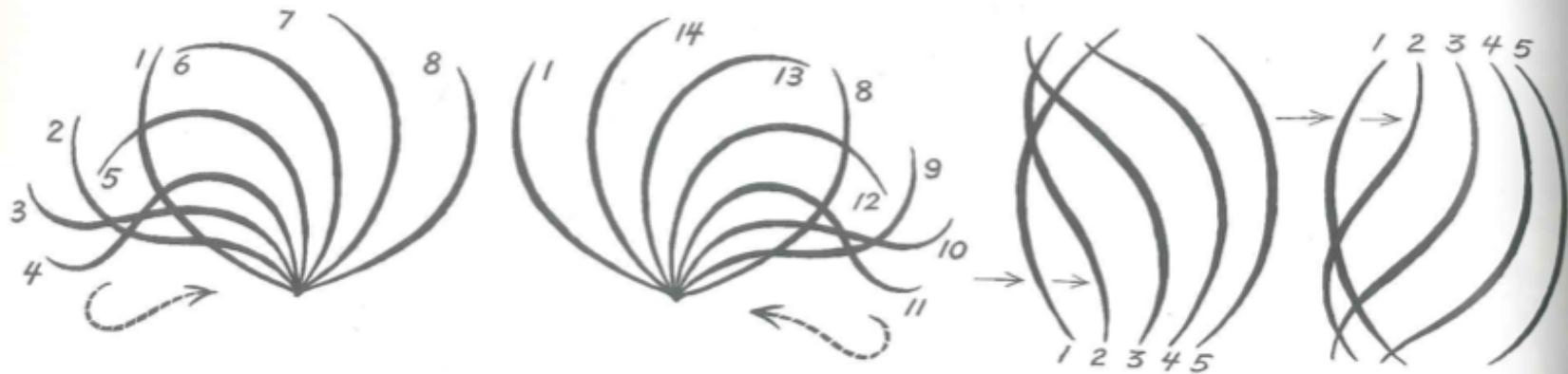# THE WAVE PRINCIPLE

RHYTHM IN ANIMATION ACTION IS BASED ON THE WAVE PRINCIPLE. THE "LINE OF BEAUTY CURVE" (LIKE AN "S") ANIMATES AS A WAVE INTO THE OPPOSITE Z-SHAPE AND BACK. THE WAVE IS PUSHED OR MANIPULATED FROM ONE SIDE TO THE OTHER.

THE FIRST THREE DIAGRAMS ABOVE ARE WAVED FROM THE BASE; THE FOURTH IS WAVED FROM THE TOP. BE SURE TO WAVE RHYTHM IN THE RIGHT DIRECTIONS. IN THE EXAMPLE, THE HORSE WAVES THE COWBOY AROUND LIKE A FLAG.
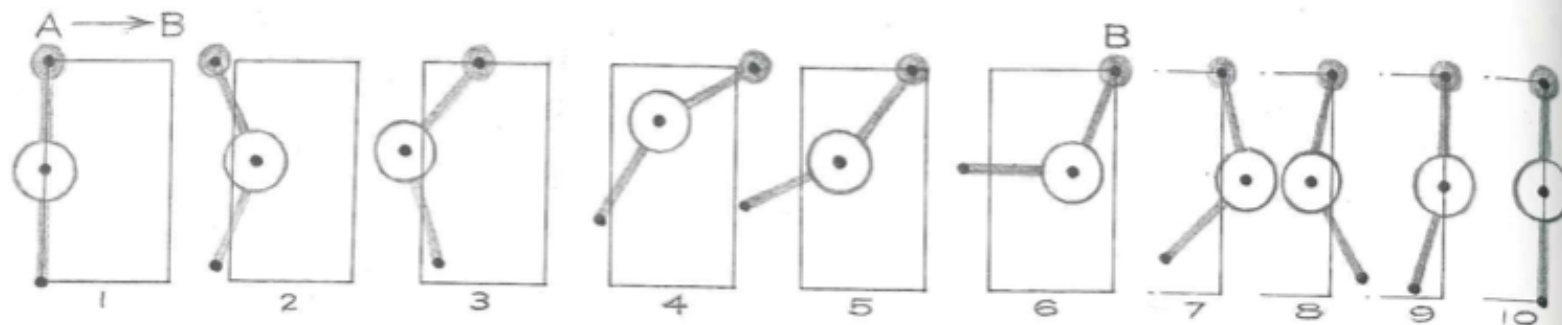

IN ANIMATION WE BUILD FROM THE FIRST DRAWING (AS WITH THE HORSE) AND START A CHAIN REACTION OF RHYTHM LINES WAVING. USE THE SECOND DRAWING AS A GUIDE. THEN WHEN

YOU GET THERE, REVISE IT SO IT FITS THE SERIES' WAVE PROGRESSION AND ANATOMY PROGRESSION. THIS PRINCIPLE APPLIES TO ALL ANIMATED CURVES.

DELAYED SECONDARY ACTION

MAKE OVERLAPPING ACTION WHENEVER YOU CAN. WHEN ANIMATING A CHARACTER FROM ONE POINT TO ANOTHER, DON'T GO THERE WITH ALL PARTS OF THE CHARACTER AT ONCE. INSTEAD, ARRIVE WITH DELAYED SECONDARY ACTIONS, AS ILLUSTRATED ON THIS PAGE.

WITH **DELAYED SECONDARY ACTIONS**, ALWAYS GET A GOOD FOLLOW-THROUGH ON LOOSE-MOVING SECONDARY OBJECTS, SUCH AS COATTAILS, HAIR, EARS, AND TAILS. IN THE SQUIRREL ACTION AT RIGHT, ON PAGE 145, THE FEET ARRIVE FIRST; THEN THE BODY RISES. AFTER THIS, THE ARMS MAY ARRIVE, FOLLOWED BY THE TAIL.

THE DOUBLE PENDULUM ACTION ABOVE ILLUSTRATES A PRIMARY ACTION OF THE DARK CIRCLE FROM A TO B, FOLLOWED BY TWO SECONDARY ACTIONS OF THE PENDULUMS. THIS PRINCIPLE IS ALSO APPLIED TO THE ACTION OF THE DOG GRABBING A BUTTERFLY WITH THE PRIMARY ACTION OF HIS ARMS. HIS HIPS AND BODY ARE SIMILAR TO THE TOP PENDULU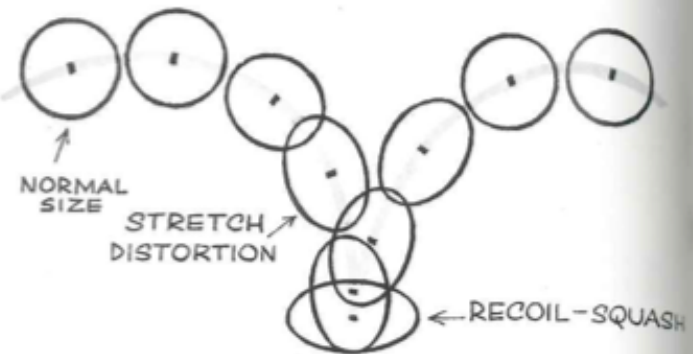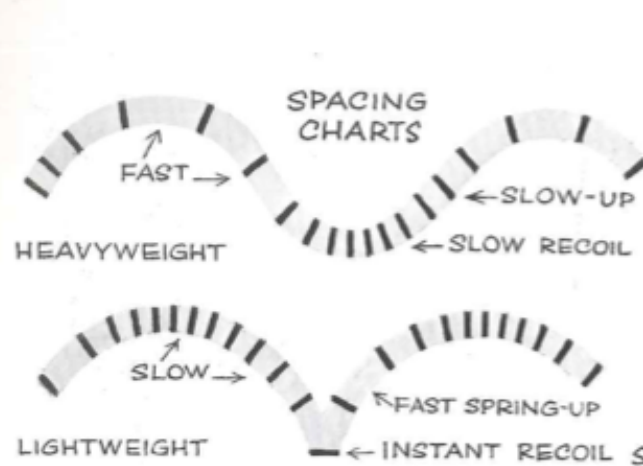M, AND HIS FEET AND TAIL ARE SECONDARY TO HIS HIPS, LIKE THE LOWER PENDULUM DIAGRAMS. THIS PRINCIPLE IS ALSO APPARENT IN HIS HEAD, WHICH SWINGS FROM HIS ARMS, AND THE EARS PENDULUM FROM THE HEAD.

DELAYED SECONDARY ACTIONS ARE EFFECTIVE IN PUTTING LIFE INTO POSES AND HOLDS. A CHAIN OF PARTS CAN ARRIVE LATE AT DIFFERENT TIMES AND IN DIFFERENT TIMINGS TO TAKE THE CURSE OFF ANY HELD DRAWING. THEN VARIOUS PARTS, SUCH AS THE EYES, CAN "TELEGRAPH" THE NEXT MOVE IN SECONDARY ACTIONS THAT PRECEDE IT. THUS, LIMITED ANIMATION FOR TV CAN BECOME VERY CONVINCING. HOWEVER, THIS IS NOT AN ECONOMY ANIMATION FORMULA; IT IS BASED ON LIFE. NOTHING MOVES IN EQUAL COMPARTMENTS OF ALL PARTS IN UNISON.

STUDY THE DELAYED ACTION OF THE SQUIRREL'S TAIL.

WEIGHT—RECOIL EFFECTS

SPACING CHARTS

FAST →
← SLOW-UP
← SLOW RECOIL

HEAVYWEIGHT

SLOW →
← FAST SPRING-UP

LIGHTWEIGHT
← INSTANT RECOIL

DOWN-PULL

SPRING-UP

NORMAL SIZE
STRETCH DISTORTION
← RECOIL—SQUASH

BOUNCING BALL ACTION
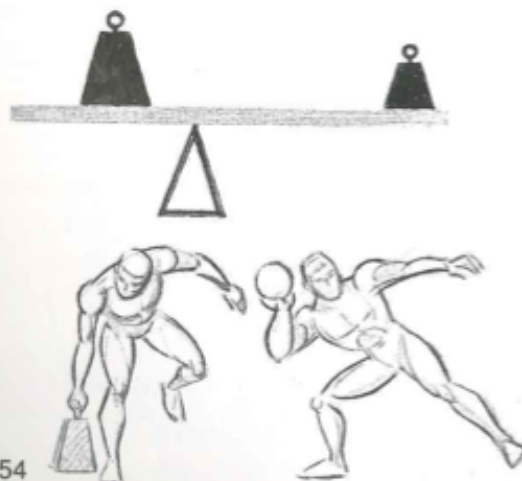
WEIGHT IS REGISTERED IN ANIMATION BY
1. THE VISUAL STRUGGLE TO MOVE WEIGHT.
2. THE VISUAL EFFECTS OF STOPPING WEIGHT.
3. THE TIMING CAUSED BY IMMOBILITY AND GRAVITY.
4. CHAIN-BALANCE DUE TO TYPES OF SAG.

LIGHT WEIGHT IS REGISTERED BY
1. THE SPRING UP WITH NO RESISTANCE.
2. THE ELIMINATION OF RECOIL PROCESSES.
3. TIMING CAUSED BY MOBILITY AND FLOAT.
4. NO SAG, STRESS, STRAIN, OR SQUASH.

THE **BOUNCING BALL PRINCIPLE** ILLUSTRATES THE BASIC RECOIL-SQUASH-CONTRACTION AND THE STRETCH-ELONGATION THAT ARE PART OF MOST CHARACTER MOVEMENT. THE ELEPHANT AT RIGHT SHOWS OVERLAPPING SQUASH-RECOIL AND STRETCH.

THE **OFF-CENTER BALANCE** IS CAUSED BY ONE-SIDED WEIGHT (LEFT).

THE **CHAIN BALANCE** IS EXAGGERATED IN A FIGURE ACTION CAUSED BY HIGH SAG, SUCH AS WITH HEAVY GIANTS AND ANIMALS (SEE PAGE 131).

STRAIN IS CREATED WHEN MOVING HEAVY BODIES OR WEIGHTS.

STRESS IS CREATED WHEN PULLED AND PUSHED ANATOMY SHOWS WEIGHT (RIGHT).
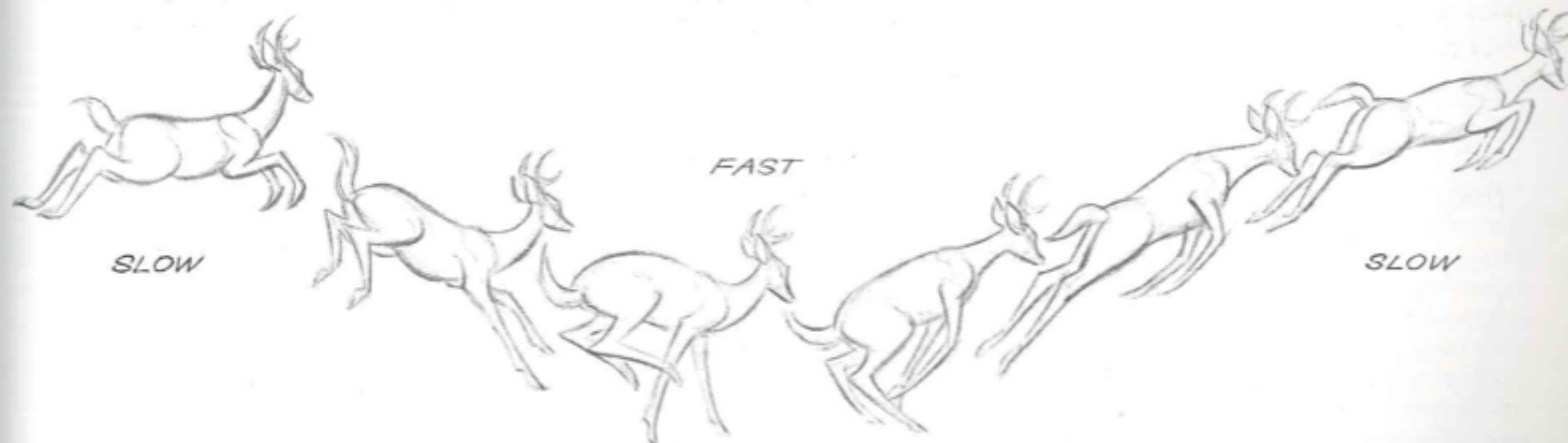
FAST   SLOW   FAST

SLOW   FAST   SLOW

THE TIMING OF A CHARACTER ACTION HAS A GREAT DEAL TO DO WITH WEIGHT—OR LACK OF IT. AS
SHOWN, THE RECOIL PROCESS TAKES TIME FOR AN ELEPHANT, WHILE THE DEER HARDLY TOUCHES THE
EARTH, SPRINGS UP, AND FLOATS, UNTOUCHED BY GRAVITY.