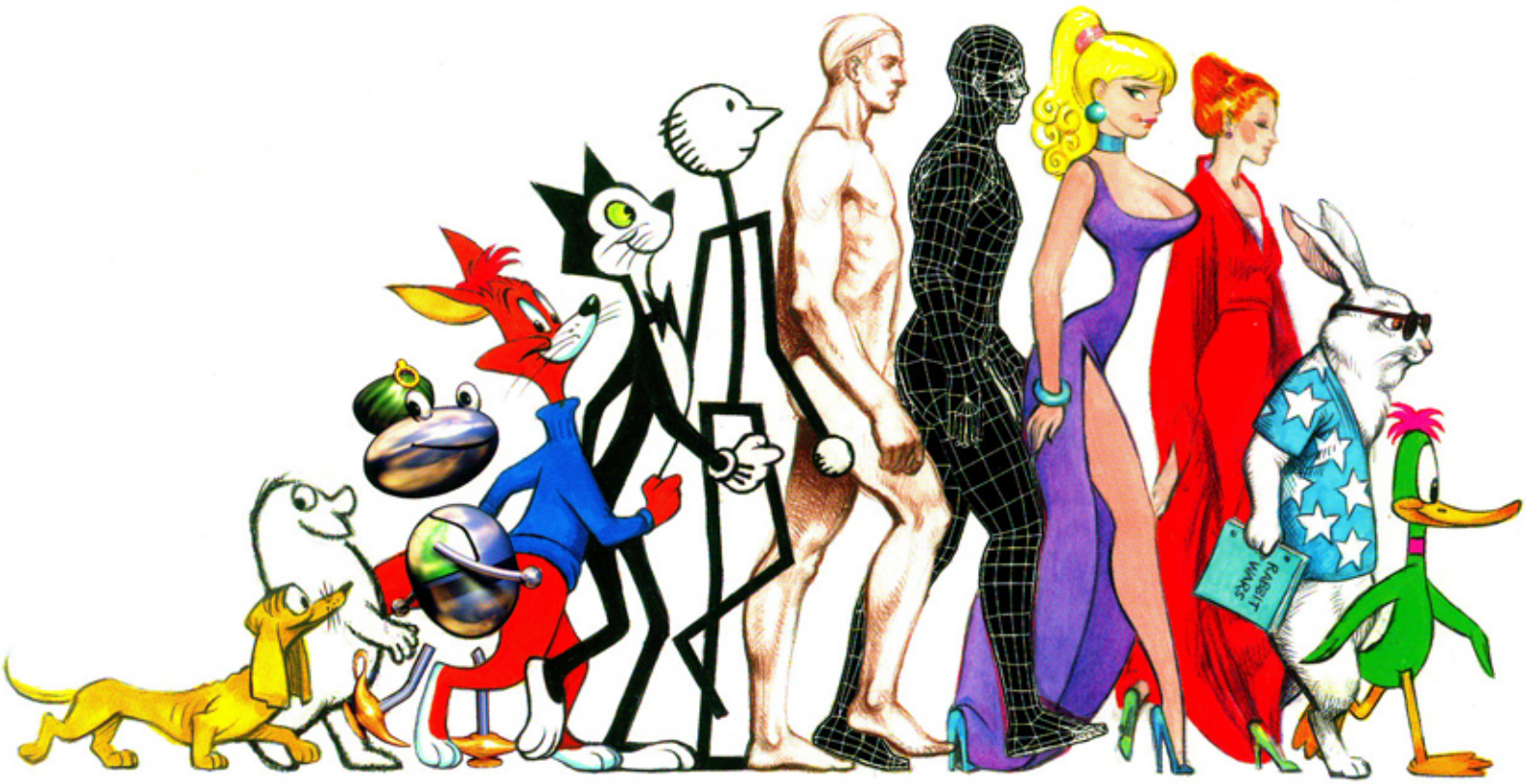
RICHARD WILLIAMS

DIRECTOR OF ANIMATION 'WHO FRAMED ROGER RABBIT'

EXPANDED EDITION



THE ANIMATOR'S SURVIVAL KIT™

A MANUAL OF METHODS, PRINCIPLES AND FORMULAS

FOR CLASSICAL, COMPUTER, GAMES, STOP MOTION AND INTERNET ANIMATORS

DRAWING IN TIME

Why animate? Everyone knows it's a lot of hard work doing all those drawings and positions. So what's the hook? Why do it?

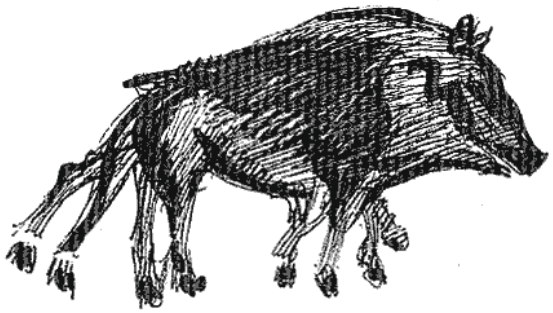
Answer: Our work is taking place in *time*. We've taken our 'stills' and leapt into another dimension.

Drawings that *walk*: seeing a series of images we've made spring to life and start walking around is already fascinating.

Drawings that walk and *talk*: seeing a series of our drawings talking is a very startling experience.

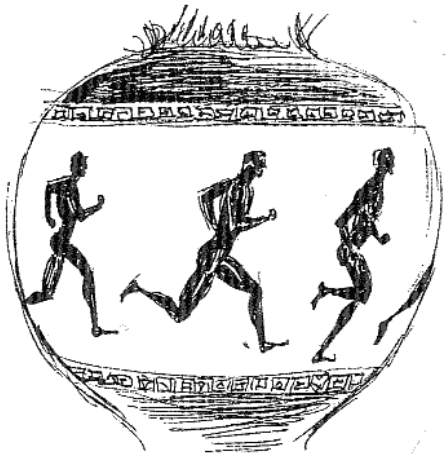
Drawings that walk and talk and *think*: seeing a series of images we've done actually go through a thinking process – and appear to be thinking – is the real aphrodisiac. Plus creating something that is unique, which has never been done before is endlessly fascinating.

We've always been trying to make the pictures move, the idea of animation is aeons older than the movies or television. Here's a quick history:

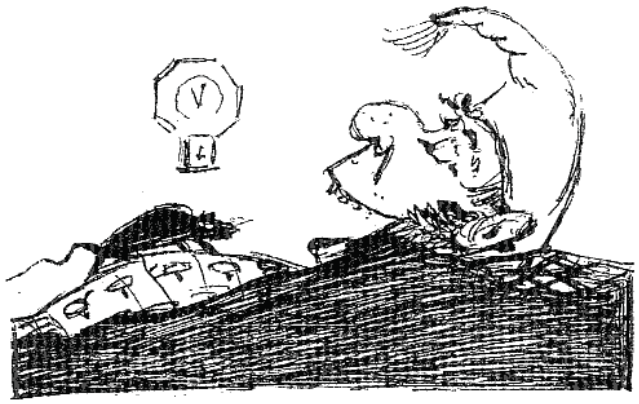


Over 35,000 years ago, we were painting animals on cave walls, sometimes drawing four pairs of legs to show motion.

In 1600 BC the Egyptian Pharaoh Rameses II built a temple to the goddess Isis which had 110 columns. Ingeniously, each column had a painted figure of the goddess in a progressively changed position. To horsemen or charioteers riding past – Isis appeared to move!



The Ancient Greeks sometimes decorated pots with figures in successive stages of action. Spinning the pot would create a sense of motion.



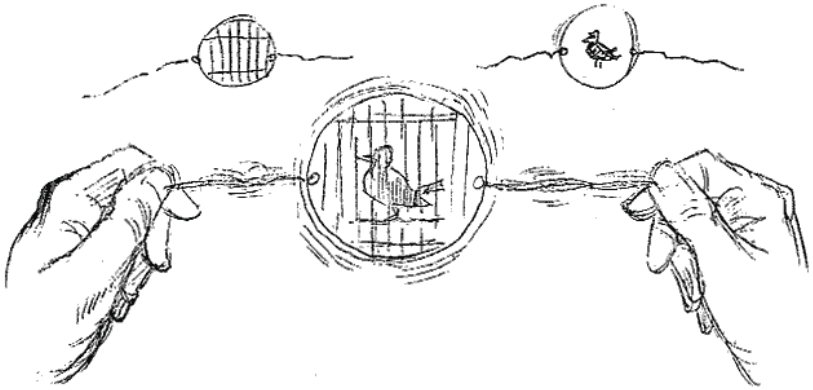
As far as we know, the first attempt to project drawings onto a wall was made in 1640 by Athonasius Kircher with his 'Magic Lantern'.

Kircher drew each figure on separate pieces of glass which he placed in his apparatus and projected on a wall. Then he moved the glass with strings, from above. One of these showed a sleeping man's head and a mouse. The man opened and closed his mouth and when his mouth was open the mouse ran in.

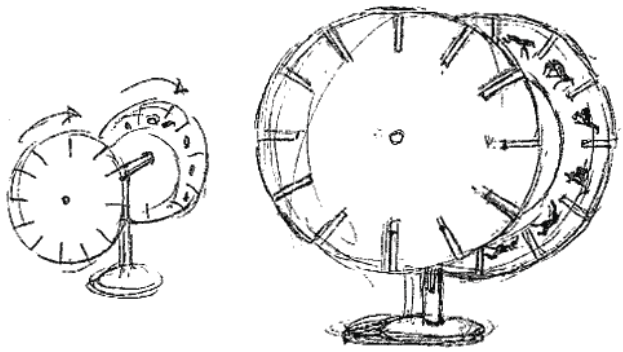
Although photography was discovered as early as the 1830s, most new devices for creating an illusion of movement were made using drawings, not photos.

In 1824 Peter Mark Roget discovered (or rediscovered, since it was known in classical times) the vital principle, 'the persistence of vision'. This principle rests on the fact that our eyes temporarily retain the image of anything they've just seen. If this wasn't so, we would never get the illusion of an unbroken connection in a series of images, and neither movies nor animation would be possible. Many people don't realise that movies don't actually move, and that they are still images that appear to move when they are projected in a series.

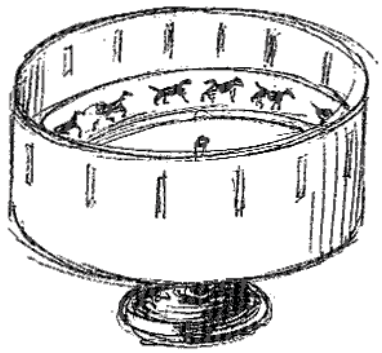
Roget's principle quickly gave birth to various optical contraptions:



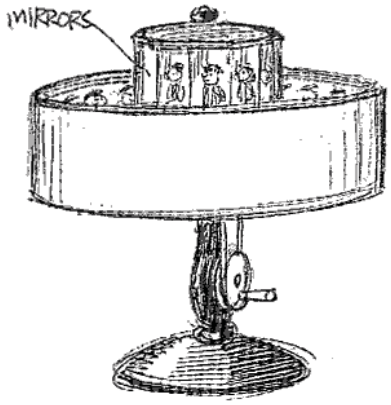
The Thaumatrope: A cardboard disc mounted on a top – or held between two pieces of string. A birdcage drawing is on one side and a bird on the other. When the top is spun or the strings are pulled the disc twirls, the images merge and the bird seems to be in the cage.



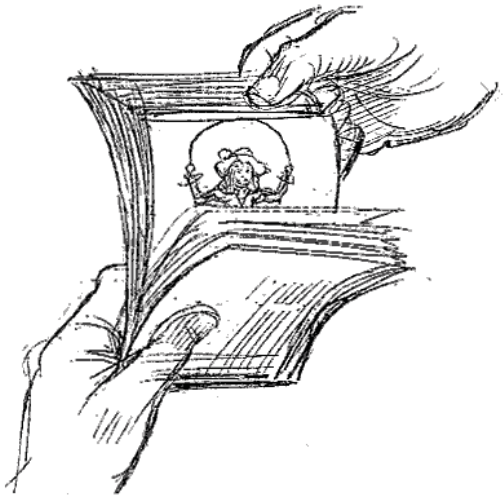
The Phenakistoscope: Two discs mounted on a shaft – the front disc has slits around the edge and the rear disc has a sequence of drawings. Align the drawings with the slits, look through the openings and as the discs revolve we have the illusion of motion.



The 'Wheel of Life' (or the Zoetrope): Appeared in the USA in 1867 and was sold as a toy. Long strips of paper with a sequence of drawings on them were inserted into a cylinder with slits in it. Spin the cylinder, look through the slits and the creature appears to move.

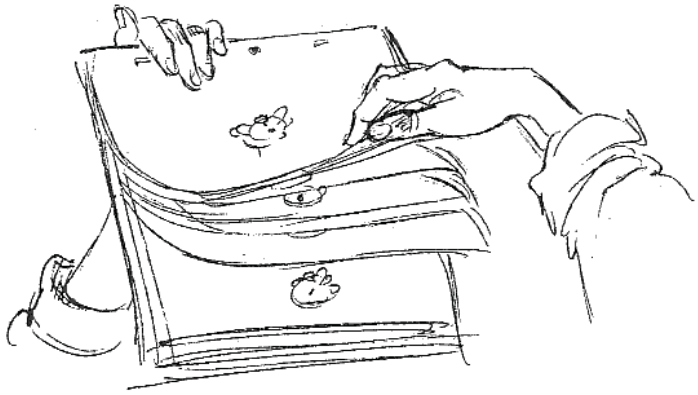


The Praxinoscope: Devised by the Frenchman Emile Reynaud in 1877. He was the first to create short sequences of dramatic action by drawing on a 30 foot strip of transparent substance called 'Crystaloid'. This opened the way for the tremendous advances to come.



The Flipper book: In 1868 a novelty called 'the flipper book' appeared worldwide and it remained the simplest and most popular device. It's just a pad of drawings bound like a book along one edge. Hold the book in one hand along the bound edge and with the other hand flip the pages and 'see 'em move'. The result is animation – the illusion of continuous action. Drawings in time.

This is the same as school kids making drawings in the corners of their math books and flipping the pages.



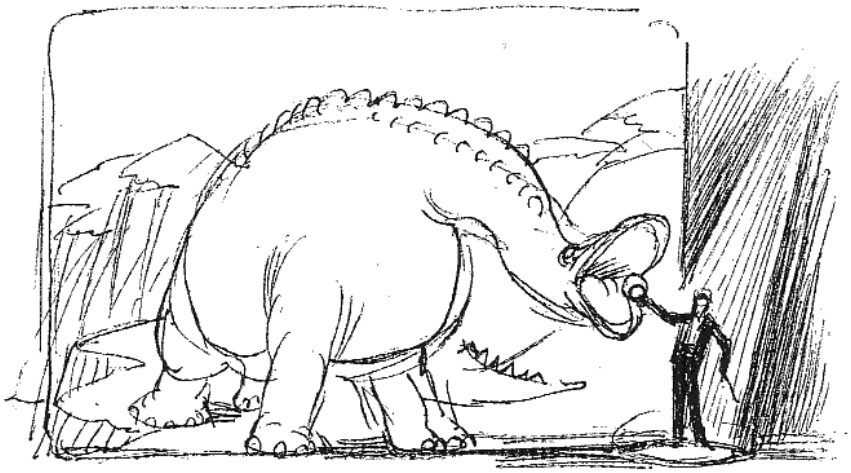
Today the 'classical' animator still flips his drawings the same way as a flipper book before testing it on the video or film camera. He places the drawings in sequence, with the low numbers on the bottom, then flips through the action from the bottom up. Eventually he should get good enough at it to approximate actual screen time and spot any errors or drawings that need altering. Now that we have the video camera with its instant playback of the drawings at film speed, not everyone learns to flip.

In 1896 a New York newspaper cartoonist James Stuart Blackton interviewed the inventor Thomas Edison who was experimenting with moving pictures. Blackton did some sketches of Edison, who was impressed by Blackton's speed and drawing facility and asked him to do some drawings in a series. Later, Edison photographed these – the first combination of drawings and photography. In 1906 they publicly released *Humorous Phases of Funny Faces*. A man puffed a cigar and blew smoke rings at his girl friend, she rolled her eyes, a dog jumped through a hoop and a juggler performed. Blackton used about 3000 'flickering drawings' to make this first animated picture – the forefather of the animated cartoon. The novelty brought explosions of laughter and was an instant hit.

A year later Emile Cohl made and showed his first animated film at the Follies Bergères in Paris. The figures were childlike – white lines on black – but the story was relatively sophisticated: a tale of a girl, a jealous lover and a policeman. He also gave lampposts and houses intelligence and movement, with emotions and moods of their own. Cohl's work prefigures the later animation dictum, 'Don't do what a camera can do – do what a camera *can't* do!'

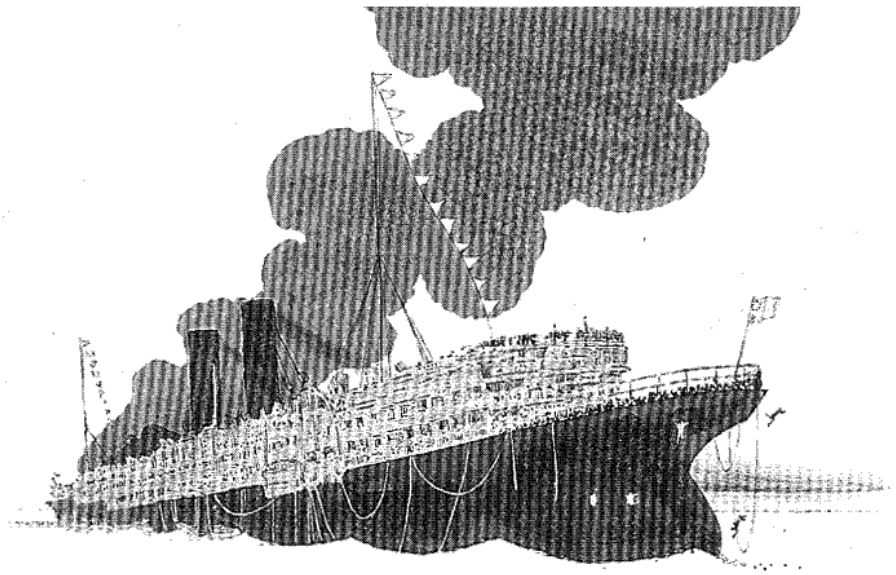
Winsor McCay, brilliant creator of the popular comic strip *Little Nemo in Slumberland*, was the first man to try to develop animation as an art form. Inspired by his young son bringing home some flipper books, he made 4000 drawings of 'Little Nemo' move. These were a big hit when flashed on the screen at Hammerstein's theatre in New York in 1911.

As another experiment he drew a bizarre short film, *How a Mosquito Operates*, which was also enthusiastically received.



Then in 1914 McCay drew *Gertie the Dinosaur* and McCay himself performed 'live' in front of the projected animation, holding an apple in front of Gertie and inviting her to eat. Gertie lowered her long neck and swallowed the fruit – astounding the audience. This was the first 'personality' animation – the beginnings of cartoon individuality. It was so lifelike that the audience could identify with Gertie. It was a sensation.

In McCay's words: 'I went into the business and spent thousands of dollars developing this new art. It required considerable time, patience and careful thought – *timing and drawing* the pictures [my italics]. This is the most fascinating work I have ever done – this business of making animated cartoons live on the screen.'



McCay also made the first serious dramatic cartoon, *The Sinking of the Lusitania*, in 1918. A war propaganda film expressing outrage at the catastrophe, it was a huge step forward in realism and drama – the longest animated film so far. It took two years of work and needed 25,000 drawings.

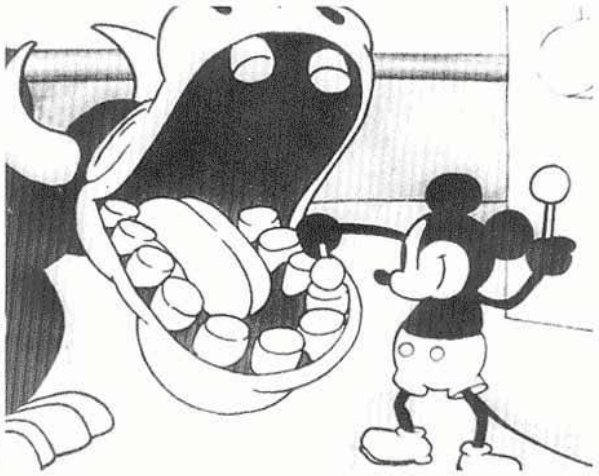
Later, as an older man being celebrated by the younger funny-cartoon animators in the business, McCay lashed out at them saying that he had developed and given them a great new art form which they had cheapened and turned into a crude money-making business done by hack artists.

This well defines the endlessly uncomfortable relationship between the pioneering artist/idealist and the animation industry – working to comfortable and predictable formulas.

Still doth the battle rage . . .

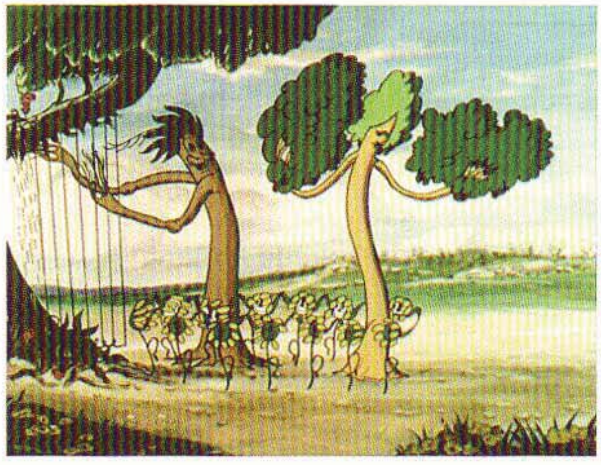
In the twenties Felix the cat became as popular as Charlie Chaplin. These short Felix cartoons were visually inventive, doing what a camera can't do. But more importantly a real personality emerged from this flurry of silent, black and white drawings and Felix 'himself' connected with audiences worldwide.

The Felix cartoons led straight to the arrival of Walt Disney, and in 1928, Mickey Mouse took off with his appearance in *Steamboat Willie* – the first cartoon with synchronised sound.

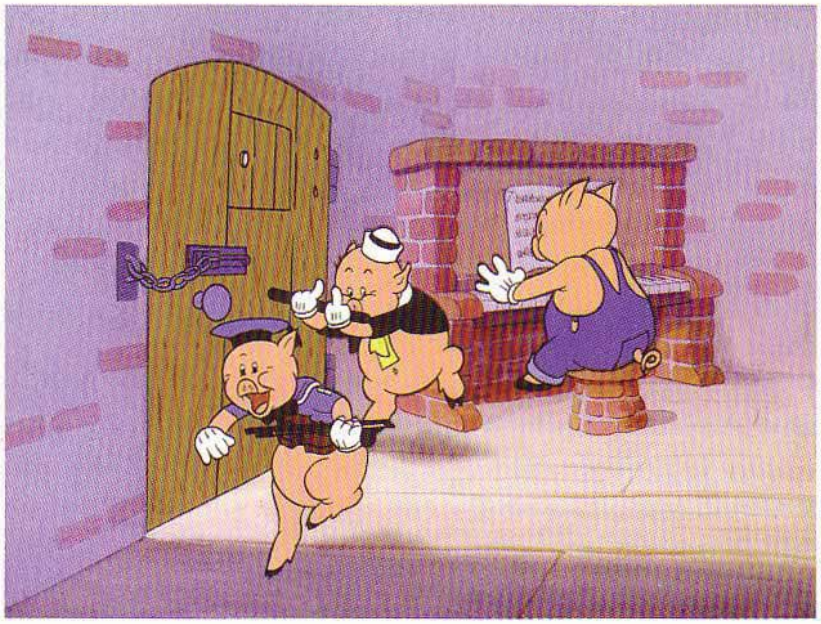


The brilliant Ward Kimball, who animated Jiminy Cricket in *Pinocchio* and the crows in *Dumbo*, once told me, 'You can have *no idea* of the impact that having these drawings suddenly speak and make noises had on audiences at that time. People went crazy over it.'

Disney followed *Steamboat Willie* with *The Skeleton Dance*. For the first time, action was co-ordinated with a proper musical score. This was the first *Silly Symphony*. Ub Iwerks was chief animator on both films and a lot of the sophisticated action of *The Skeleton Dance* still holds up today.



Disney leapt forward again in 1932 with *Flowers and Trees* – the first full colour cartoon.



Then he followed it one year later with *Three Little Pigs*. This had a major impact because of its fully developed 'personality' animation – clearly defined and believable separate personalities acting so convincingly that the audience could identify with and root for them. Another first.

Astonishingly, only four years after that, Disney released *Snow White and the Seven Dwarfs*, the world's first fully-animated feature-length film, raising cartoon drawings to the level of art and holding the audience spellbound for eighty-three minutes. A truly staggering feat accomplished in an incredibly short space of time. (It's said that many of the artists booked themselves in advance into hospital to recover from the effort of completing the film.)

The tremendous financial and critical success of *Snow White and the Seven Dwarfs* became the foundation of Disney's output and gave birth to the 'Golden Age' of animation: *Pinocchio*, *Dumbo*, *Bambi* and *Fantasia*, as well as the *Silly Symphonies* and Donald Duck and Mickey Mouse shorts.

Surrounding the potent Disney centre were the satellite studios: Max Fleischer with two features – *Gulliver's Travels* and *Mr Bug Goes to Town* – and Popeye shorts; Warner Bros' Looney Tunes and Merrie Melodies with Bugs Bunny, Daffy Duck, Porky Pig; MGM with Tom and Jerry, Droopy and the great anarchic Tex Avery shorts, and Walter Lantz with Woody Woodpecker. Fed as they were by the knowledge and expertise emanating from the Disney training centre, their much wilder humour was often in reaction to or in rebellion against Disney 'realism' and 'believability'.

But after the Second World War the situation changed.

The arrival of television and its voracious appetite for rapidly produced product demanded simpler and cruder work. 1950s stylisation gave birth to UPA studios in Hollywood who created Mr. Magoo and Gerald McBoing Boing. UPA's approach was regarded as more graphically sophisticated than Disney and used more 'limited' and much less realistic animation. At the same time there was a worldwide flourishing of personal, experimental and 'art house' animated films made in new ways with many different techniques and with very different content to the Hollywood product. Animators were reinventing the wheel stylistically but were ignorant of the structural knowledge developed in Hollywood's Golden Age.

This knowledge, though residing in the hands of the originators, was generally ignored as being 'old hat' or was forgotten in the following thirty years.

However, in the last few years, the renaissance of animation as a form of mass entertainment is giving rebirth to the old knowledge. The startlingly successful innovations of computer animation are helping to transform animation in all it's multi-faceted forms into a major part of the entertainment mainstream. Alongside this, there is also the explosion in the computer games industry.

If drawn 'classical' animation is an extension of drawing, then computer animation can be seen as an extension of puppetry – high tech marionettes. Both share the same problems of how to give a performance with movement, weight, timing and empathy.

The old knowledge applies to *any* style or approach to the medium no matter what the advances in technology. Most of the work methods and devices in this book were developed and refined in the Hollywood animation studios between 1930–1940.

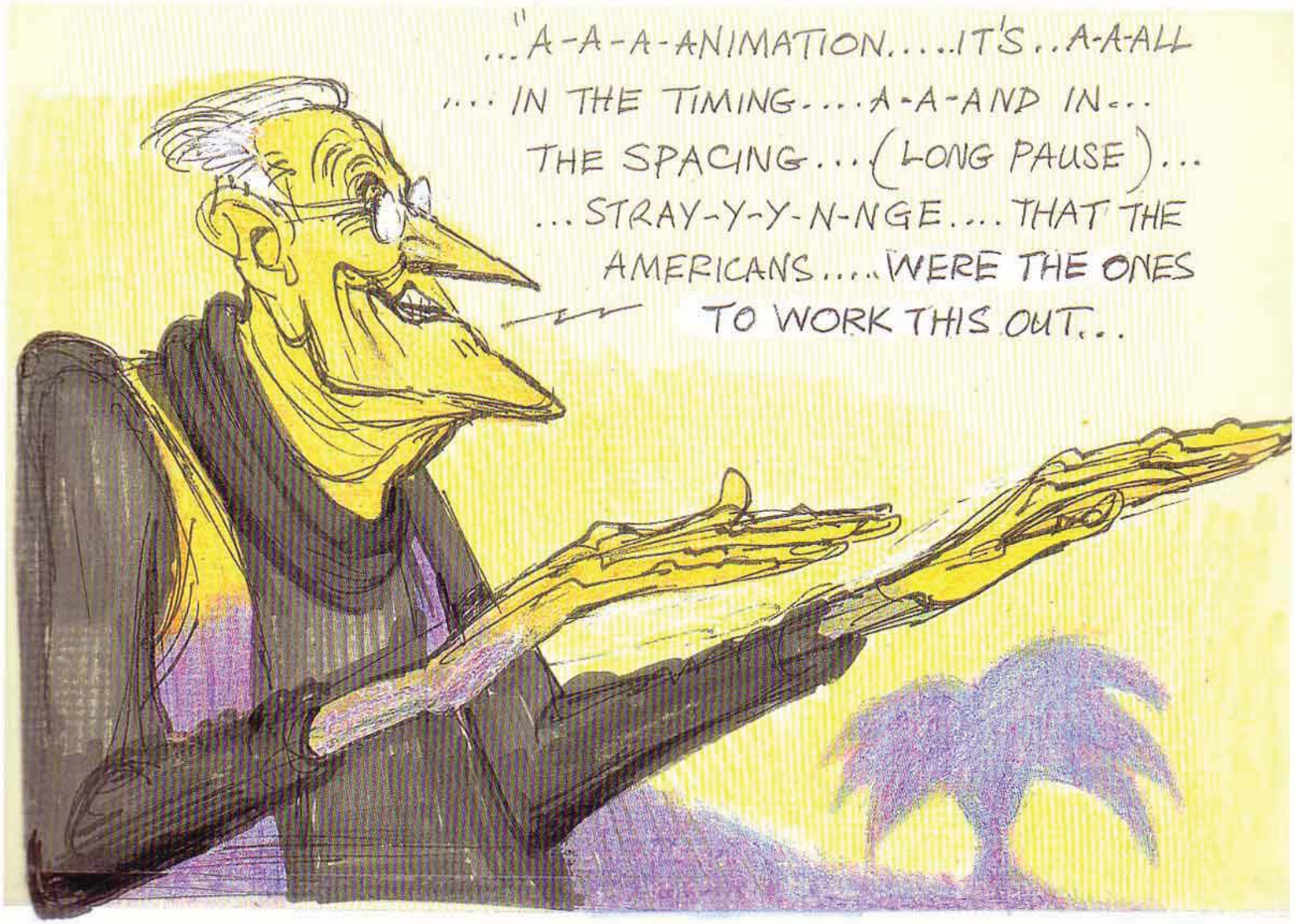
I've co-ordinated what I've learnt from various approaches and I'm presenting it here in a form based on my own experience in this medium – with its limitless possibilities of imagination.

Emery Hawkins said to me, 'The only limitation in animation is the person doing it. Otherwise there is no limit to what you can do. And why shouldn't you do it?'

IT'S ALL IN THE TIMING AND THE SPACING

I met Grim Natwick (born Myron Nordveig) in a Hollywood basement when he was in his eighties. Grim was the oldest of the great animators, being already in his forties when he animated eighty-three scenes of Snow White in Disney's *Snow White and the Seven Dwarfs*. Previously, he'd designed Betty Boop for Max Fleischer, for which he received nothing and was furious about it 'til the day he died, aged 100.

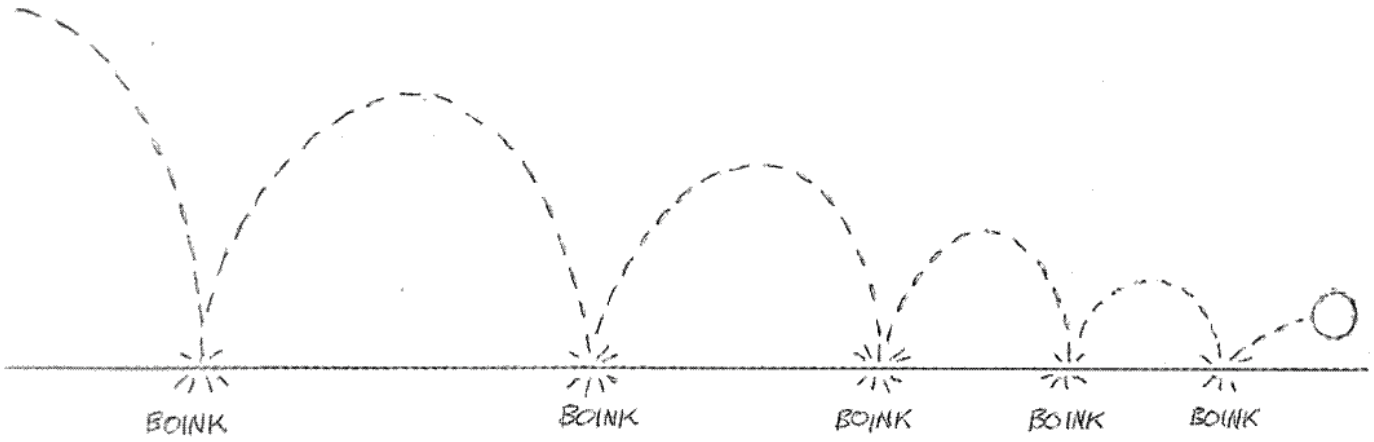
I'll never forget the image of this big Norwegian American sitting in the golden twilight, extending his long arms and spatula hands saying . . .



The bouncing ball says it all.

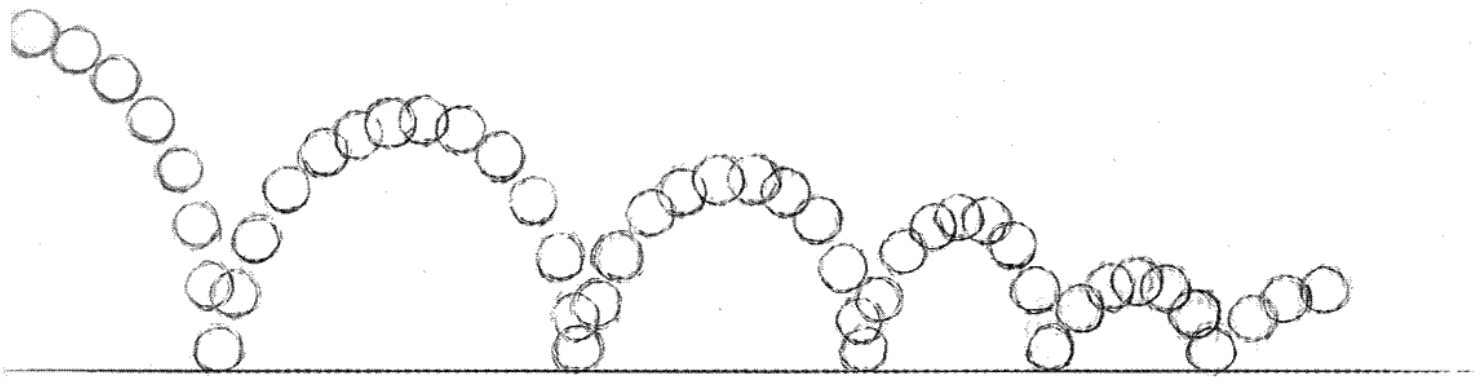
The old bouncing-ball example is often used because it shows so many different aspects of animation.

A ball bounces along,



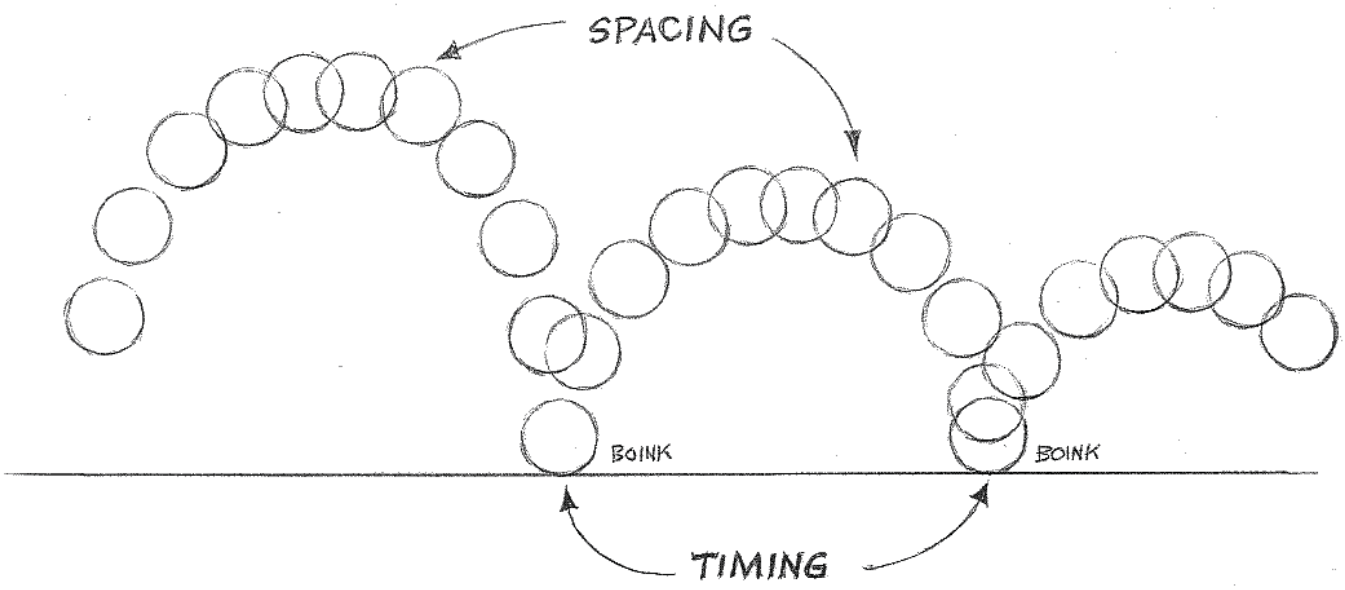
and where it hits – the 'boinks' – that's the *timing*. The impacts – where the ball is hitting the ground – that's the *timing* of the action, the rhythm of where things happen, where the 'accents' or 'beats' or 'hits' happen.

And here's the *spacing*.



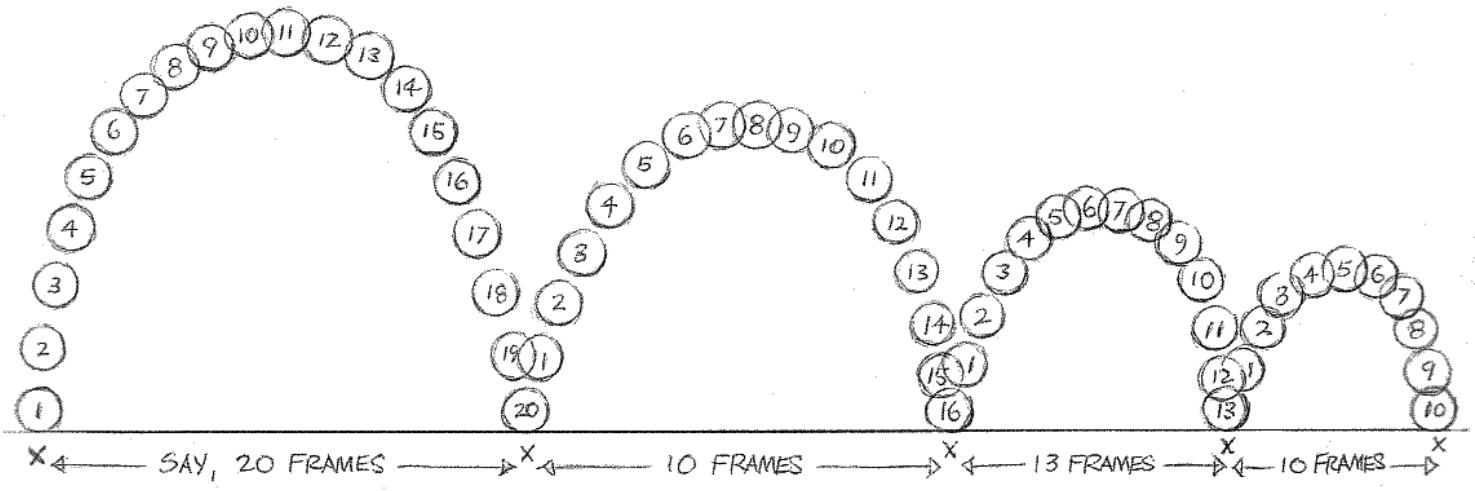
The ball overlaps itself when it's at the slow part of its arc, but when it drops fast, it's spaced further apart. That's the *spacing*. The spacing is how close or far apart those clusters are. That's it. It's simple, but it's important. The spacing is the tricky part. Good animation spacing is a rare commodity.

So we have:



The two basic elements of animation.

To experience this, take a coin and film it in stages under a video camera.



First plot out the *timing* – where you want the ball to hit the ground. Then push the coin around – taking a picture at each frame – and see what looks right or wrong. Try it with different timings and spacing. You're already animating. You're already dealing with the important fundamentals and you haven't even made a single drawing. You're doing pure animation without any drawings.

Hidden in this simple test is the weight of the ball – how it feels, light or heavy; what it's made of. Is it large or small, moving fast or slow? This will all emerge if you do several tests – which only take a few minutes to do. The importance of the timing and the spacing will become obvious.

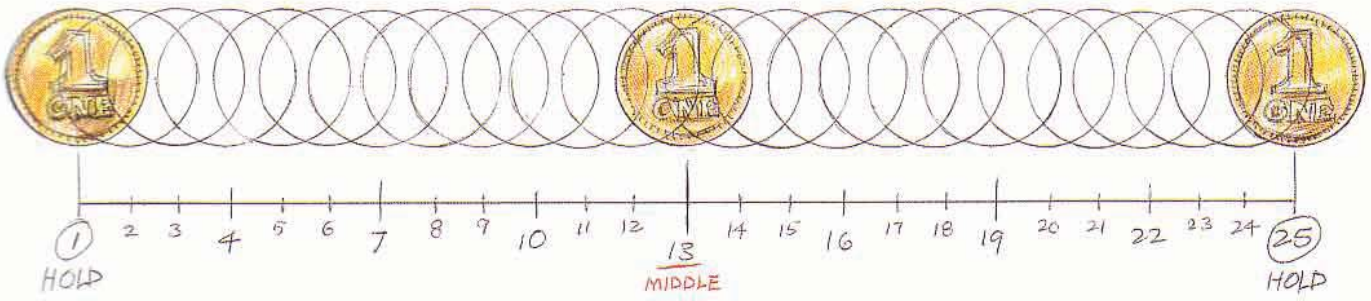
Because *you* did it, a certain amount of personality will creep into the action – whether the ball is deliberate, slow, jaunty, erratic, cautious, even optimistic or pessimistic.

And all this, before you've made a single drawing. This reveals how important and dominant the timing and the spacing is. Even if the ball positions were drawn in detail by Michelangelo or Leonardo da Vinci, the timing and the spacing of the drawings will still dominate.

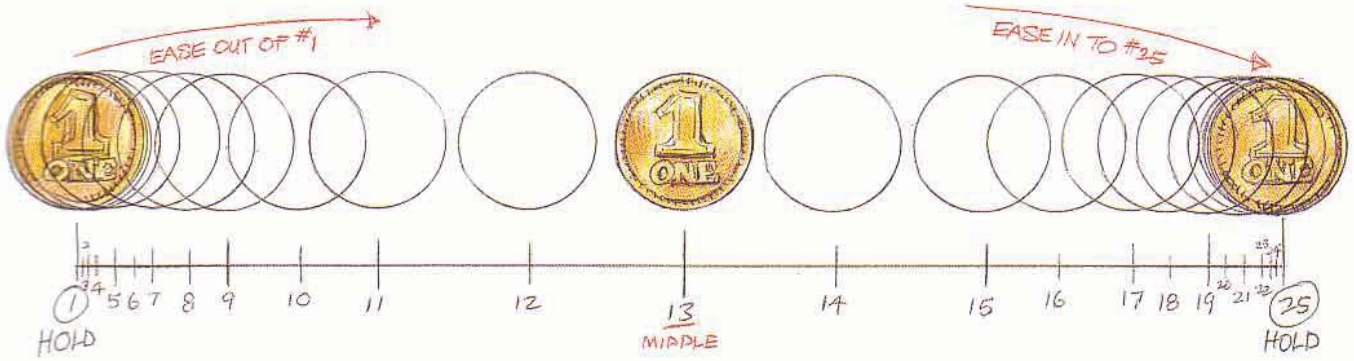
Another interesting way to experience the difference between timing and spacing right away is this:

Let's put a coin under the video camera and move it across the page (or screen) in one second – 24 frames of screen time. That's our *timing*.

We'll space it out evenly – and that's our *spacing*.



Now we'll keep the same *timing* – again taking one second for the coin to move across the page. But we'll change the *spacing* by slowly easing out of position number 1 and easing gradually into position number 25.



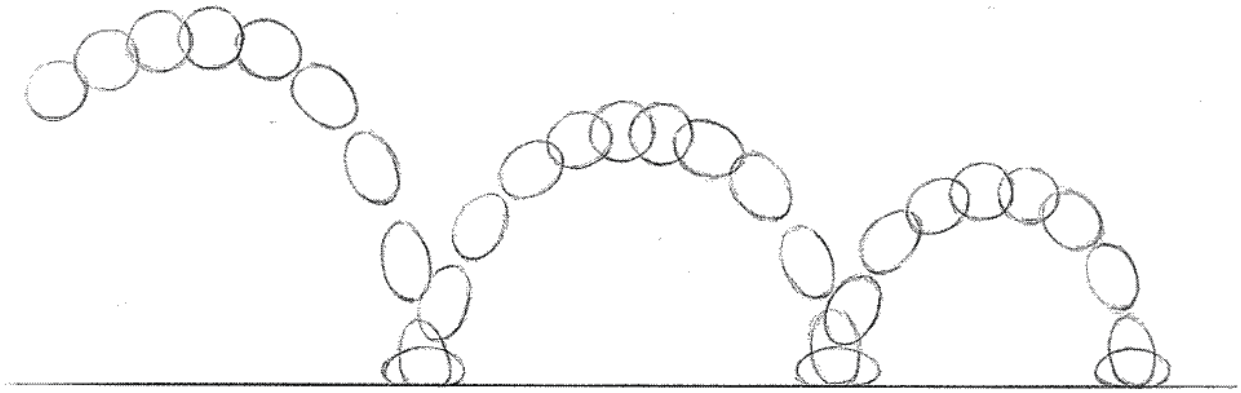
It still takes one second for the coin to get over there. It has the same timing – but there is very different movement because of the different spacing. Both start together – and both hit the middle together – but the spacing is quite different. And so the action is very different.

You could say that animation is the art of timing. But you could say that about all motion pictures.

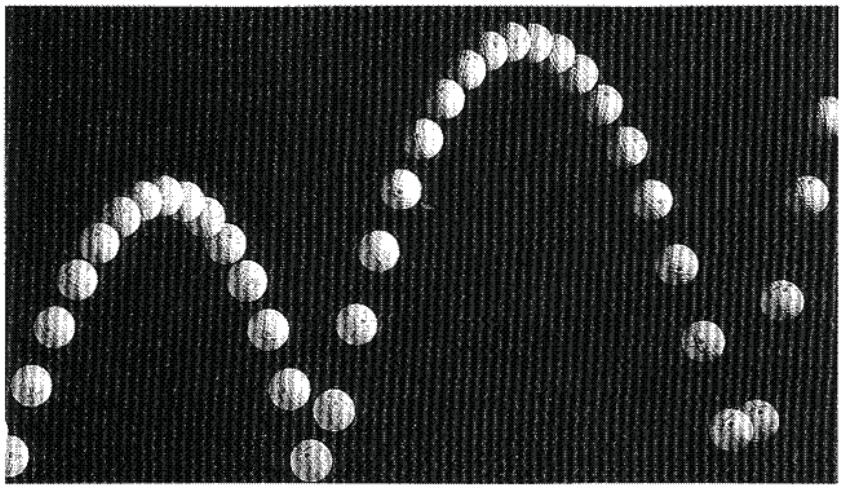
The most brilliant masters of timing were the silent comedians: Charlie Chaplin, Buster Keaton, Laurel and Hardy.

Certainly for a film director, timing is the most important thing. For an animator, it's only half the battle. We need the spacing as well. We can have a natural feel for timing, but we have to learn the spacing of things.

One other thing: The bouncing ball example is often used to show animation 'squash and stretch' – that is, the ball elongates as it falls, flattens on impact with the ground and then returns to its normal shape in the slower part of its arc.
It *might* squash and stretch this way if it was a very soft ball with not much air in it, but what



I've found is that you can get a good enough effect with a rigid coin – *provided* the spacing of it was right – so this added technique is not always necessary. Certainly a hard golf ball isn't going to bend all over the place. In other words, if you do this squishy squashy thing too much, everything comes out a bit 'sploopy', like it's made of rubber. Life ain't like that. At least most of it ain't. More about this later.



Golf ball bounce, 1951

Having established all this, let's go to lesson one:

Stills from Charles Dickens' *A Christmas Carol*, 1972. We're starting to get better. I got my first Oscar for this half-hour film made originally for TV. You wouldn't think a lot of this was drawn by Bugs Bunny animators! It couldn't have been done without Ken Harris who carried the load on Scrooge. Towards the end, Chuck Jones (the Executive Producer) lent us Abe Levitow, a great unsung animator with majestic qualities. We also had help from Disney alumni George Nicholas and Hal Ambro. My own stalwarts were Richard Purdum, Sergio Simonetti and Roy Naisbitt.

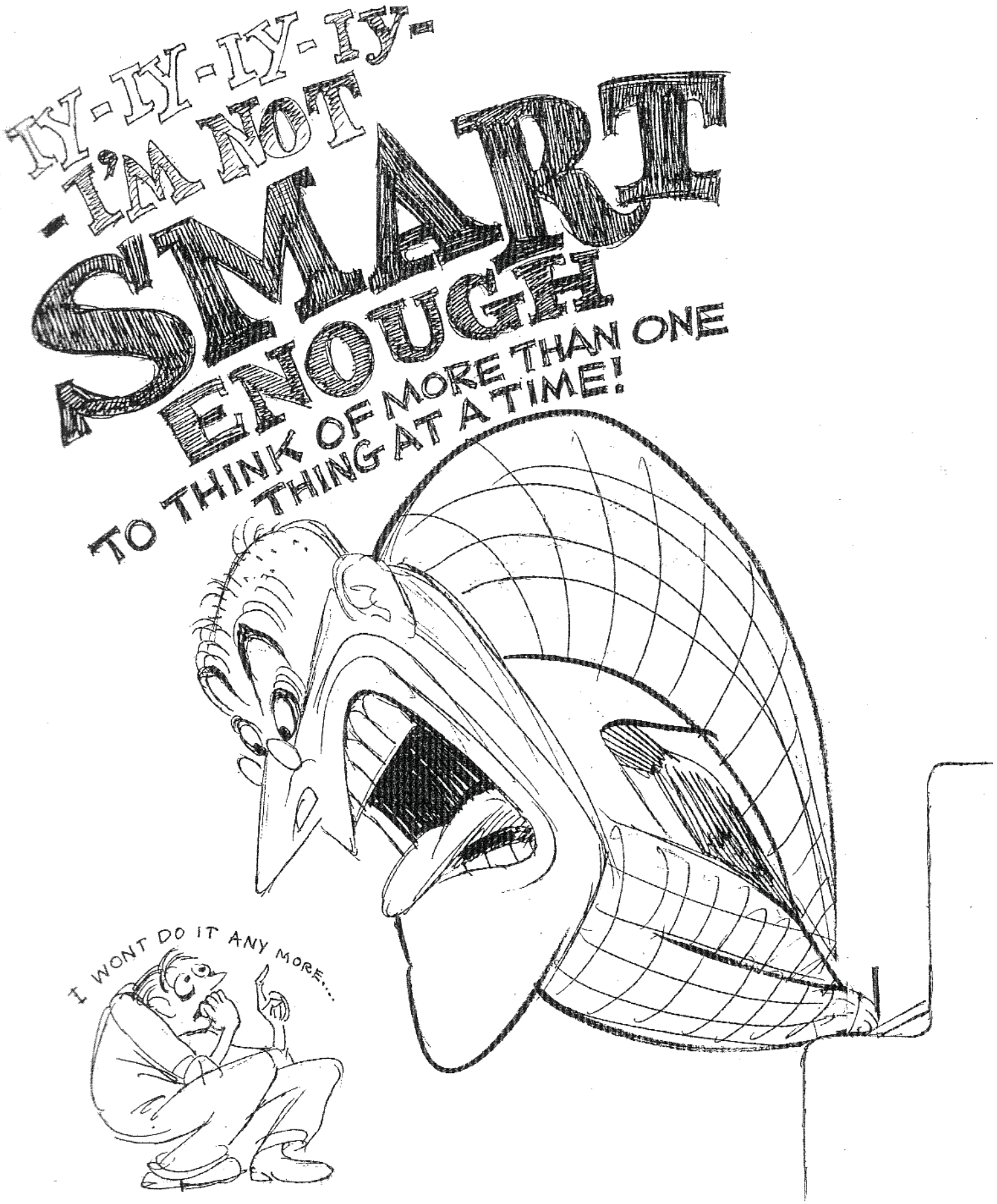
LESSON ONE

UNPLUG!

Unplug! Take off your head phones! Turn off the radio! Switch off the CD! Turn off the tape! Close the door.

Like many artists, I had the habit of listening to classical music or jazz while working. On one of my first visits to Milt Kahl I innocently asked:


OF ALL the S-S-S-STUPID GOD-GOD-GOD-DAMNED
QUESTIONS I-I-I-I'VE EVER HEARD! I-I-I-I-
NEVER HEARD SUCH A-A-A-A-F-F-F-F-F-STUPID
QUESTION!


IY-IY-IY-IY-
-I'M NOT
SMART
ENOUGH
TO THINK OF MORE THAN ONE
THING AT A TIME!
I WONT DO IT ANY MORE...

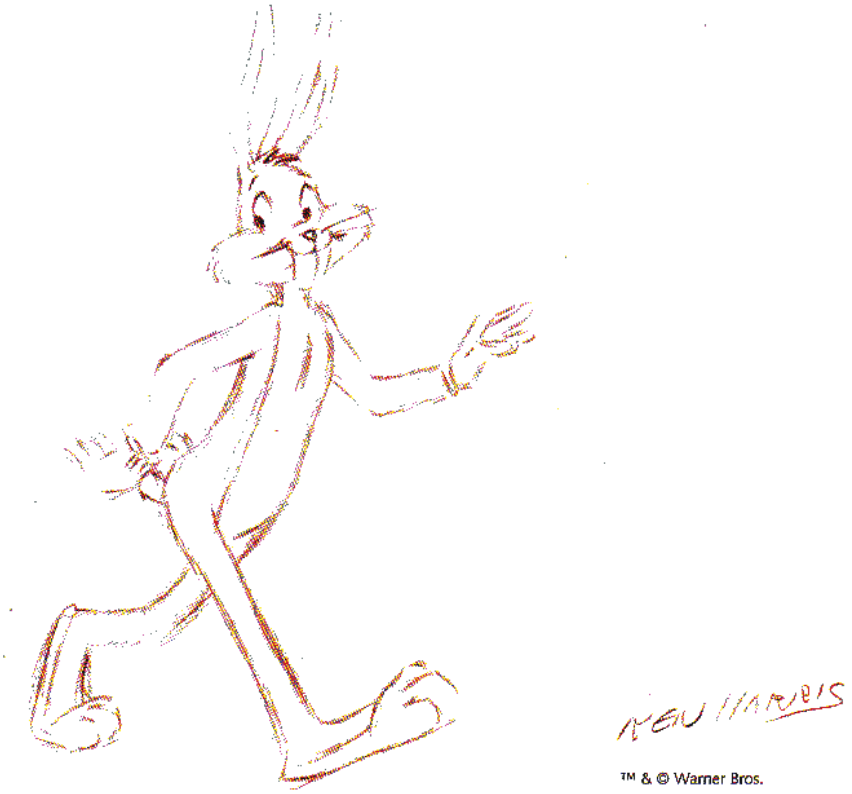
Since it came from a genius, this made quite an impression on me. After this I learnt to face the silence and think before swirling my pencil around. My animation improved right away.

This has been the case with many artists when I've passed this wisdom along. Recently, two previously sound-addicted computer animators were shocked to find that their plugged-in colleagues instantly made them objects of ridicule for not having wires coming out of their ears. They were even more surprised at the startling improvement in their work.

. . . end of lesson one.

Photo Frank Herrmann

Portrait of the artist after receiving lesson 1.



ADVANCING BACKWARDS TO 1940

Let's advance backwards to approach where animators were during the 'Golden Age'. And then go forward from there – so we can do new things.

The thing you are going to build on must be basic.

Everyone wants to decorate their house with interesting pieces before putting in the cornerstones and supports. Everyone wants to jump ahead to the sophisticated bit – glossing over the dull, old support work.

But it's the thorough understanding of the basics that produces real sophistication.

As Art Babbitt said:
'The knowledge that went into making little drawings come to life is in the early Disneys. Nobody taught us how to articulate these fanciful characters. We had to discover the mechanics ourselves and pass them around amongst each other. There are many styles but the mechanics of the old Disney animation remain.'

They had it all worked out by 1940, around the time that *Pinocchio* was released.

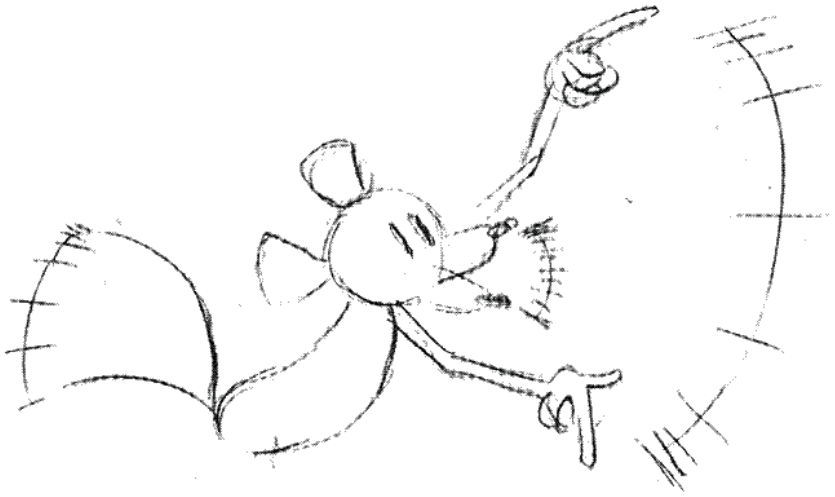
It was a wonderful system – precise and *simple*.

First we'll take it bit by bit – and then we'll put it all together.

HISTORY OF The CHART and INBETWEEN

A very interesting thing happened when we worked with Grim Natwick. He was so old that each day he tended to snap back into a different professional period of his life: one day he would come in and do circular 'rubber hose' animation from the 1920s, then the next day he would be in a 1936 '*Snow White*' phase, making tons of smoothly moving drawings, the next day would be sharp, physical actions with plenty of static holds from his 1950 UPA 'Mr Magoo' period, then he'd be doing as few drawings as possible, as if he were animating a 1960s TV ad, and then the next day back into fulsome *Fantasia* mode.

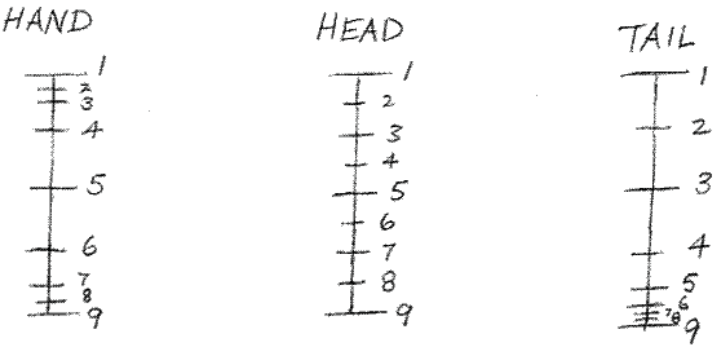
One day I found him drawing in an old style – something like this:



He wasn't just showing the arc of the action – he was indicating all the different spacings on his drawing.

I suddenly realised that this was probably the origin of the charts that animators put on the edge of their drawings

e.g.



I asked, 'Hey, Grim – did these charts just gradually move across the page away from the drawings?

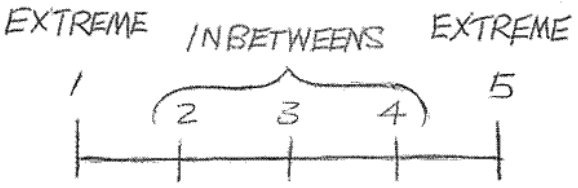
A far-away look came into his eyes – '. . . Yes . . .'

In the 1920s, animators did most of the work themselves. Dick Huemer was the top New York animator and was working for Max and Dave Fleischer on their *Mutt and Jeff* series. Dick told me they said to him, 'Your work is great, Dick, but we can't get enough of it.' So Dick said to them, 'Give me someone to put in the in-between drawings and I'll do two to three times as much work.' And that was the invention of the 'inbetweener'.

Dick later said in an interview that it had been the Fleischers' idea and that he just went along with it. But Dick actually told *me* that he had invented the inbetween and the inbetweener, the helper or assistant.

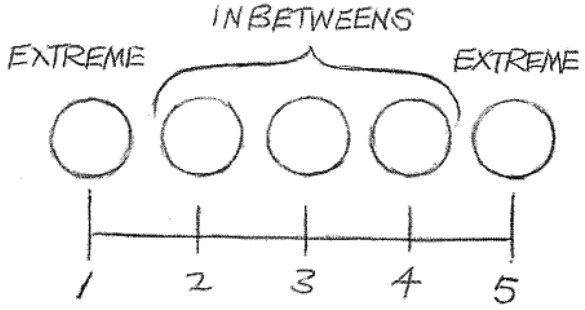
The main drawings or extreme positions came to be called *extremes* and the drawings in between the extremes were called the *inbetweens*.

The chart shows the spacing.



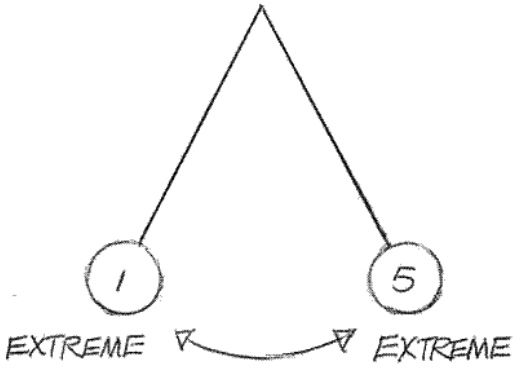
We'll put in three even inbetweens between the two extremes.

Number 3 is smack in the middle between 1 and 5. Then we put number 2 right in the middle between 1 and 3 – and number 4 in the middle between 3 and 5. We've got the inbetweens spaced evenly.

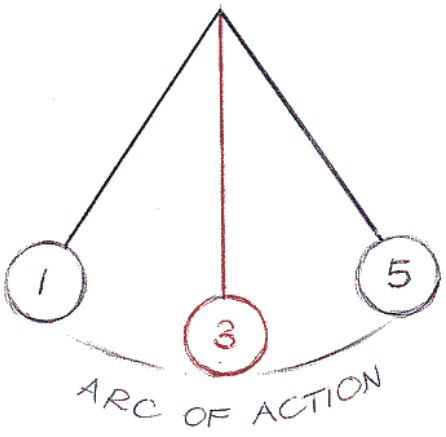


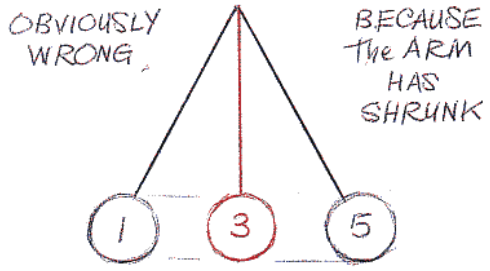
EXTREMES and BREAKDOWNS

Take the example of a swinging pendulum: The extremes are where there is a change in direction – the ends of the action where the direction changes.



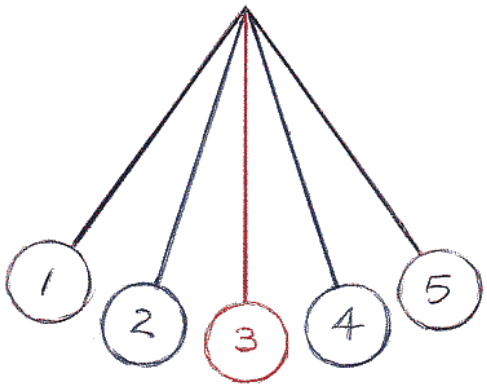
Because the pendulum's arm maintains its length as it swings, the middle position creates an arc in the action. We can see how important that middle position between the two extremes is going to be to us.

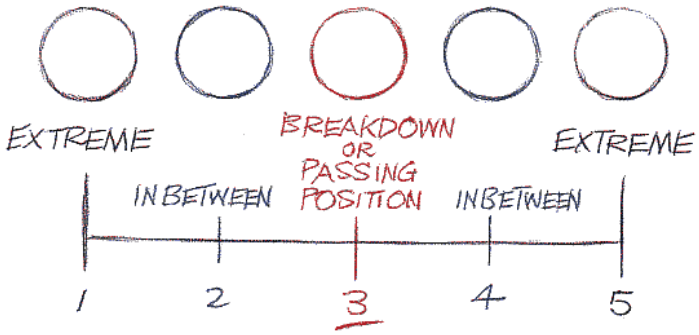




It's obvious how important this middle position is. In the 1930s they called this the 'break-down' drawing or 'passing position' between two extremes.

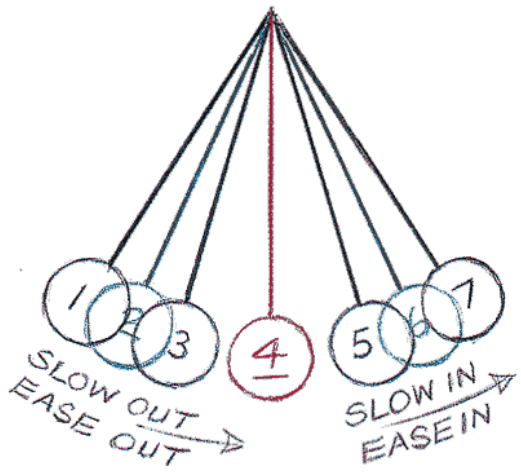
We'll add two inbetweens.





Some animators underline the breakdown or passing position because it's so important to the action. I have the habit of doing this because it's a position which is crucial to helping us invent. We're going to make tremendous use of this middle position later . . .

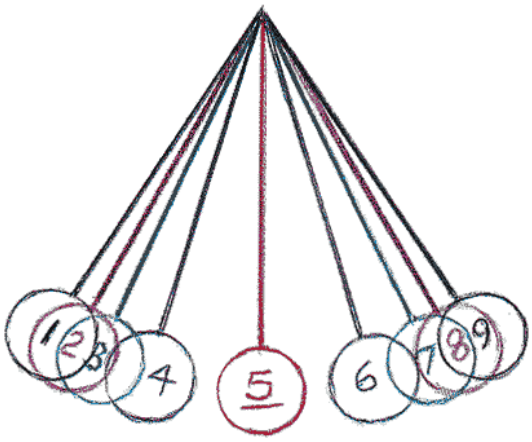
If we want to make our pendulum ease in and out of the extreme positions, we'll need a couple more inbetweens:



So our chart will look like this.

What we're doing is easing in or easing out of the extreme positions. 'Slowing in' or 'slowing out' is the classical terminology for it, but I prefer today's computer animators' term of 'easing in' and 'easing out'.

To make the action even slower at the ends, let's add a couple more inbetweens.

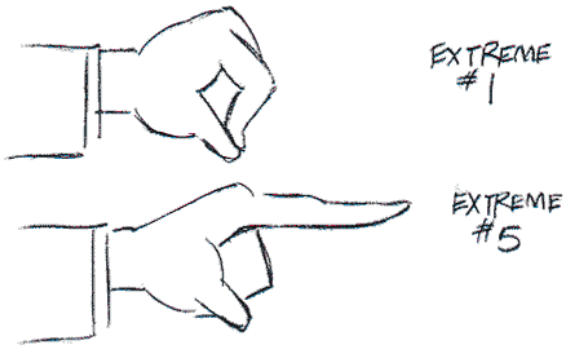


Now our chart will look like this.

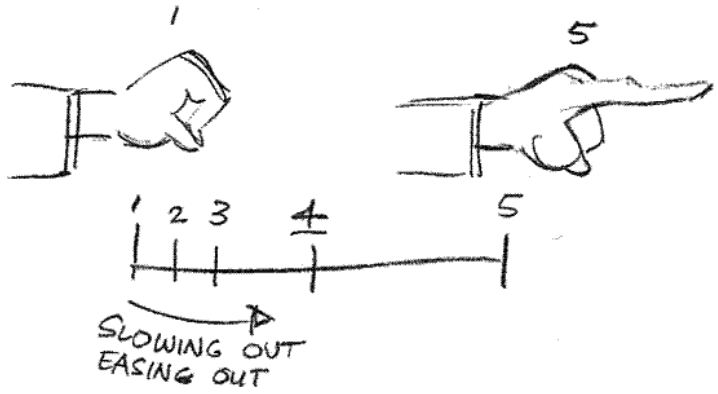
Ken Harris always called it 'cushioning' – which is a nice way to think of it.

Master animator Eric Larson – who became the instructor of the younger Disney animators – says that what animation has to have is a change of shape.

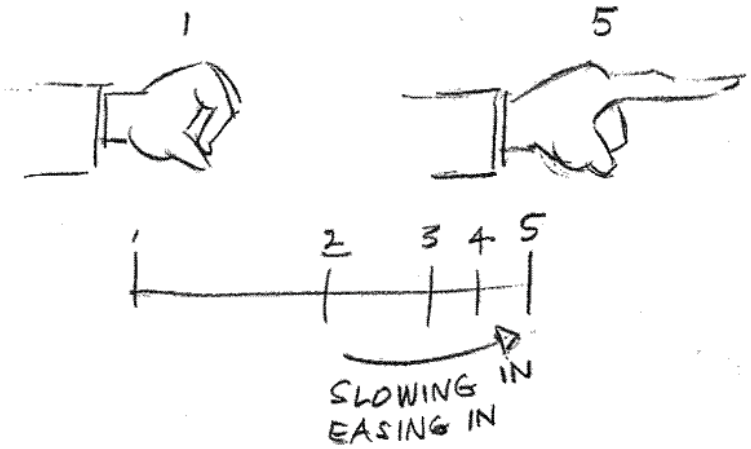
So, let's change from a closed hand to a pointing finger.



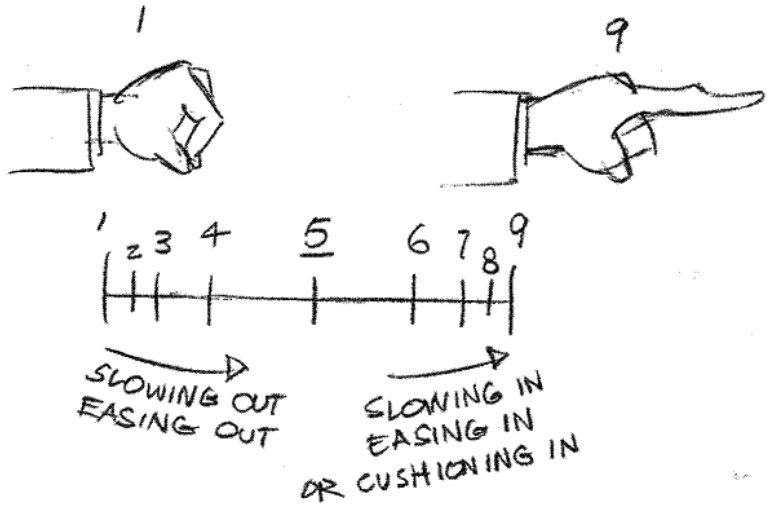
If we 'ease out' of number 1 in order to point – number 5 – the chart will be:



Alternatively, if we 'snap out' or 'speed out' of the closed hand and 'ease in' or 'cushion in' to the pointing finger the chart will be:



For a more relaxed, slower action we could add more inbetweens and ease out of the closed hand, and speed through the middle, and then ease in to the pointing finger.

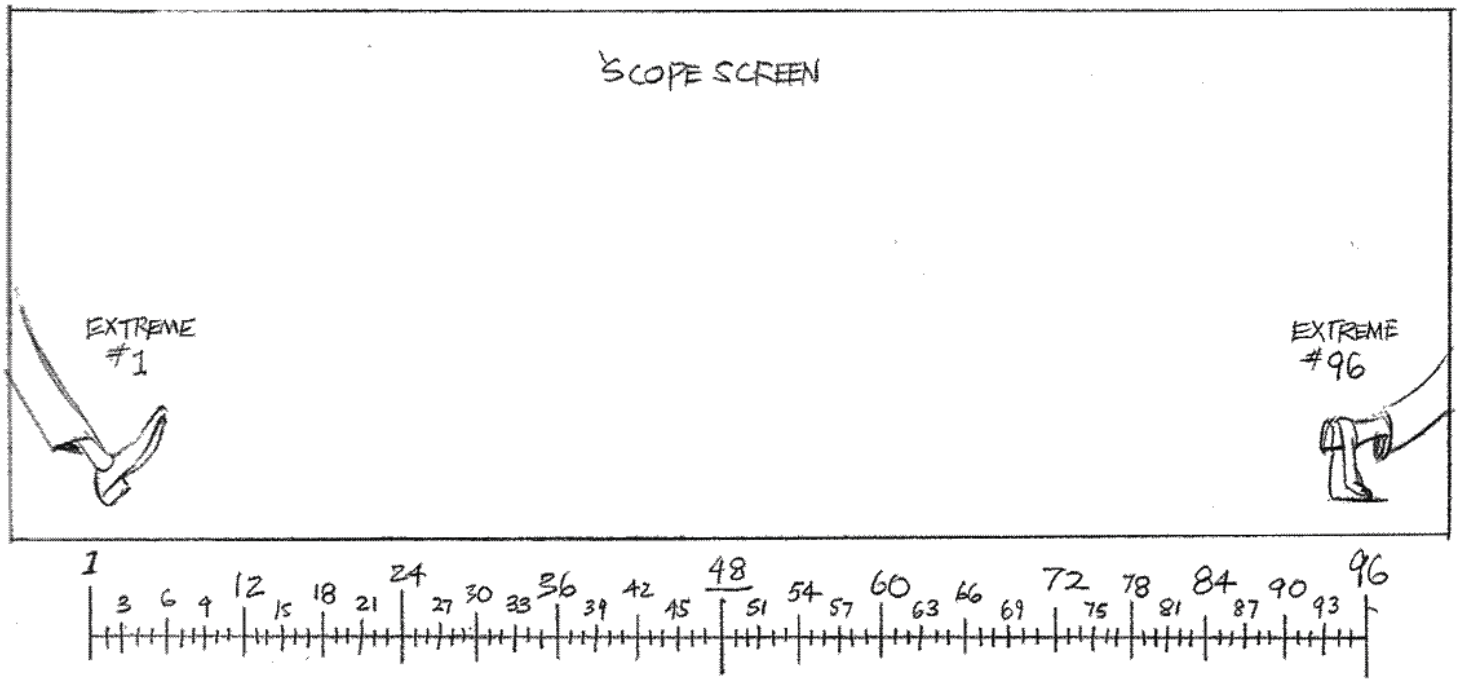


The animator can get away with just drawing the two extreme positions and making a chart for the assistant to put in all the inbetween positions.

I was spoilt by being taught by marvellous, hardworking, top Hollywood animators and I had a few shocks when I worked with some of the lesser mortals.

Here's how a Hollywood hack animator might duck the work:

A character enters screen left . . . and goes out screen right.



To walk across the screen it's going to take 4 seconds – 96 frames. So the animator does drawing number 1 and drawing number 96 and gives this chart to the assistant and goes off to play tennis. He wanders back in next day and blames the assistant for the terrible result.

This may seem far-fetched, but it does happen.

Moving on – we know the extremes and the breakdowns are crucial to the result, but the inbetweens are also very important.

The genie in the computer creates perfect inbetweens, but for 'drawing' people – getting good inbetweens can be a real problem.

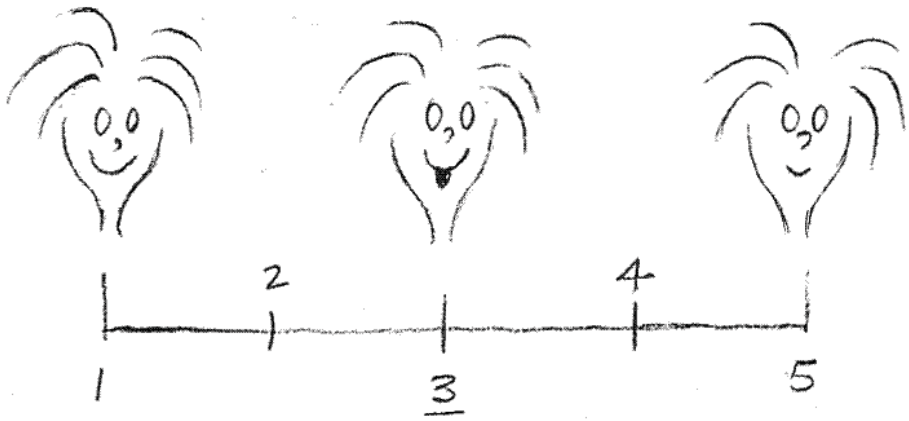
Grim Natwick constantly intoned, 'Bad inbetweens will kill the finest animation.'

In 1934, when the novice Milt Kahl – having just started work at Disney – first met the great Bill Tytla, he told Tytla that he was working in the inbetweening department. Tytla barked, 'Oh yeah? And how many scenes have you screwed up lately?'

Like most people starting out, I did all my own inbetweens. Then I got my first 'official' job animating for UPA in London. They gave me an inexperienced assistant who drew well, but this is what happened:

We had a simple character of the period, a little girl called Aurora who was advertising Kia Ora orange drink. 'Where's the Kia Ora, Aurora?'

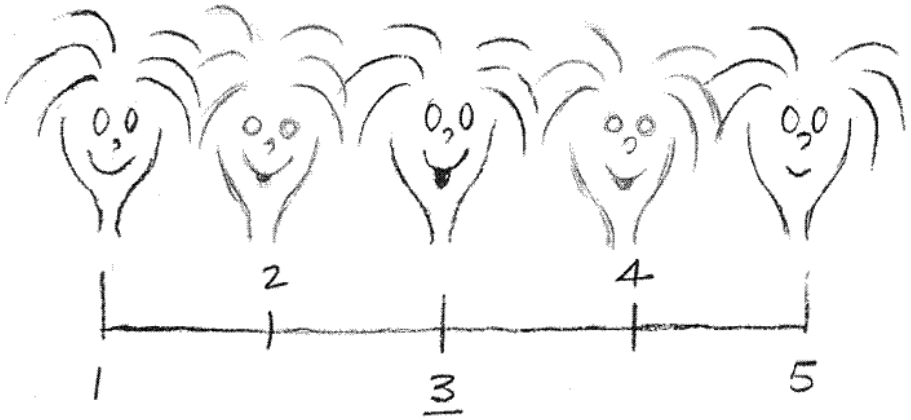
She looked like this.
I drew drawings 1 and 3 and 5, my assistant put in inbetweens 2 and 4.



He had ambitions as a designer and he didn't like egg-shaped eyes like this:

He liked circular eyes like *this*:

So the inbetweens all went in like this:



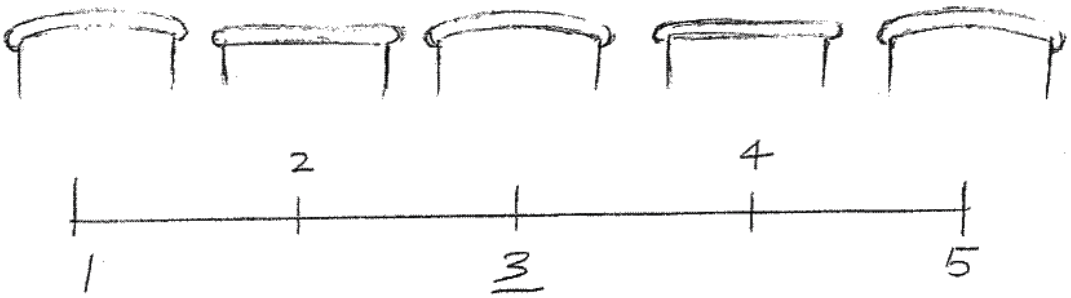
The result on the screen, of course, is this:

Wobble, wobble, wobble.

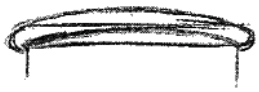
As is common in production when racing to meet the deadline, we end up hiring anybody off the street who can hold a pencil. And this is what happens:

Say a live actor is holding an animated coffee cup –

The inbetweener from the streets doesn't understand simple perspective – so the curved top of the cup gets put in *straight* on the inbetweens.



Result: 'Frying tonight.' Wobble, wobble, wobble.

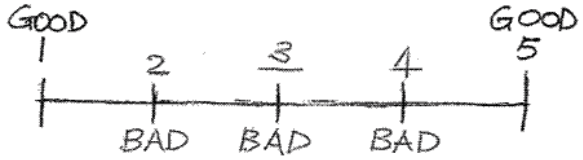


And if it's this wobbly with a simple thing, just imagine what it's going to be like when we are dealing with complex drawings. All the shapes will be doing St Vitus's dance. So the assistants' or inbetweener's job is really *volume control*.

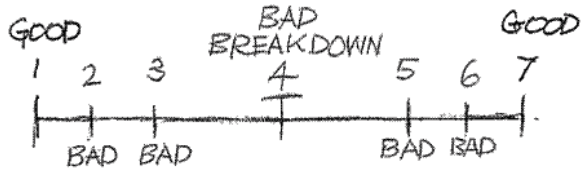
A lot of assistants worry about the quality of their line – matching the animator's line quality. I always say never mind the line quality – just get the volumes right. Keeping the shapes and volumes consistent = volume control! When the thing is coloured in, it's the shapes that we see – it's the shapes that dominate.

Whenever we were under the gun and short of skilled helpers, we found if we outnumbered the dodgy inbetweens by three good drawings to two bad ones – we just scraped through with an acceptable result.

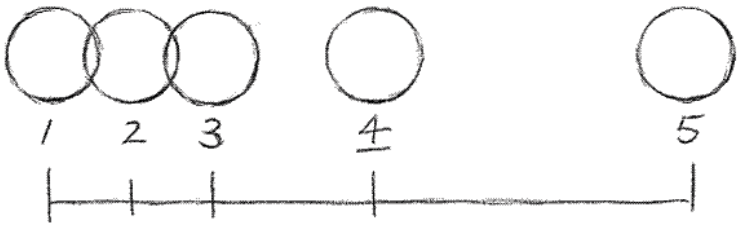
When we only had two good ones with three bad ones in between them – the bad ones outnumbered the good ones and the result was lousy.



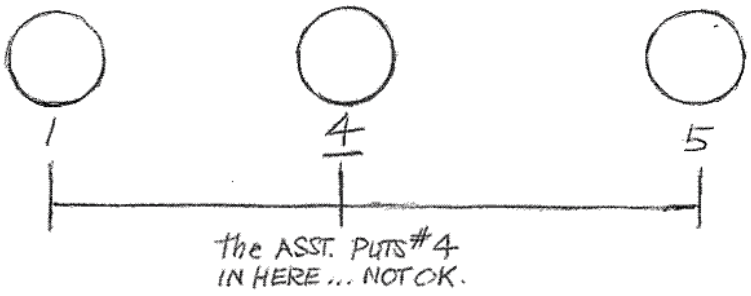
If the breakdown or passing position is wrong, all the inbetweens will be wrong too.

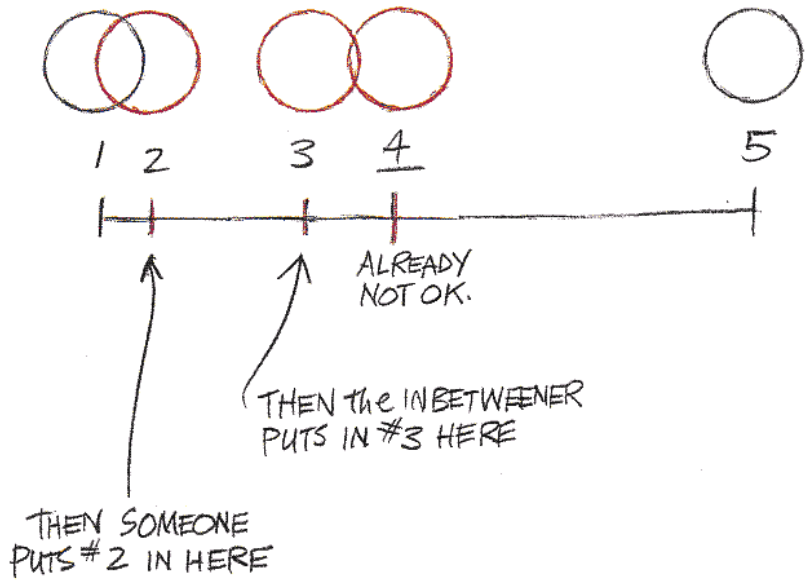


When we're not accurate, here's what happens: The animator supplies a chart and wants equal inbetweens. This is putting them in the right place.



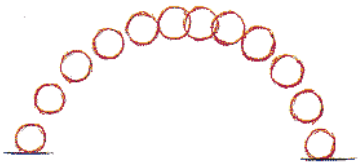
But let's say the assistant puts the breakdown or passing position slightly in the wrong place –





So: Number 4 is wrong.
3 compounds it.
2 compounds it more.

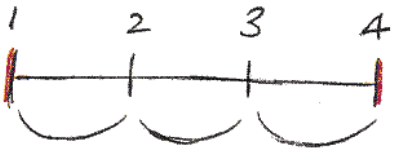
And instead of ending up with fluid actions like this –



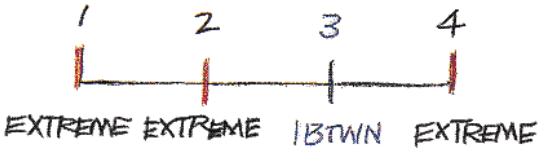
– we'll get this all-over-the-place kind of thing.

One thing an animator should *never* do is to leave his assistant to make 'thirds'.

If we need to divide the chart into thirds –

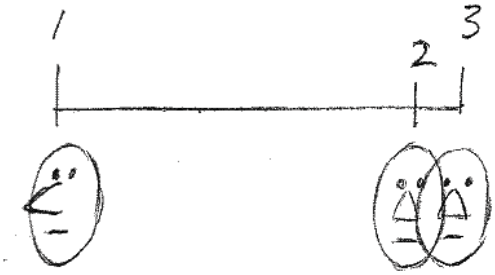


– the animator should make one of the inbetween positions himself –

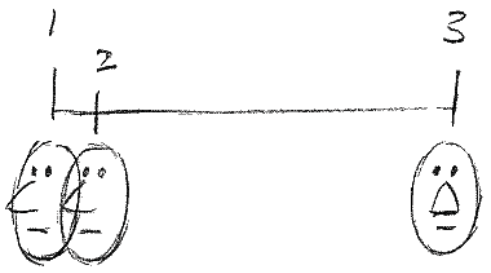


– in order to leave the assistant to put in the remaining position in the middle.

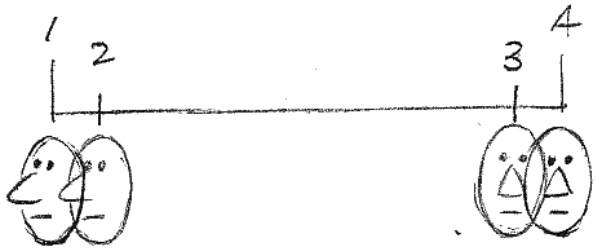
Leaving thirds to the assistant is cruel and is asking for trouble – but it's fair to make a chart like this, calling for an inbetween very close to an extreme:



MAKE ONE INBTWN CLOSER TO 3



MAKE ONE IBTWN CLOSER TO



MAKE ONE IBTWN CLOSER TO 1

MAKE ANOTHER IBTWN CLOSER TO 4

KEYS

And now we come to the Great Circling Disease. For some reason, animators just *love* circles. We love to circle the numbers on our drawings. Maybe it's because, as old Grim Natwick said, 'Curves are beautiful to watch.' Or maybe it's just a creatively playful thing.

I once worked with a Polish animator who circled every single drawing he made!

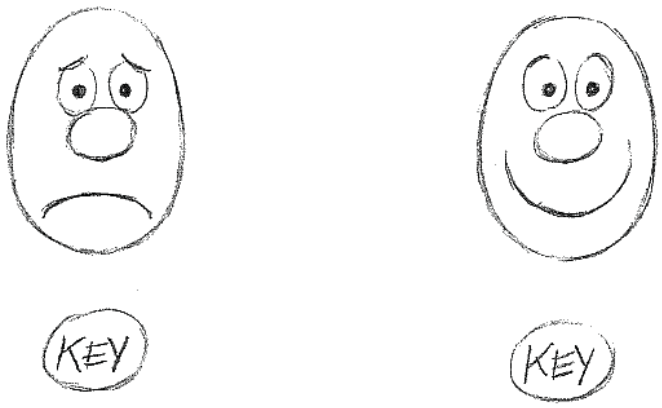
'Is animation, man! Circle! Circle! Circle!'

You'll notice that so far I haven't circled *any* extreme positions. In this clear working system and method developed by the 1940s, the extremes are *not* circled, but the key drawing *is*. The drawings which *are* circled are the 'keys'.

Question: What is a key?

Answer: The storytelling drawing. The drawing or drawings that show what's happening in the shot.

If a sad man sees or hears something that makes him happy, we'd need just two positions to tell the story.

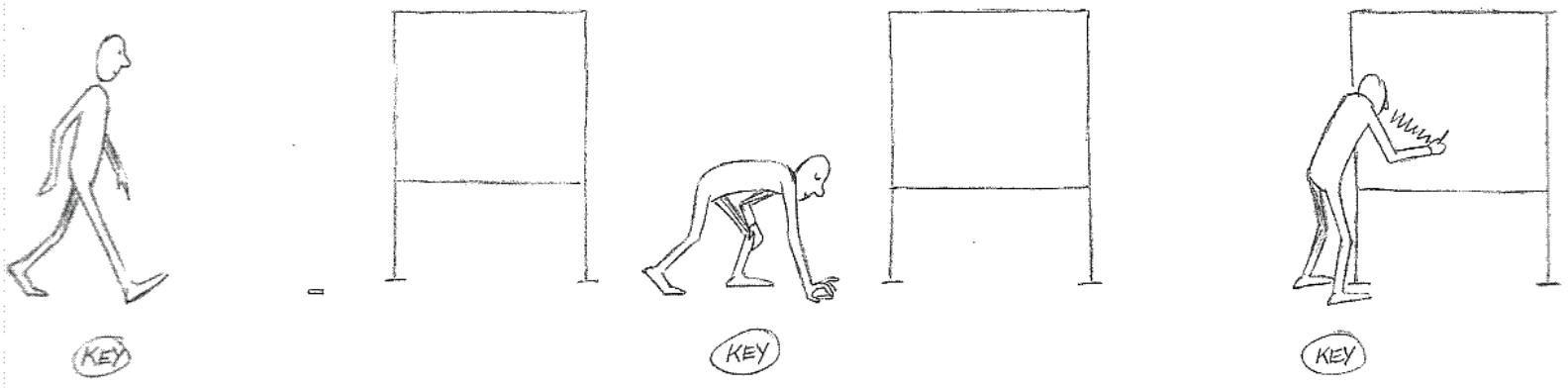


These are the keys and we circle them.

These are the drawings we make first. How we go interestingly from one to the other is what the rest of this book is about.

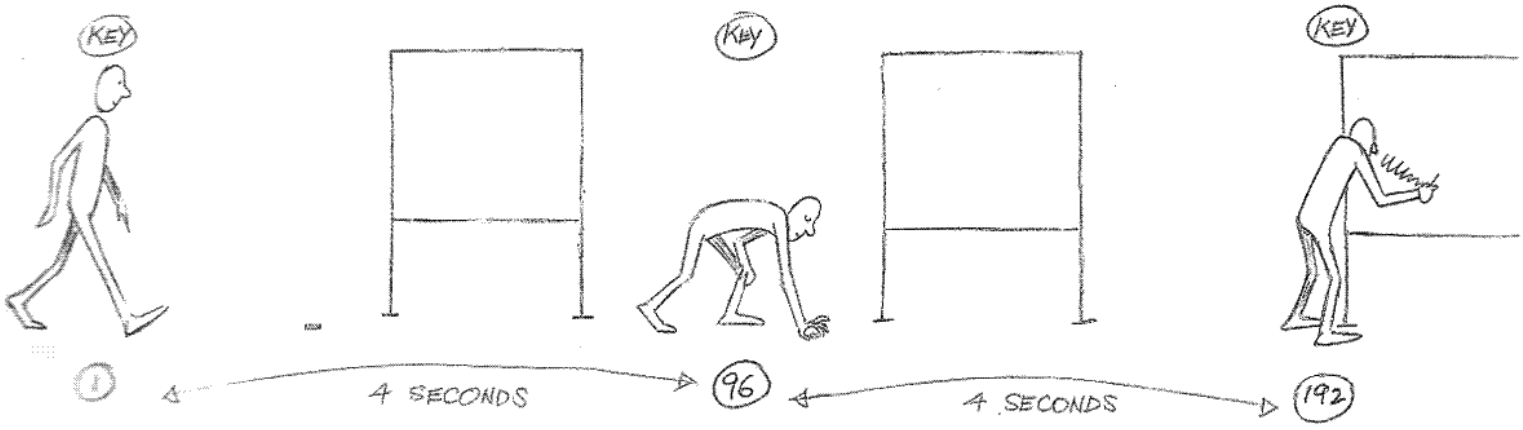
Take a more complex example:

Let's say a man walks over to a board, picks up a piece of chalk from the floor and writes something on the board.



If it was a comic strip or if we wanted to show what's happening on a storyboard, we'd need only three positions. We'll keep it simple and use stick figures so we don't get lost in detail. These three positions become our keys and we circle them.

The keys tell the story. All the other drawings or positions we'll have to make next to bring the thing to life will be the extremes (not circled): the foot 'contacts', the passing positions or breakdowns and inbetweens.



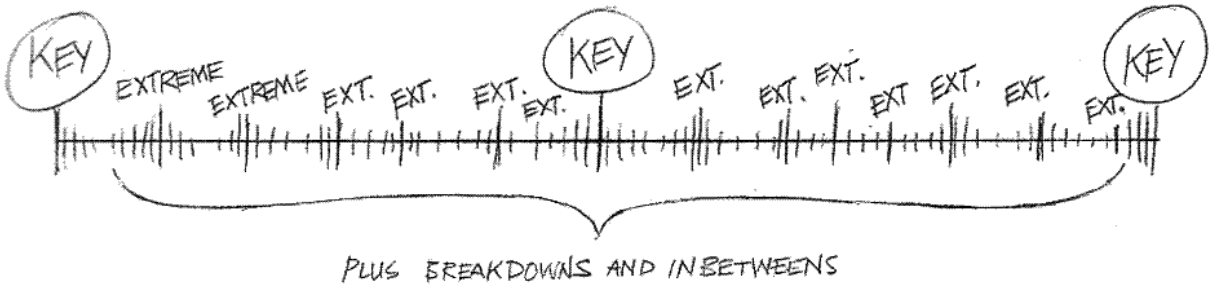
If we time this action out with a stopwatch, we might find that our first key position at the start will be drawing 1. Say it takes him 4 seconds to walk over and contact the chalk on the floor – we'd circle the second key drawing as 96. And when he's stood up, stepped over and written his stuff, it might take another 4 seconds – so our third key could be the last drawing in the shot – 192. The whole shot would then take 8 seconds.

Of course, we don't need to time it all out first, but before we dive into animatorland with all that stuff, we have to clearly set out with our keys what it is we're going to *do* – and we can test our three drawings on film, video or computer.

We haven't dealt with how he or she moves – whether the character is old or young, fat or thin, tall or short, worried or happy, beautiful or ugly, rich or poor, cautious or confident, scholarly or uneducated, quick or slow, repressed or uninhibited, limping or fit, calm or desperate, lazy or energetic, decrepit or shaking with the palsy, drunk or frightened, or whether it's a cold-hearted villain or a sympathetic person – in other words all the 'acting' stuff, plus all the trimmings – clothes, facial expressions etc.

But what we *have* done is made it very plain what *happens* in the shot before we start.

If we were to make a diagrammatic chart of the whole scene, it would end up looking something like this:



Important animators are called key animators, and word got round that they just draw the keys – anything that they draw is a key – and slaves fill in the rest according to the little charts provided by the key animators. Wrong. A key animator is simply like a key executive – an important one.

Many good animators call all their extremes 'keys' – I sure used to. But it makes life so much clearer and easier if you separate the keys from the extremes. Actually, I never heard Ken Harris ever call a drawing a key, but he would say, 'Draw *that* one first. *That's* an important drawing.' And it was a key, really.

I've worked every system, good, bad or half-baked, and experience has convinced me that it's best – even crucial – to separate the storytelling keys from the extremes and all the other stuff. (Of course, as in our example above, the three keys will also function as extremes.) Separating them out stops us getting tangled up and missing the point of the shot, as we vanish into a myriad of drawings and positions.

There may be many keys in a scene – or maybe just one or two – it depends on what it is and the length of the scene. Its whatever it takes to put it over, to read what's to occur.

You can spend time on these keys.

I remember once visiting Frank Thomas and he was drawing a cat. 'Dammit,' he said. 'I've been working all day on this damn drawing – trying to get this expression right.'

I was shocked. All day! Wow! That was the first time I ever saw anyone working so hard on a single drawing. How was he ever going to get the scene done? Finally, the penny dropped. 'Of course, stupid, its his *key*!' It's the most important thing in the scene! He's got to get *that* right!

And it was encouraging to see anyone that great struggling to get it right!

3 WAYS TO ANIMATE

1. The natural way, called STRAIGHT AHEAD

We just start drawing and see what happens – like a kid drawing in the page corners of a schoolbook – stick the numbers on afterwards.

Disney director–animator Woolie Reitherman said, 'When I didn't know what I was doing in an action, I always went straight ahead. I'd just start on ones. Half the time I didn't know what I was doing. To me, it's fun. You find out something you wouldn't have found out otherwise.'

ADVANTAGES

- WE GET A NATURAL FLOW OF FLUID, SPONTANEOUS ACTION.
- IT HAS THE VITALITY OF IMPROVISATION.
- IT'S VERY 'CREATIVE' – WE GO WITH THE FLOW – TAKING ALL OF THE ACTION AS IT COMES ALONG.
- OFTEN THE UNCONSCIOUS MIND STARTS TO KICK IN: LIKE AUTHORS SAYING THEIR CHARACTER TELLS THEM WHAT'S GOING TO HAPPEN.
- IT CAN PRODUCE SURPRISES – 'MAGIC'.
- IT'S FUN.

DISADVANTAGES

- THINGS START TO WANDER.
- TIME STRETCHES and the SHOT GETS LONGER and LONGER.
- CHARACTERS GROW and SHRINK.
- WE CAN TEND TO MISS THE POINT OF THE SHOT and NOT ARRIVE AT THE RIGHT PLACE AT THE RIGHT TIME.
- THE DIRECTOR HATES US BECAUSE HE/SHE CAN'T SEE WHAT'S HAPPENING.
- IT'S LOTS OF WORK TO CLEAN UP THE MESS AFTERWARDS – and IT'S HARD TO ASSIST.
- IT'S EXPENSIVE – THE PRODUCER HATES US.
- IT CAN BE HARD ON THE NERVES – MAD ARTIST and NERVOUS BREAK-DOWN TIME AS WE CREATIVELY LEAP IN and THRASH AROUND IN THE VOID – ESPECIALLY WITH LOOMING DEADLINES.

2. The planned way, called POSE TO POSE

First we decide what are the most important drawings – the storytelling drawings, the keys – and put them in. Then we decide what are the next most important positions that have to be in the scene. These are the extremes and we put them in – and any other important poses. Then we work out how to go from one pose to another – finding the nicest transition between two poses. These are the breakdown or passing positions. Then we can clinically make clear charts to cushion and ease in and out of the positions and add any finishing touches or indications for the assistant.

To illustrate how effective the pose to pose method is, the brilliant Disney art director–designer Ken Anderson told me that when he was making layout drawings of characters for animators working on *Snow White and the Seven Dwarfs*, he drew lots and lots of key poses of Grumpy for each shot. Ken's drawings were then given to one of the Grumpy animators. Ken found out later that the guy just put charts on the drawings, handed them to his assistants and went off to lunch, and took the credit, for what in effect, was Ken's fine animation.

ADVANTAGES

- WE GET CLARITY.
- The POINT OF The SCENE IS NICE and CLEAR.
- IT'S STRUCTURED, CALCULATED, LOGICAL.
- WE CAN GET NICE DRAWINGS and CLEARLY READABLE POSITIONS.
- IT'S IN ORDER – The RIGHT THINGS HAPPEN AT The RIGHT TIME and IN The RIGHT PLACE IN The OVERALL TIME ALLOTTED.
- The DIRECTOR LOVES US.
- IT'S EASY TO ASSIST.
- IT'S A QUICK WAY TO WORK and FREES US UP TO DO MORE SCENES.
- The PRODUCER LOVES US.
- WE KEEP SANE, OUR HAIR ISN'T STANDING ON END.
- WE EARN MORE MONEY AS WE ARE SEEN TO BE RESPONSIBLE PEOPLE and CLEARLY NOT MAD ARTISTS.

PRODUCERS HAVE TO DELIVER ON TIME and ON BUDGET, SO BRILLIANCE IS NOT REWARDED AS MUCH AS RELIABILITY. I SPEAK FROM EXPERIENCE WORKING BOTH SIDES OF the FENCE. THEY DON'T PAY US FOR 'MAGIC.' THEY PAY US FOR DELIVERY.

DISADVANTAGES

- BUT – AND IT'S A BIG BUT: WE MISS the FLOW.
- The ACTION CAN BE A BIT CHOPPY A BIT UNNATURAL.
- AND IF WE CORRECT THAT BY ADDING A LOT OF OVERLAPPING ACTION TO IT IT CAN GO EASILY The OTHER WAY and BE RUBBERY and SQUISHY – EQUALLY UNNATURAL.
- IT CAN BE TOO LITERAL - A BIT COLD-BLOODED. NO SURPRISES
- WHERE'S the MAGIC?

So it's pretty obvious the best way to work is going to be:

3. The COMBINATION OF STRAIGHT AHEAD and POSE TO POSE

First we plan out what we're going to do in small thumbnail sketches. (It's also a good idea to have done this with the other two methods.)

Then we make the big drawings – the storytelling drawings, the keys. Then we put in any other important drawings that *have* to be there, like anticipations or where hands or feet contact things – the extremes. Now we have the structure, just as we had with the pose-to-pose system.

But now we use these keys and important extremes as *guides* for things and places we want to aim at. After you get your overall thing – go again. *Do one thing at a time.* We'll work straight ahead on top of these guideposts, improvising freely as we go along.

We'll do *several* straight ahead runs on different parts – taking the most important thing first. We may have to change and revise parts of the keys and extremes as we go along, rubbing bits off and re-drawing or replacing them.

So: we make a straight ahead run on the primary thing.

Then take a secondary thing and do a straight ahead run on that.

Then take the third thing and work straight ahead on that.

Then the fourth thing, etc.

Then add the hair or tail or drapery or flapping bits at the end.

ADVANTAGES

— WORKING THIS WAY COMBINES the STRUCTURED PLANNING OF WORKING FROM POSE TO POSE WITH the NATURAL FREE FLOW OF the STRAIGHT AHEAD APPROACH.

— IT'S A BALANCE BETWEEN PLANNING and SPONTANEITY.

— IT'S A BALANCE BETWEEN COLD BLOODEDNESS and PASSION.

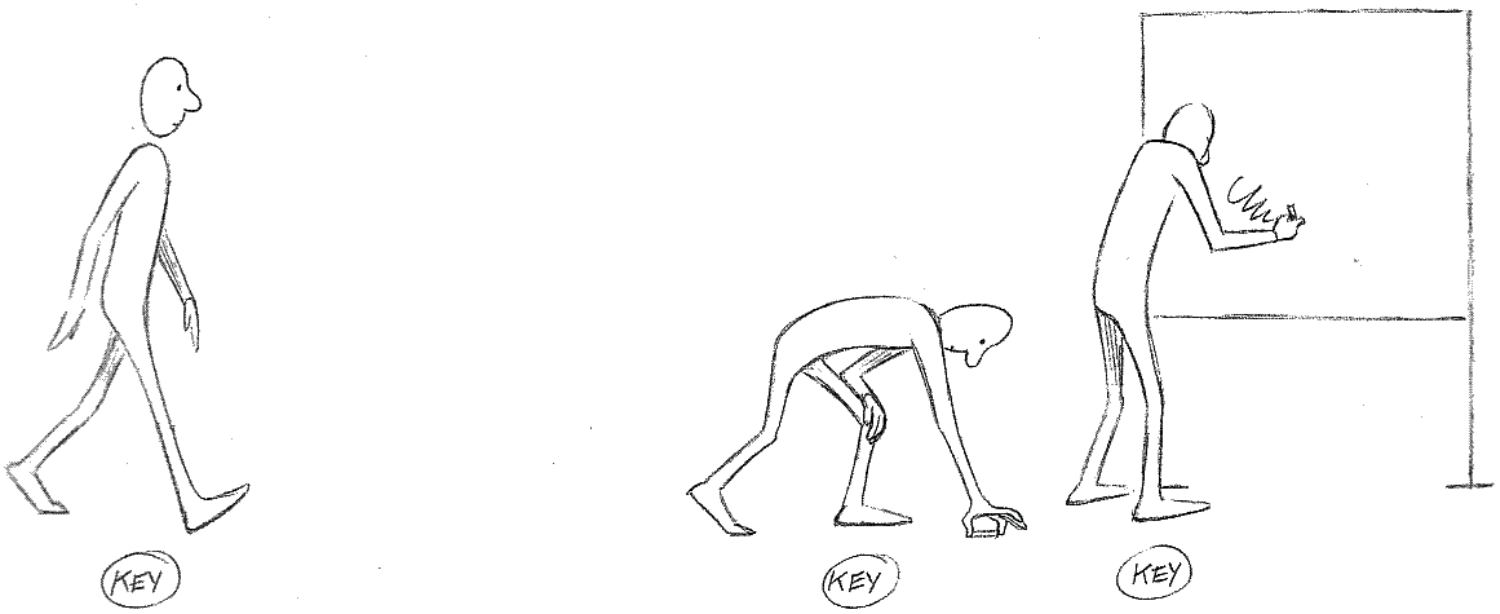
DISADVANTAGES

— NONE THAT I KNOW OF...

Let's take our man going over to the blackboard again.

What do I do first?

Answer: The keys – the storytelling drawings or positions that *have* to be there to show what's happening. Put it where you can see it . . . so it *reads*.



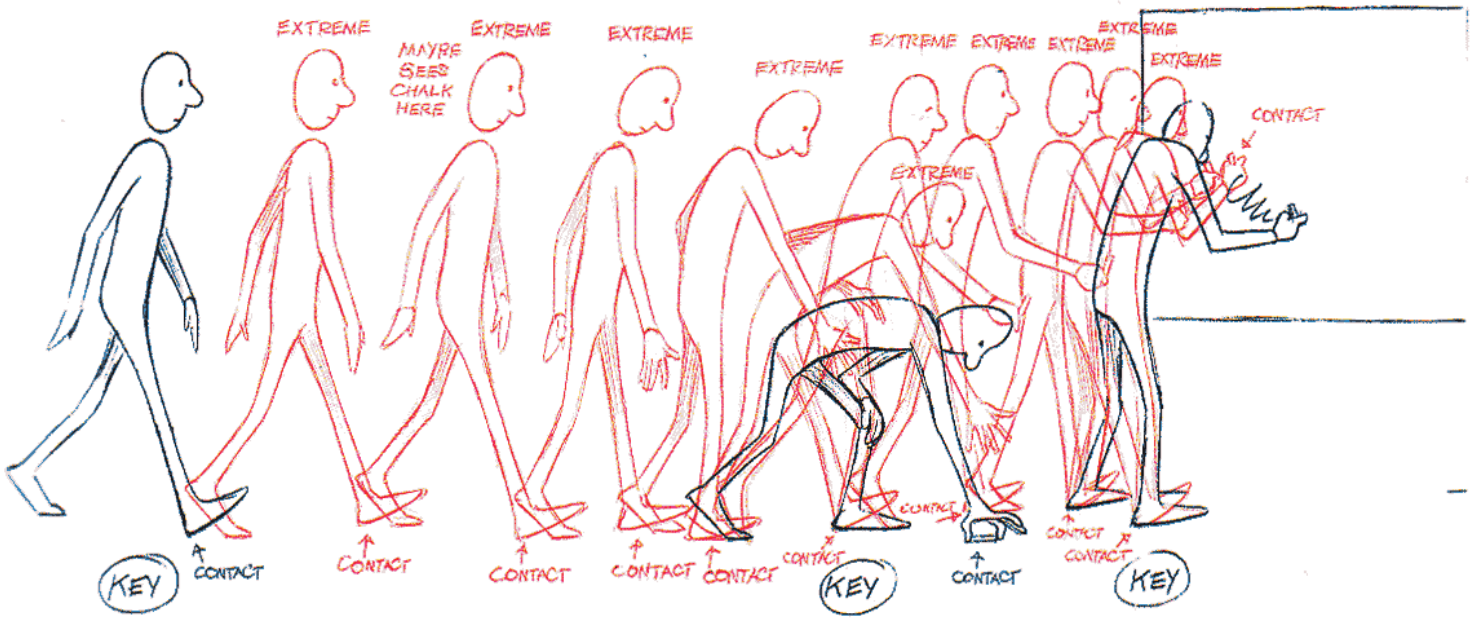
What do we do next?

Answer: Any other drawings that *have* to be in the shot. Obviously, he has to take steps to get over to the chalk – so we make the 'contact' positions on the steps where the feet are just touching the ground.

There's no weight on them yet – the heel is just contacting the ground. As with the fingers just contacting the chalk – they haven't closed on the chalk yet.

If we act all this out, we might find he takes five steps to get to the chalk and bend down. I notice that when I act it out, I automatically pull up my left pant leg as I bend down, then I put my hand on my knee before my other hand contacts the chalk. I would make an extreme where the hand just contacts the pant leg – before it pulls up the pants.

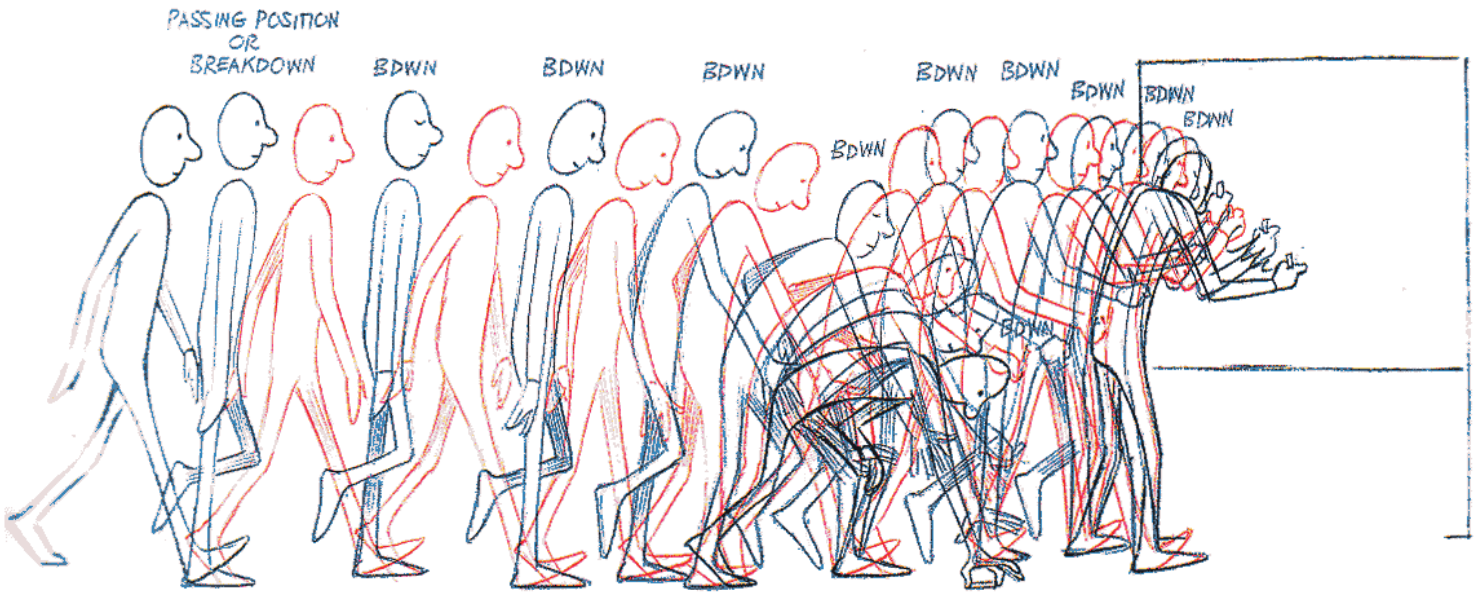
These will be our extremes. We're working rough, sketching things in lightly – although we probably have made rather good drawings of the keys. (I haven't here, because I'm trying to keep it simple, for clarity).



We could act it out, timing the steps and putting numbers on the extremes or we could leave the numbering till later. I would probably put numbers on it now and test it on the video to see how the timing feels as his steps get shorter – and make any adjustments.

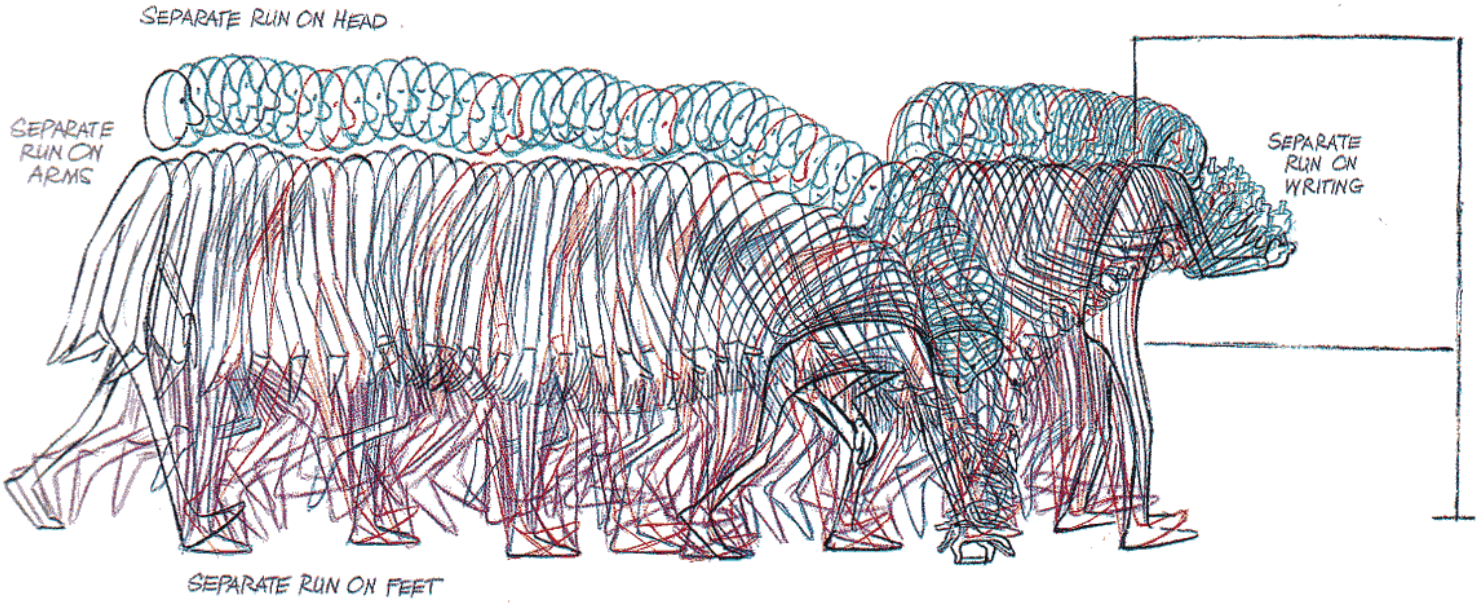
What next?

We'll break it down, lightly sketching in our passing positions or 'breakdowns'. We won't get fancy about it now – the fancy stuff comes later in the book. For now, we'll just make the head and body raise up slightly on the passing positions of the steps – like it does on a normal walk.



We'd probably have numbers on the drawings by now, and when we test it, we've got three or four positions for every second – so it's easy to see what our timing is. And to make any adjustments. And if the director wants to see how we're doing – it looks almost animated.

Now we'll make straight ahead runs on the different parts – using our extremes and breakdown positions as a guide – and altering them, or parts of them, if we need to as we go along. Take one thing at a time and animate it straight ahead.



Maybe he's mumbling to himself, or maybe he's talking – maybe his head just wobbles around with self love. Whatever it is, we'll treat it as a separate straight-ahead run, working on top of what we already have.

We'll make another straight-ahead run on the arms and hands. Maybe they'll swing freely in a figure eight or a pendulum movement; or maybe they hardly move before he reaches for the chalk. Maybe he pulls up his pants as he moves along – or scratches or snaps his fingers nervously, or cracks his knuckles. When we arrive at our key, we might rub out the arm and alter it to suit our arm action. Or delay his head. Or raise it early to look at the board.

We can do lots of interesting things with the legs and feet, but for now we just want them to function smoothly. (I'm avoiding the problem of weight at this stage because the up and down on the head and body that we have at the moment will be adequate for now, and the figure won't just float along.)

When he writes on the board, we'll treat that as a separate run. If he has long hair or a pony tail, we'll do that as a separate straight-ahead run. His clothes could be a separate run, baggy pant legs following along. If he'd grown a tail, that would be the last thing we'd put on.

I've shown these things in different colours to be as clear as possible. In my own work I sometimes use different coloured pencils for the separate runs – then pull it all together in black at the end. I was delighted to find that the great Bill Tytla often used colours for the separate bits, then pulled them all together afterwards.

To recap:
Having made the keys, put in the extremes, then put in the breakdowns or passing positions. Now that we've got our main thing – we go again, taking one thing at a time.

First, the most important thing.

Then, the secondary thing.

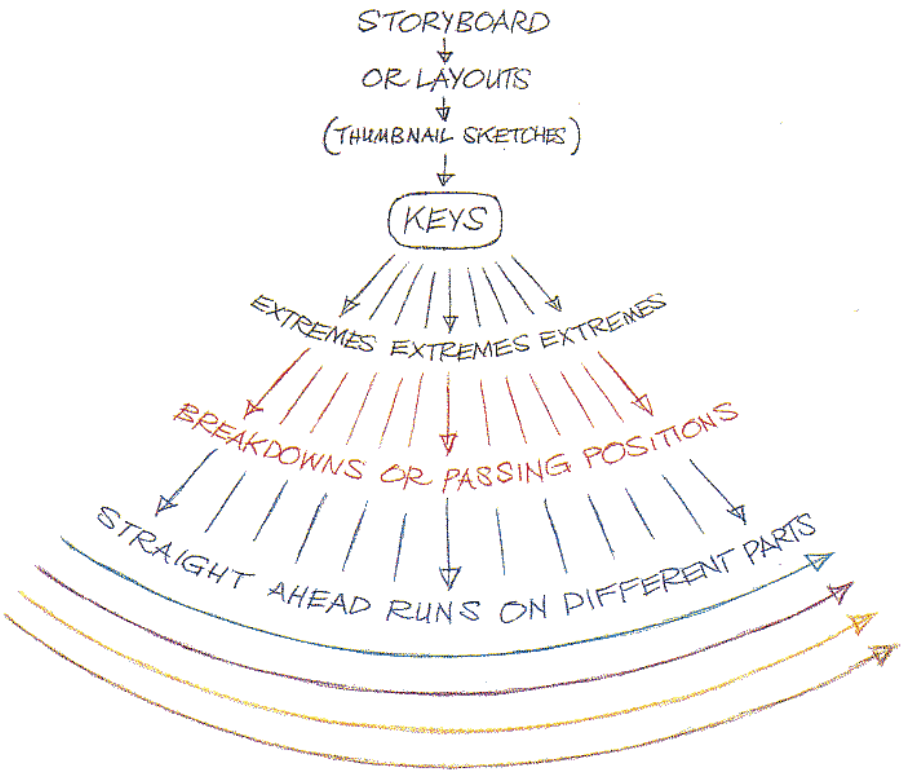
Then, the third thing.

Then, the fourth thing etc.

Then, add any flapping bits, drapery, hair, fat, breasts, tails etc.

The general principle is:
After you've got your first overall thing – go again. Do one thing at a time (testing as you go along). Then pull it all together and polish it up. Make clear charts for the assistant to follow up or do it all yourself.

It's like this:



Of course, you can work any way you want. There are no rules – only methods. You might feel like ignoring all of this and just work straight ahead or work from pose-to-pose, or start one way and switch to the other – why not?

What's to stop us re-inventing the wheel? Lots of people are busy doing it. But on the other hand, why bother?

This method of going at it was developed through concentrated trial and error by geniuses and it's a wonderful basis on which to operate. Having used just about every approach going – including no system – I've found this is the best working method by far. Get it in your blood-stream and it frees you to express yourself. Use this technique to get past the technique!

Milt Kahl worked this way. Near the end of his life I told him, 'Now that I've been working the same way, I really do think that – apart from your talent, brain and skill – fifty per cent of the excellence in your work comes from your working method: the *way* you think about it, and the *way* you go about it.'

'Well . . .' he said thoughtfully, 'you're right. Hey, you've gotten smart!' Milt often told me that by the time he'd plotted everything out this way, he'd pretty much animated the scene – even including the lip sync. Then he'd finish putting numbers on the drawings, add bits and make little clinical charts for the assistant – easing things in and out. He complained he never really got to animate because when he'd finished plotting out all the important stuff – it *was* animated. He'd already done it.

I rest my case.

I always use the video to test my stuff at each stage – even the first scribbles – time them and test them. In the 1970s and 80s, Art Babbitt used to get mad at me for it – 'Goddamit, you're using that video as a crutch!' 'Yes,' I'd say, 'but is it not true that Disney first instituted pencil tests and that's what changed and developed animation? And don't you always say that pencil tests are our rehearsals?'

Assenting grunt.

'And what's the difference between rushing a test in to the cameraman at the end of the day when he's trying to get home, and if he does stay to shoot it, hang around the next day till the lab delivers the print and mid-morning interrupt the editor, who's busy cutting in the main shots, and then finally see your test – when we can use today's video and get a test in ten minutes?'

Art would turn away, 'I am not a Luddite.' (Machine wreckers protesting the Industrial Revolution.)

Whenever Ken Harris had to animate a walk, he would sketch out a quick walk cycle test and we'd shoot it, pop the negative in a bucket of developer, pull out the wet negative (black film with white lines on it), make a loop and run it on the moviola.

'I've done hundreds of walks,' Ken would say, 'all kinds of walks, but I still want to get a test of my basic thing before I start to build on it.'

Bill Tytla said, 'If you do a piece of animation and run over it enough times, you must see what's wrong with it.'

I actually think the video and computer have saved animation!

Certainly the success of *Who Framed Roger Rabbit* contributed substantially to the renaissance of animation, and having the video to test everything as we went along was crucial to us. We had a lot of talented but inexperienced young people, and with a handful of lead animators we were able to say, 'Take that drawing out, change that one, and put more drawings in here' etc. This enabled us to keep improving everything as we raced along, so we were able to collectively hit the target.

Milt always said he would never bother to look at his tests. 'Hell, I know what it looks like – I *did* it!' He would wait to see several of his shots cut together in a sequence but only to see 'how it's getting over'.

But that was his way. I have never reached that stage and probably never will. I test everything as I go along and it really helps. We're building these performances, so why not test our foundations and structure and decorations as we proceed? And since it reveals our mistakes – mistakes are very important since we *do* learn from our mistakes – we make our corrections and improvements as we build.

Of course, at this stage I wouldn't have a problem routining my way through a job without testing – but why?

The video or computer is there, so let's use it.

An interesting thing I've noticed is that when animators get older their perception of time slows up. They move slower and animate things slower. The young guys zip stuff around. So, the video is a useful corrective to us old bastards. And young ones when it's *too* fast.