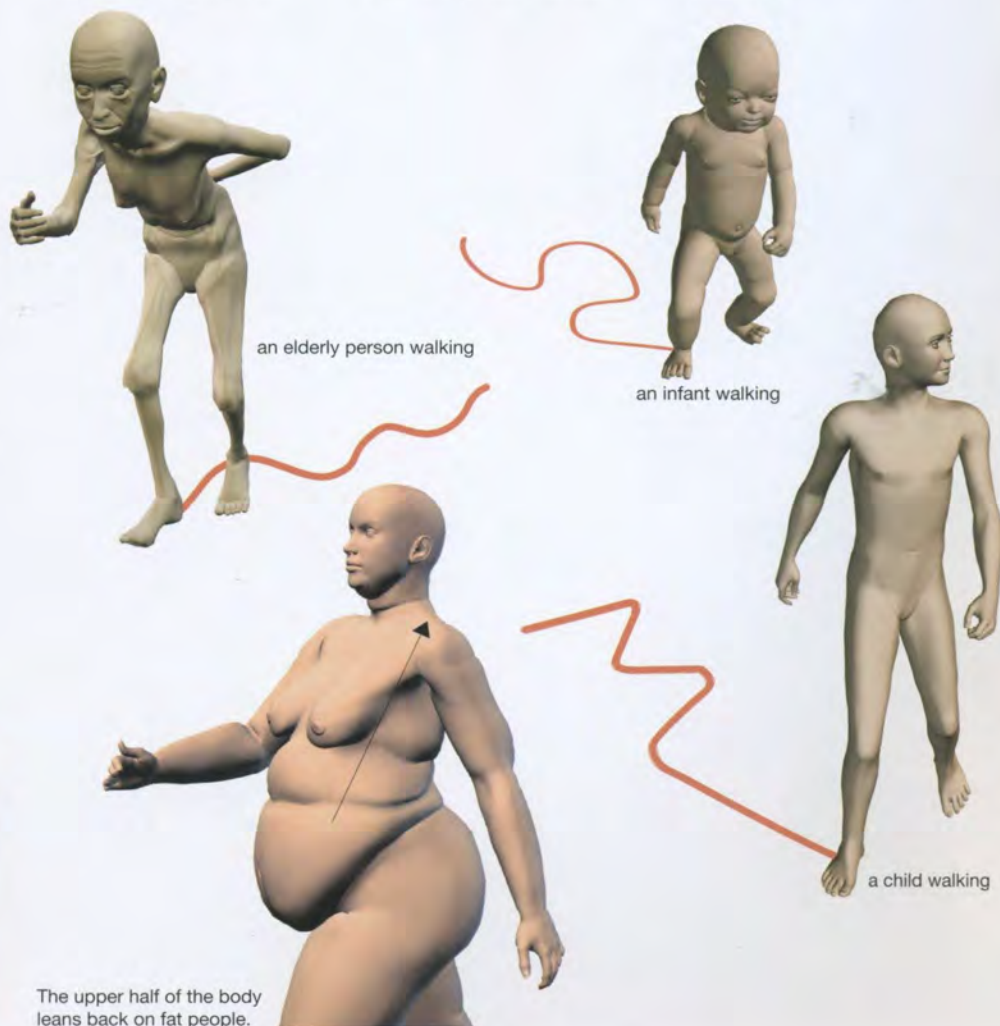
children who let their actions be led by what interests them don't walk straight.

Adolescents walk in a simple way because they haven't developed a self-conscious style yet. Self-consciousness sprouts in adults, and walking changes in all sorts of ways. At age 40 or so, walking feels like exercise, as it tires us. The elderly may use canes or have to muster up all their might to move.

In the first half of our lives, the reasons that our walks differ tend to be inside ourselves. In the second half, the reasons have more to do with the condition of our bodies, especially our hips

and joints. But in any movement, our personality and reflections of how we want to be viewed by others can be glimpsed. Walking is one activity where this sort of self-consciousness can be strikingly apparent.

People rarely walk in a straight line and with the same feeling. Many reasons exist to make this so. From physical reasons like differences in the grade of the path to reasons driven by personal feelings, we manage all sorts of things as we walk. Make sure you don't have the footprints falling in a uniform pattern, as if they were all measured out.



The upper half of the body leans back on fat people.



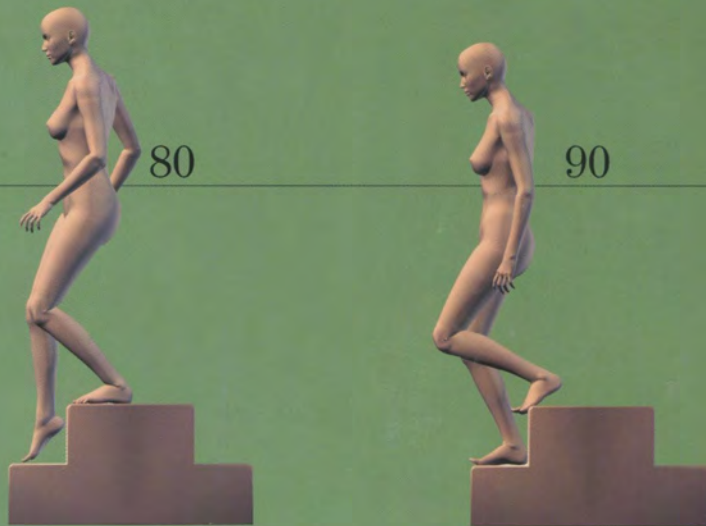
This sample action is just about 4 seconds. The woman walks up and down two steps. Each second includes 30 frames, and we've pulled out every tenth one to display here.



# climbing up and down

lifting the body up, then cautiously bringing it down

The ground is uneven. That's why we've constructed stairs to smoothly climb up and down. How does a person comfortably climb up stairs, or how does she safely climb down them? We'll step directly into the issue of people and stairs, and investigate an action that is more difficult than walking by breaking it down into small doses.

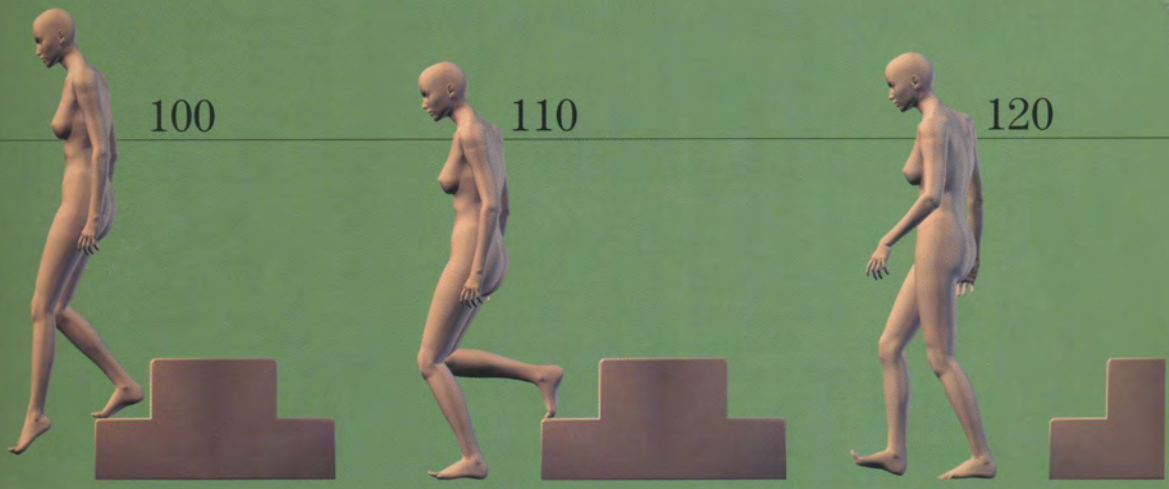
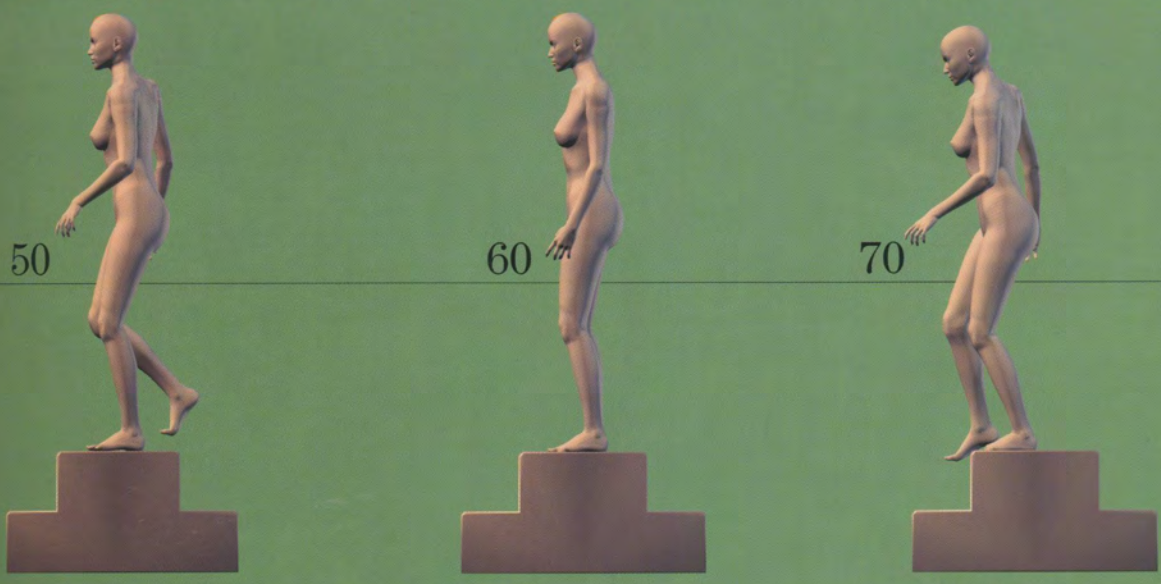


Movements

Exploring the Mechanisms of Body Movements

climbing  
up and down





down



0

## checking the steps

The steep steps used in this sample clearly show how the body changes. Most steps are not as high. For starters, as the person approaches the step, she looks at the first one. She then lifts her right foot to place it on the step. The hip is facing slightly out and toward the right.

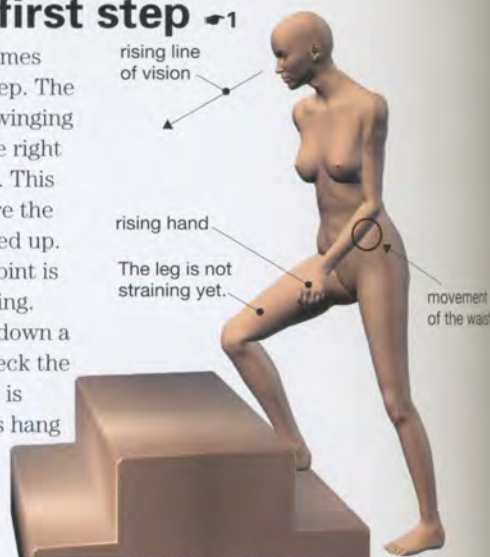


checking the footing

10

## onto the first step

The right foot comes down on the first step. The left arm reacts by swinging forward and up. The right leg is exerting itself. This is the moment where the body weight is shifted up. The action at this point is very similar to walking. The head is angled down a little as the eyes check the next step. The back is sloped and the arms hang at the sides.



creating the energy to climb

20

## bringing the body weight up

By using the strength of the right leg and the forward-leaning tendency of the upper body, the waist is moved. By using these reactions, the body weight shifts and the person successfully climbs the first step. The upper half of the body leans quite a bit, and the chin juts out. The hands float in the air—they have nothing useful to do at the moment. The waist and the rest of the body move to the left and forward. The right leg, which is supporting the body by itself, is bent. The body is being lifted into the air by the person's energy as well; the leg does not have to bear the full weight of the person.



using energy to lift the body weight

30

## setting off for the last step

This is just before the person steps on the top stair. The left leg has yet to touch down on the surface. In order to come to a stop on the top stair, the body begins to shut down the continuing reactions that would normally take place. Most of the body weight is shifted to the slightly bent right leg. The upper half of the body is leaning forward a tad, and the waist is still directly above the right leg. The right arm swings forward.

### Opposing gravity on the way up; being pulled by it on the way down

Stairs are made so that people can climb them one at a time and descend them as well. When moving across a surface that has different grades, the body bears a greater burden than when it is just walking. When climbing, the body has to lift all its weight while opposing the pull of gravity; when descending, the body has to control its reactions as it shifts its weight lower. Going down is harder on the legs and hips as people

are pulled by gravity and are careful not to fall.

People move up and down at a slower speed than when they walk. When going up, the energy needed to lift the body slows them up; when going down, the body is slowed because it is careful not to misstep. Also, the head is placed differently than when it is walking. This is a unique form of movement, and people must control their center of gravity, which is why we should pay close attention to the head's placement.

It's also necessary to understand

how stairs are made. The angle of the stairs, their width, the presence of a railing or antislip material—stairs are made of many components that affect the way we move.

### 1. Onto the first step—how the parts move

The hips are still in the back, with the leg closest to the ground. The head, which was looking down, shows its intention to move ahead by sticking out. The upper half of the body leans forward. The left leg helps by staying where it is.

### 2. The line of vision when bringing the body weight up

If someone is climbing a long flight of stairs, that person can estimate the height of the next step, so he or she usually looks farther up the stairs. But if the staircase is like those short stone staircases found on walking trails, a person might not see that one of the stones is missing and step right into the hole. We check out the first step carefully, then we tend to look farther up the path.



# 40

## arriving on the last step

The left leg exerts itself as it lands on the top step. The right leg's role is almost finished. The upper half of the body, which had been leaning forward up till now, straightens up. This is the body's way of preparing to balance while standing still—it shuts down all of the impulses to continue on. The head, which had been angled down, returns to a level position. This is the posture of someone who has just climbed a hill and finds herself on level ground. The hips are low. They have carried weight to this point. After this, they will be in a higher position.



# 50

## just before the pause

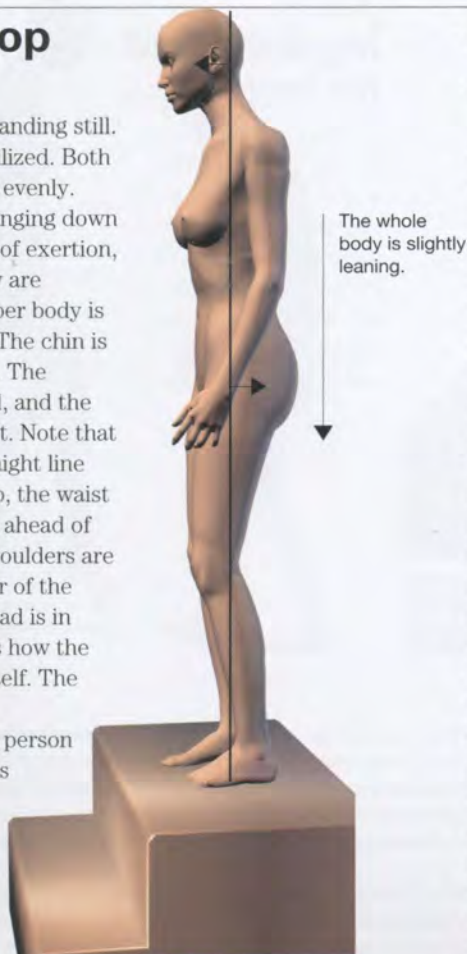
The left leg has jumped up and is stretching, bringing the right leg up in reaction. The waist is still being pulled a little, and the body weight has yet to settle. All of the weight is on the left leg, and the right leg is coming to help. Once the legs are even, the body goes into a resting posture. This is the point just before the body is still, so all of the movements are slowed down substantially.



# 60

## on the top step

The body is standing still. The waist is stabilized. Both feet are standing evenly. Both arms are hanging down without any sign of exertion, even though they are swaying. The upper body is stretching back. The chin is slightly drawn in. The shoulders are full, and the knees are straight. Note that if you draw a straight line from the heels up, the waist would be slightly ahead of the heels. The shoulders are behind the center of the waist, and the head is in front of it. This is how the body balances itself. The action has been completed, but a person can't stay like this forever. The joints begin to bend as they prepare for the next action.

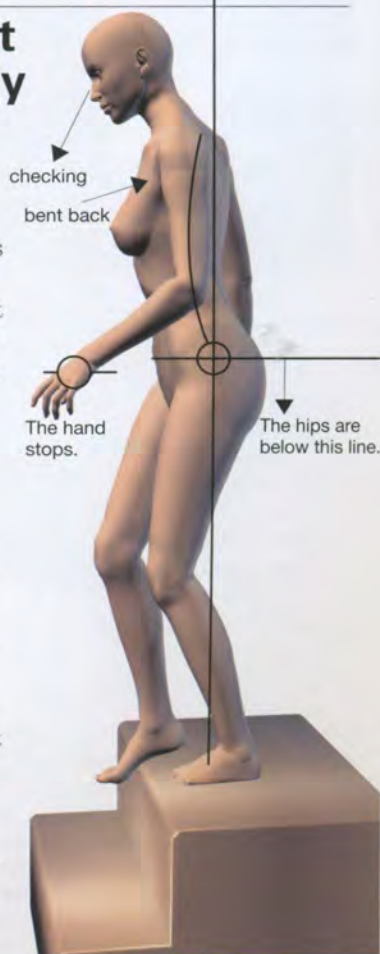


a resting posture in the middle of the action

# 70

## taking the first step cautiously

From here, the body descends the stairs. This is the point when the first step is made. The waist is a little lower but in the same place as before. The left leg supports the body weight, and the right leg moves cautiously forward. The right leg is extended as it searches for a spot on the lower step. Both arms help the body balance by being slightly raised and to the sides. The right arm maintains the same position as before, while the left arm moves to try to compensate for the imbalance caused by the right leg's action. The body is leaning forward, and the head is looking down. Just as when the body takes its first steps up, it is very careful when taking the first step down. The shoulders are rounded and behind the hips. From this position, it is still possible to stop descending and return to the top.



descending uncertainly

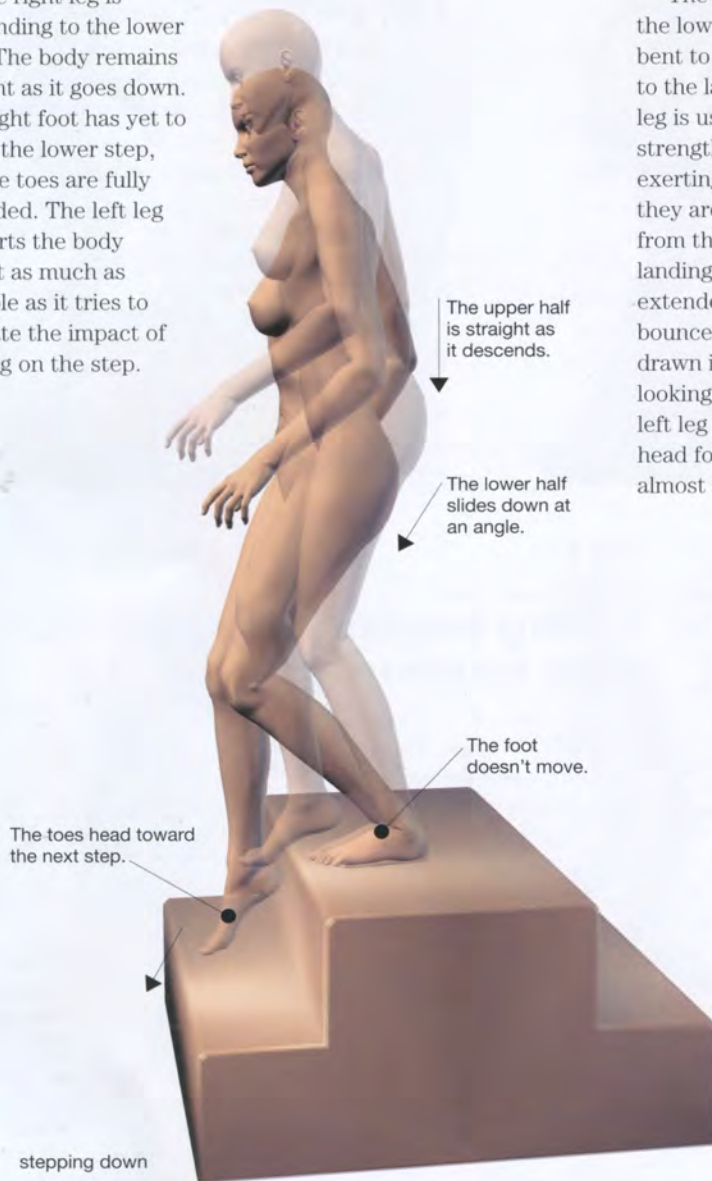
ement  
the waist



80

## letting the body fall ↻3

The right leg is descending to the lower step. The body remains straight as it goes down. The right foot has yet to touch the lower step, but the toes are fully extended. The left leg supports the body weight as much as possible as it tries to alleviate the impact of landing on the step.



### ↻3. The cautious first step

We slowly start our descent on stairs through the efforts of the left leg and the way the waist remains in a higher position. The first step is especially cautious. The rhythm and movement of actions up to now change at this point, no matter what the preceding actions were. This is an interesting point to investigate more closely.

### ↻4. The impact and range of vision when the next step begins

Basically, people don't watch each step they make. Unless there is some special reason—like dangerous material afoot—people don't just look down as they advance.

The impact of landing can be seen in the muscles and joints, but it also

90

## onto the next step ↻4

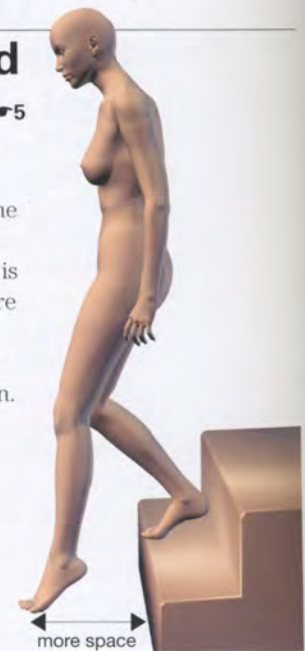
The right leg lands on the lower step. The knee is bent to soften the reaction to the landing. The right leg is using a lot of its strength. The arms are not exerting themselves, but they are stretching down from the impact of the landing. Once they've fully extended, they sort of bounce back up. The jaw is drawn in; the eyes are looking farther ahead. The left leg begins quickly to head for the next step; it almost slides off the step.



100

## landing and its impact ↻5

The legs stretch out for the final step. This step is different from the last; the groin is stretched further. This is because the steps before this were narrow, and the leg has arrived at a wider surface to step on.



can be seen in a woman's breasts or hair. The body sinks for an instant, then bounces back to normal. The movements are fast because they are falling actions.

### ↻5. The last step is full of relief

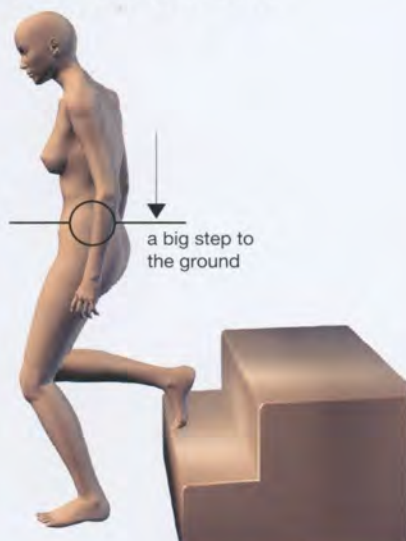
When the bottom is reached, movements are influenced by physical and mental feelings of relief

at being released from the restrictions of the stairs. This movement, free from the tension of previous movements, can be a little negligent. The body doesn't support itself as strongly, and the impact of this step can be stronger.



## carrying the momentum on

This is the last frame of the descent. Once the ground is reached, the body is propelled forward. To control this, the legs take shorter steps. The head is forward as it checks the place the body is heading towards. The upper body leans to the right, just as the front foot does. The knee cushions the impact by bending. The waist also lowers. When the waist is in a lower position, it is proof that the leg muscles, not the bones, are supporting the body weight.



## back to normal walking

The momentum propelling the person after the last step to the ground is controlled in one step. From here, the person can walk at a normal pace. The descent of the stairs is complete, but if the staircase was a long one, a throbbing can be felt in the thighs. It seems that we would tire more on the way up, but actually the back and legs have more of a burden to bear on the way down. To soften the blow of going down the stairs, the legs have exerted themselves quite a lot.



### The structure of steps; the effect of shoes

When climbing the stairs, we lift a leg, advance the hips, and shift the body weight with a burst of energy. If the stair is short, the strength of the leg and the movement of the upper body is enough to advance. But the first step involves bigger movements than the other steps. From the second step, we

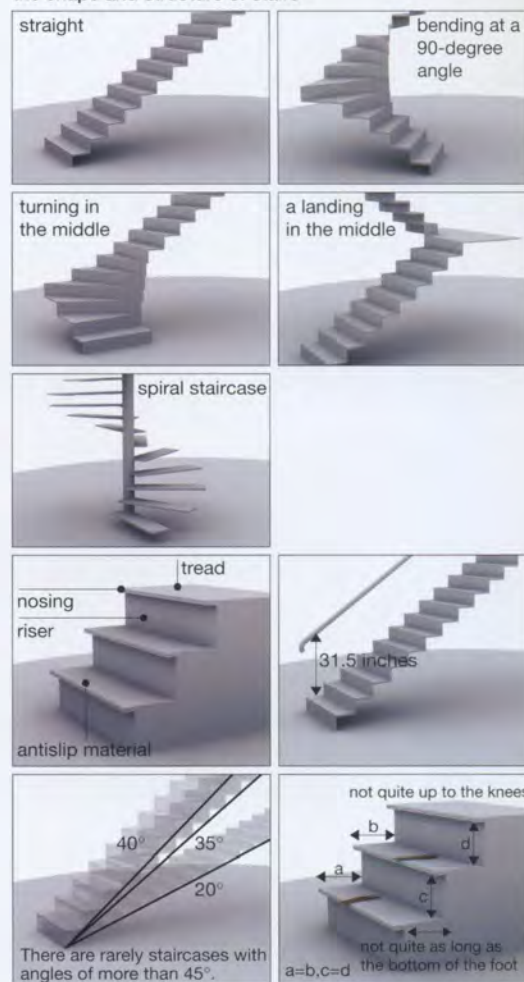
can use the energy from the first and get into a good tempo as we climb.

In this sample, we've used two tall steps, but in reality stairs are rarely that tall. Some stairs are very difficult to climb, and this creates different body movements than those seen in this example. To capture movement on these sorts of stairs, closer study is necessary.

We also need to pay close attention to instances where the person is wearing boots that immobilize the ankles. When climbing and descending stairs, if we can't use our ankles to help our feet land properly, the body weight won't be supported and our posture becomes difficult to control. Sometimes, a person won't be able to bend her knee because the

back leg can't support the body weight or the ankle of the front leg is unable to move. When we look at instances where a person is disabled in some way, it is easy to see the roles of different body parts.

### the shape and structure of stairs



## E T C E T E R A

### A variety of stairs

Generally speaking, there are five types of stairs: straight stair; ones that bend at a 90-degree angle; ones that bend in the middle; ones that have a landing in the middle; and spiral staircases. The top of the stair is called the tread. The part that is perpendicular to the ground is the riser. The part of the stair that juts out a little and has antislip material on it is called the nosing. It is there to make the steps just a little bit longer. If there is a handrail, it is usually 31.5 inches above the steps. There are very few stairs sloped at 45 degrees or more, or steps shorter than 7.9 inches.



This sample action is of someone who has been running completely unencumbered for a while. This action shows 1 second of the running in 30 frames. We've provided almost every other frame here.

frame

0 initial stage

4



# running

the continuously bounding body

Running is not an everyday activity for everyone. Perhaps that's why we can see an elegance and refined beauty in this action. It's an action where half the body is working very hard. It's also an action that isn't always done in an ideal way. In this chapter, we will explain and examine the physical side of running from the viewpoint of someone creating animation of the human body. We will also look at the basics of running and how circumstances can transform a person's run.

22

24

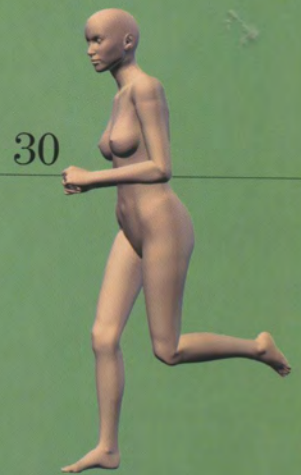
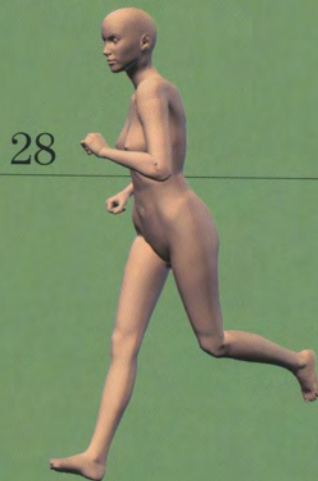


Movements

Exploring the Mechanisms of Body Movements

running

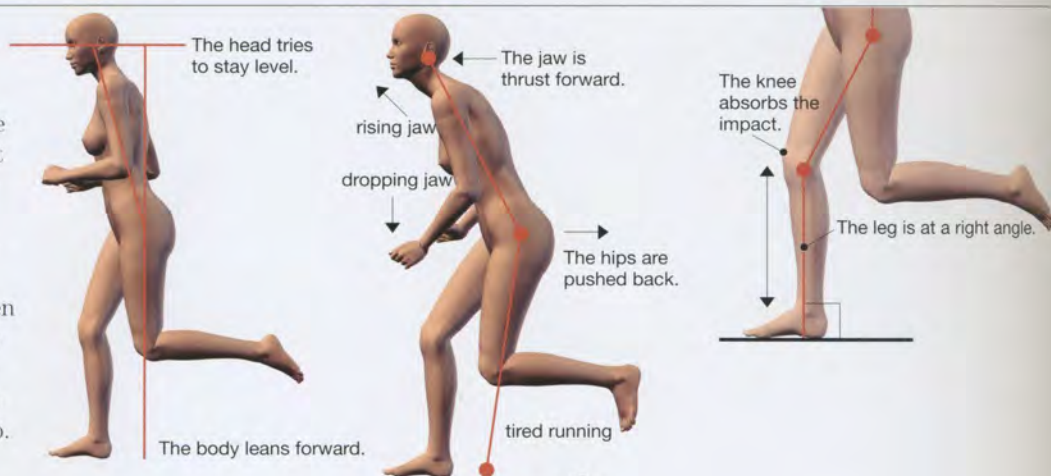






## impact of landing ◀1

This frame captures the moment that the right foot lands on the ground. The right leg is using a lot of strength, and most of the impact of landing is absorbed by the knee. Even so, the whole body shakes from the impact. Because the leg is coming up again soon, the hands don't drop.



## 4

## body sinking down

Once the right foot has landed, the body is propelled forward, pushing that foot to the rear. When you look at someone running, this is the lowest point. The right arm stretches out before the rising left thigh, which is also heading forward. When the right

foot hit the ground, the whole body felt the impact, and women's breasts sag for a moment. The jaw also drops a little, although the head is trying as much as possible to stay level. The shoulders are sunken. From here, the whole body begins to rise.



the body at its lowest point



The point of contact doesn't move.

### Three telling characteristics of human movement

The three most important characteristics of human movement for animators are consciousness, weight, and habit. Consciousness refers to what a person is interested in and where he or she is looking. It also refers to separating consciously made movements from subconscious ones. Weight affects possible reactions to movements, including preparatory and successive actions. Also the animator must consider how

weight is supported and balance is maintained. The final characteristic, habit, is about individual differences. Movements can convey differences in gender, age, and race, and bring out the character and circumstances surrounding the individual. These three categories are prime subjects for further investigation and must be enhanced in the depiction of the human body.

Another important and fundamental topic is the understanding of the human structure. We move around

without much thought of how our bodies work, but actually human bodies have shapes formed by movements and movements formed by shapes. To use a very simple example, because we have two legs, we necessarily tend to walk in a certain way. However, we weren't given two legs for the purpose of walking. Once we deeply understand the human structure, we can probe beyond the general circumstances and imagine more movements.

## 6

## body bouncing up

In one burst, the body tries to rise diagonally. The shoulders shrug as they rise. The right arm moves closer to the chest to maintain balance. The fist rises first; the shoulders follow. Remember that the fist's rise is especially fast. It is driven to rise; the hand uses its strength to stabilize the body. The underarms are firmly shut. The left thigh is exerting itself and is just about to kick up.



The shoulders look as if they were suspended from above.

The arm bursts up and near the body.

### ◀1. The impact of landing—posture and body weight

Look at the picture in frame 0. This is one picture taken of a woman in the middle of a run. The upper body is leaning forward a bit, the head is raised, and the eyes are staring ahead. Usually, the jaw is slightly drawn in when running. When a runner gets tired, the jaw begins to jut out. This movement forces the shoulders out, slopes the back, and pushes the hips back.



## body stretching up

The left leg has risen. This gives birth to the biggest reaction. To run faster, the thigh rises higher. The waist and shoulders twist deeply to retain the equilibrium on either side. The right foot is pushing off the ground at this moment. The body is leaning forward and pushing up. The right arm stays up. At this point, a woman's breasts would be flung to the left and up. The upper body also twists this way. The left arm is bent at the elbow as it pushes back. This is the point where the body is at its highest, as the shoulders, arms, and legs all push the body up. From here, the body sinks.



## body falling

The body begins to fall. The arms and shoulders continue their movements. The elbows, shoulders, and chin stay raised. The left leg stretches out quickly in an effort to land as far forward as possible. The right leg has left the ground and is released to the rear. The body looks as if energy is being drawn from it as it falls forward and prepares for the next impact.



## landing and proceeding

Now the left leg lands. The left leg below the knee is at a right angle with the ground as the knee and thigh try to absorb the impact of landing. The body continues to sink. The image here—stable and strong—is different from before.



## preparing for the next jump

The body continues to sink. The left leg is preparing to push the body upward. The right hand also subconsciously comes back. The left hand begins to lift the upper body. It is trying to keep the right leg from turning the body around.



## carrying the momentum on

The body has sunk again. The left leg is bent, and the whole body is low. A low stance indicates that the body is carrying a burden. Because the person leaped forward, she must sink. This sort of compensation—to move faster, a person has to bear more of a burden—is what tires a runner out over the long haul.





## body stretching up

The body begins to stretch out again. The left leg uses a lot of strength to propel the body upward. The left arm has also risen. The right leg is already coming to the front. At this point, the toes on the left foot are tightly gripping the ground. For comparison, the toes on the right foot are just being carried along. The left arm is making conscious actions, and the upper part is exerting itself.



### Running without swinging the arms

If we can't swing our arms when running, we become unstable and we can't lift our legs as high, which reduces our speed. To run fast without using our arms, we may try to make our strides longer or make the legs go back and forth faster. With the former, the body will rise more, making the impact upon landing stronger, but the movements are

slow, giving the body stability. With the latter, the body minces forward in an agitated fashion. While the impact of one step is slight, the body constantly swings wildly, creating instability.

### Out-of-control, wasteful actions

When we tire, our movements become confused. We really don't want to use our muscles any more, so

## legs at full stride

The left and right legs are at their most distant. The left leg is once again off the floor and kicking backwards. The left shoulder is pushing

forward. The head tries to stay level but it still moves quite a bit because the upper body is twisting a lot during the run.



## just before landing

The right leg is extended and near the landing point. Note that the shoulder will swing out more than usual if the runner is carrying something or can't swing her arms for other reasons.



### Turning awareness on and off

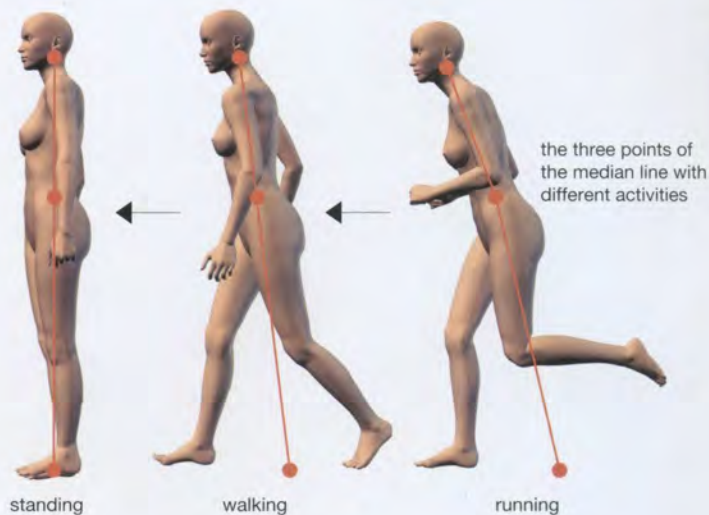
Running is an action that clearly shows when awareness or consciousness is "on" and "off." The arm comes forward with intention, which means it's "on." But it's "off" when it swings back. The legs are "on" when they thrust forward or when they kick off the ground, but they're "off" when they extend backward. This doesn't mean that runners consciously think that it's



## body stretching up

The legs stretch out again. The extended leg heads toward the ground, and the knee bends just before impact. The median line of the body, which runs through the center and connects the central spots in the shoulders and the waist, is a very important tool in understanding the upper body at all times, not just when running. If these two spots start

to slip out of line, the head or legs will always try to compensate. If they slip too far, the runner could fall over. Note that with any movement, the connection of these two spots and a third spot where the feet hit the ground dictates the movements of the arms and legs. The median line is especially important for a person standing straight.



## at the end of a full cycle

This frame is the same as the first one. The impact of landing is running through parts of the body. This frame can be seen as both the moment of the biggest vibration and the stillest moment. Even as the run slows, it is still a run and not a walk. The difference is in how the leg kicks up from the ground during a run. In fact, this is the most distinct characteristic of running. It doesn't even occur in fast walking.

Now you can begin to see when the shoulders, hands, hips, and other parts are at their highest and lowest points, and when an action is intended or involuntary.



time to swing their arms. Running is something we have become used to, so we run in a manner that is most comfortable to us.

Any action has levels of mastery. Running is not something we do every day, which is why differences emerge. An extremely different form of running would be skipping. People don't run that much. Running puts a big burden on the body, which makes us reluctant to run again. If it's not for

exercise or training or some other voluntary reason, most people run as if they have no choice.

Usually, people don't run in a straight line; they may turn as they run. They tend to form a bit of an arc because of their momentum. When turning a corner, it's dangerous to just check for oncoming traffic at the last second, so runners slow down by leaning their upper body back and putting a stop to their reactions.

Also, running for a long time and running for short bursts are clearly different. It's the difference between pacing yourself and going for speed. When running, toes play a significant role in lifting up the body. So shoes—with hard, unbendable soles—seen on hard leather shoes, for example—are not suitable for running. They don't allow the toes to bend on the ground to lift the body. For the same reason, high heels and loose

sandals are also unsuitable. Boots and high-top shoes restrict the ankles, and backpacks put a burden on the body, making it increase its reactions to compensate. We need to consider all of these points and more once we have understood the basics of running.



Movements

jumping

This sample action includes three continuous actions—visualizing the feat, jumping, and landing—that take about 3 seconds to complete. With 1 second taking 30 frames, this action has 85 frames. We've chosen almost every seventh one to display here.

frame  
0 initial stage



7



# jumping

the shape of consciousness

Now for jumping. We'll focus on the mainly conscious decisions made here, from the difficult task of controlling the body weight to the building of the strength needed to make a jump. With any action, there is first an intention and then the action trying to fulfill that intention. In the continuous act of jumping, what intentions are at work as movement occurs? Let's take a look at a vertical jump to learn.

56



63





14



21



28



35



42



49



70



77



84





## visualizing the feat **1**

First the hand stretches up toward the target and confirms where to aim. This is more than just checking on the target—it's like

rehearsing the jump. Often the person will stretch her arm a lot as she marks off a spot as high as she thinks she can jump.



### The shape of conscious movements

There are many ways to jump, but we selected the vertical jump because the conscious transitions that take place are striking. The vertical jump is used in physical examinations to measure a person's vertical spring. The reaching hand will touch a line on the blackboard that shows the height of the jump.

Basically, the person doing the jumping will aim for a spot as high as physically possible. Not much

thought is given to what happens after the jump, which is why people often fall after an attempt. If a person is planning to make a high jump, her actions before the jump become bigger. The eyes are fixated on the target, and the fingertips pulsate with awareness. The whole body sinks deeply, and the arms swing a lot to build toward a big reaction. While these actions are taking place, the consciousness is concentrated on jumping high, and the head is eyeing the target. At the same time, the body

## bending the body forward

The body gets ready to react. The upper body sinks and leans forward. Now, as the body sinks, the consciousness switches from the target above to the space in front of the knees. We treat our face as the most important body part, and consciousness follows it. This rule is not limited to the conscious moving of arms and legs. In this frame, the head is still slightly raised as it just begins to change its focus. The hips are pushed back, and the chin is thrust out. The arms aren't really being controlled, as they're not consciously involved in the action. They are hanging and slightly separated from the body as they help it keep its equilibrium and wait for the chance to jump.



## sinking the body down

The body begins to sink. The shoulders drop, and the back rounds. The face looks down; the eyes gaze out at nothing in particular. The hips are pushed farther out and down, and the back becomes even rounder. The head and hips work at keeping the body balanced. The arms, until now unaware of the action, begin to exert themselves to prepare for being held aloft by rising a little and extending outward. This is the moment where the action switches from sinking to reacting.



is subconsciously working to make the jump as high as possible. The intensity of the action to come is steadily focused on the target.

People rarely jump without a purpose. This is true about other actions as well.

### ◀ 1. Visualizing the feat—the movement and consciousness of different parts

The head is pointed at the target. The person is coming to grips with

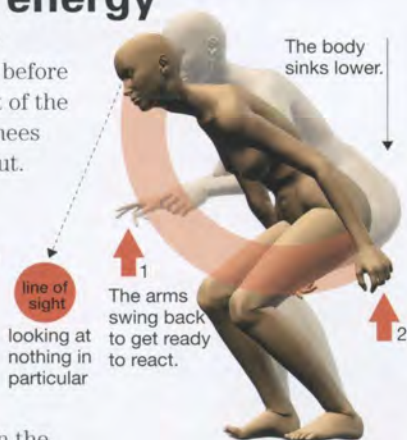
the distance from her position to the target, and though she is not jumping, she is reaching toward the target to confirm it. Although the arm is stretching to its limit, the legs are not assisting by stretching out the back. To prepare for the jump, the knees bend slightly, creating a flexible posture, but this is done subconsciously. The upper body is twisting up and to the right. The right arm is in control, but the left arm is just hanging there.



21

## holding the energy

Both arms swing back forcefully in the moment before the jump. The upper part of the body sinks farther, the knees bend, and the chin juts out. The full weight of the body is being borne by the legs, and the tension is visible. The arms aren't really exerting themselves, but they are preparing to form a big arc. Up until this point, the hips have taken the initiative while sinking lower.



Consciousness is concentrated here.

35

## jumping

Both legs stretch out strongly and the body flies into the air. The strength of the legs is gone in an instant, and they now move in a slightly lax way. The whole body extends, and the shoulders rise. In this instant, the body parts that are under control and those that aren't are strikingly apparent.



### 2. Jumping—the shape of movements, consciousness in different parts

The eyes have been staring at the target. The right arm extends toward it. It's not necessary for the left arm to do anything, so it just sort of hangs in the air. But note that the left shoulder is firmly raised.

Consciousness is solely focused on

the right fingertips, not on the rest of the arm or the legs. The whole body is bent, putting the hips slightly in the front. The body is focused on trying to reach as high as possible with the right hand. This is a sudden burst of activity, so disorder can be seen in several places. But the head is still firmly pointing at the target, and the right hand is replying to it.

28

## stretching up

The body is released like a spring; it begins to stretch upward. The hips are up and a little forward. Both arms are making a big arc as they swing, lifting the upper half of the body. The eyes immediately search for the target, quickly darting to the upper right. While the upper half of the body bends back, it brings the waist along. The arms help here by rotating as the body prepares to leap. From this point, the legs strengthen and provide the final kick. This moment contains very fast movement.



42

## moment of accomplishment and release

The fingers hit the target for an instant. After hitting it, the right hand heads to the back. This action was created by fully extending the upper half of the body and doing a half turn with the arms, and now that the goal has been reached, the upper body bends back. But the head is still fixed on a spot beyond where the right hand was reaching. The body is pulled by gravity and is forced to descend. The left shoulder begins to slump a little. The legs look as if they are writhing as they are released to the rear. Like the instant when a marathon runner crosses the finish line, the controlled movements give way to more relaxed movements. At this instant, the consciousness moves from the right arm to controlling the posture as the body plans its safe landing. The connection between the head and the right hand is cut. The conscious control exercised in landing is not purposeful, but instinctive.



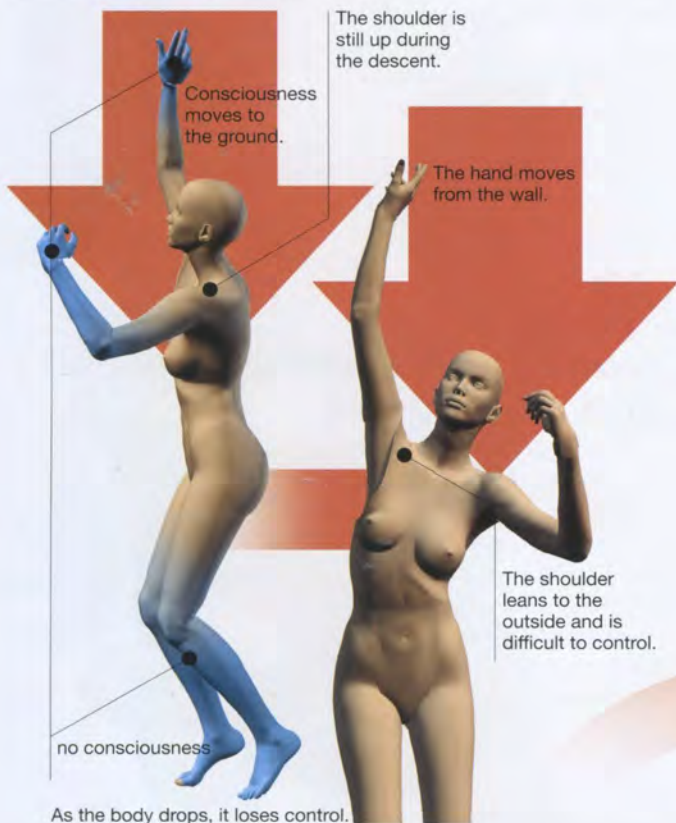


49

## body falling

The body begins to descend. It reflexively prepares for the descent by bending and going into a defensive posture. At this point, the action is probably not going exactly as envisioned. Body parts are probably not doing exactly what they are supposed to, and control is only partial. The person is falling

backward a bit. She is pushing her hips back and pulling them forward to retain balance. The legs are already bent and bracing to absorb the impact of the landing. From the front, the person's median line seems to be leaning to the left, making it hard to control the body weight.



As the body drops, it loses control.

70

## insecure balance

It looks as though the person has landed skillfully, but coming back from a big slip is not as easy as it looks. The balance is still a little off. To restore the balance of the upper half of the body, which was tilting to the left, the waist quickly jerks to the

right and the left arm swings out. The hips and arms are releasing the impact that the legs could not absorb. The head is raised and defending its position. Once the person has taken a little time to see if she is really stable, she'll stand.

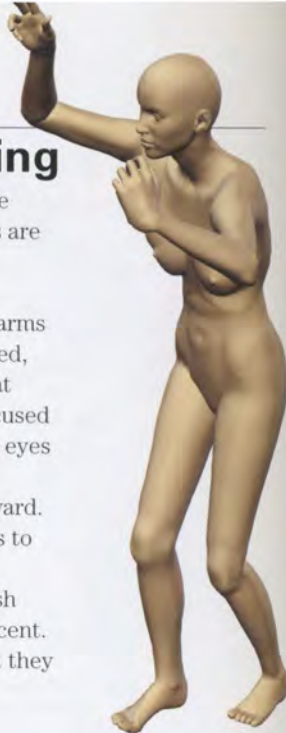


The left hand hurriedly tries to restore balance.

56

## awkward landing

This is the moment when the feet touch the ground. The legs are tense, but they are in control enough to move softly. Both shoulders are raised, and both arms follow. The back is quite rounded, but it is not leaning forward that much. The consciousness is focused on controlling the posture. The eyes aren't looking at anything in particular; they are cast downward. The head rises as the body tries to straighten the median line and restore balance. The body's flesh slumps as a reaction to the descent. The feet are on the ground, but they don't have steady footing yet.



63

## absorbing the impact

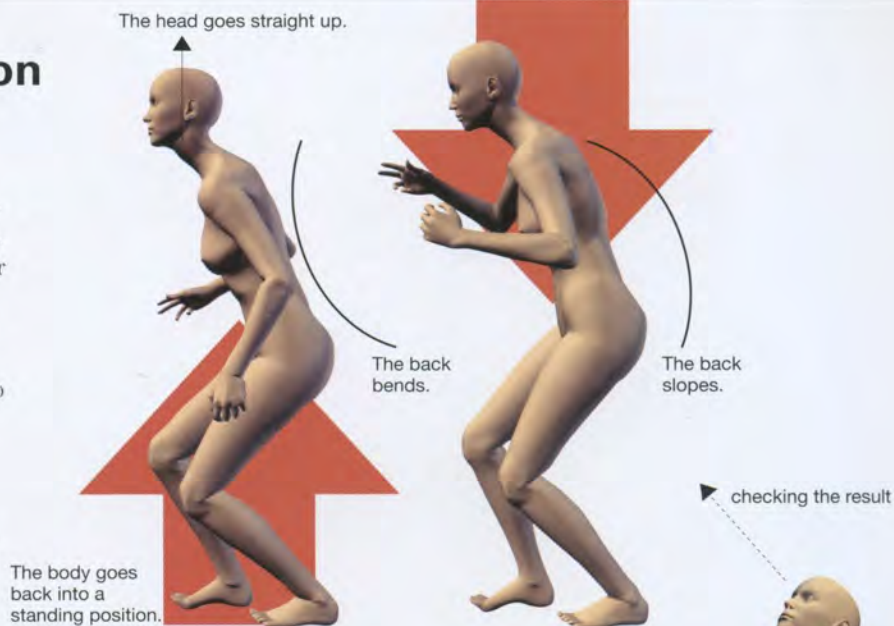
The footing is eventually established. The head is still raised. The shoulders are followed by the arms on a gentle descent toward the waist. The waist is also sinking. Both thighs are tense as they brace the body.





## back into a standing position

After balance has been restored, the body rises again. The head looks as if it is suspended from above as it stays fixed while the waist slowly rises. After the arms have finished their work, they keep balance while going slack and dropping to the sides. The hips, having been pushed to the back, now move up and forward. The body is consciously working toward a final goal of standing straight. Compare this to the instinctive shape of frame 63, and it is clear that the body intends to control its movements here.



## ETCETERA

### The processes of checking

1. sight
2. touch
3. smell
4. taste (perhaps the final goal all along?)



### The conscious and subconscious movement of body parts

Expressions of the ego are mostly depicted in actions. Even the desire to do nothing expresses an intention. Actions like sleeping on a sofa or lying on the floor with one's arms and legs spread out give us an inkling of the person. When depicting a living person with a will to do something, we must aim to show the person making a move that clearly indicates what that person wants to do.

Choosing something to do is the next step after identifying a person's interest. To know what someone's interests are, we have to study the person going through the processes of checking.

The man in the diagram (above left) goes through the processes of inspecting an apple. First, the apple is checked by the eyes. This is something we do even if we're not that interested in the apple. Next, the man touches the apple. Then, he reflexively smells it to see if it can be

## finishing up

All that's left from here is to straighten up the back and stretch out the knees. At this point, the head looks up and to the right for the target, searching for the mark made by the hand. The two actions—the subconscious standing and the conscious looking at the target—are done together. Of course, the person's focus is pulled toward the result of the jump.

not much awareness in these parts



eaten. If the object is the right size to put in the mouth, that is the next step. Of course, if he had inspected the apple before, he would cut out some of the steps. But be aware that all actions go through this process.

To understand the action of jumping, remember that the jumper changed her focus in several places. When checking the target, she then worked to see if she could jump even a little higher. Then she tried to touch that higher spot. After that, the jumper prepared to land. Lastly, she

checked the target again. At each stage, be clear about which parts are moving subconsciously and which parts are ignored. By paying attention to these points, you'll be able to see how a body begins to slip when trying to maintain its equilibrium. Was it a slip that came from not being able to control the body, or something caused by a part that wasn't being controlled? It's important to know what causes the swaying in the body.