



# Facial Expressions and Animation

FACIAL EXPRESSION



# Facial Expressions and Animation

- Theory behind Facial Expressions
- Execution in Animation
- Prof. Paul Ekman
  - Universality in Facial Expressions?

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# Facial Expressions and Animation



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# Facial Expressions and Animation

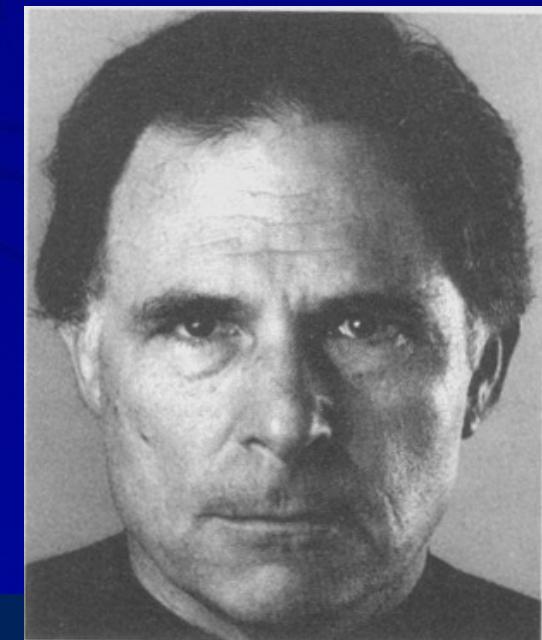
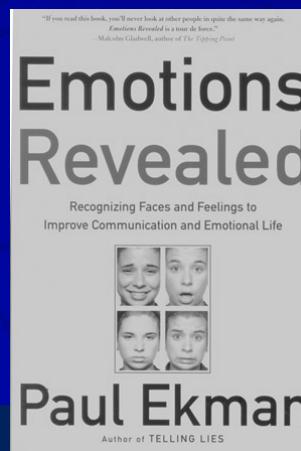


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# Paul Ekman

- Professor of Psychology
- Expert in facial expression recognition
- Emotions Revealed (2003)
- Categorizing different emotions



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# Paul Ekman

- Nurture vs Nature
- Are facial expressions universally recognizable?
- Ekman's proof
  - Blind people
  - Indigenous cultures



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# Facial Action Coding System



- Method for measuring and describing facial behaviors
  - By Paul Ekman and W.V. Friesen in the 1970s
  - Determining how the contraction of each facial muscle (singly and in combination with other muscles) changes the appearance of the face
  - Identifying the specific changes that occurred with muscular contractions and how best to differentiate one from another
- Goal: To create a reliable means for skilled human scorers to determine the category or categories in which to fit each facial behavior
- FACS scores are descriptive only, and provide no implications about the meaning of the behavior

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# FACS Categories and Actions



Original Action Units – Part 1



Original Action Units – Part 2



Original Action Units – Part 3



Original Action Units - Part 4



Original Action Units – Part 5



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# Categories of Facial Expressions



- Facial Expression Categories:
  - Sadness and agony
  - Anger
  - Surprise and Fear
  - Disgust and Contempt
  - Happiness
- “No single facial expression can be relied upon always to be present when an emotion is felt”



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# Sadness and Agony

- 
- Often invokes similar feelings of sadness
  - Rarely voluntary
  - Hard to mimic
  - Consists of a combination of conflicting actions
- 



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# Recognizing Sadness



- Mouth

- Corner of lips pulled down
- Raised cheeks
- Possibly dropped jaw (for agony and crying)



- Eyes

- Upper eyelids drop
- Inner corners of eyebrows raised and brought together



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# Sadness



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# Anger

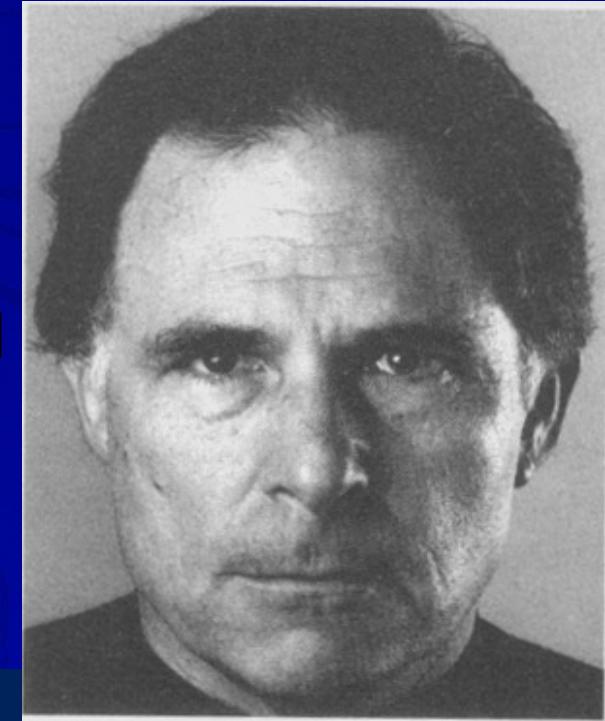
- Unlike sadness:
  - Looking at anger does not invoke it
  - Easier to mimic

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# Recognizing Anger

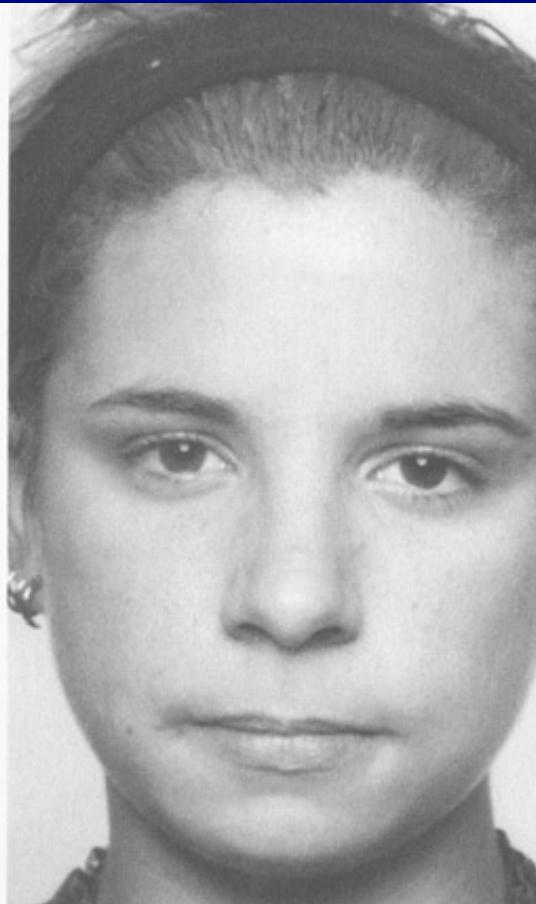
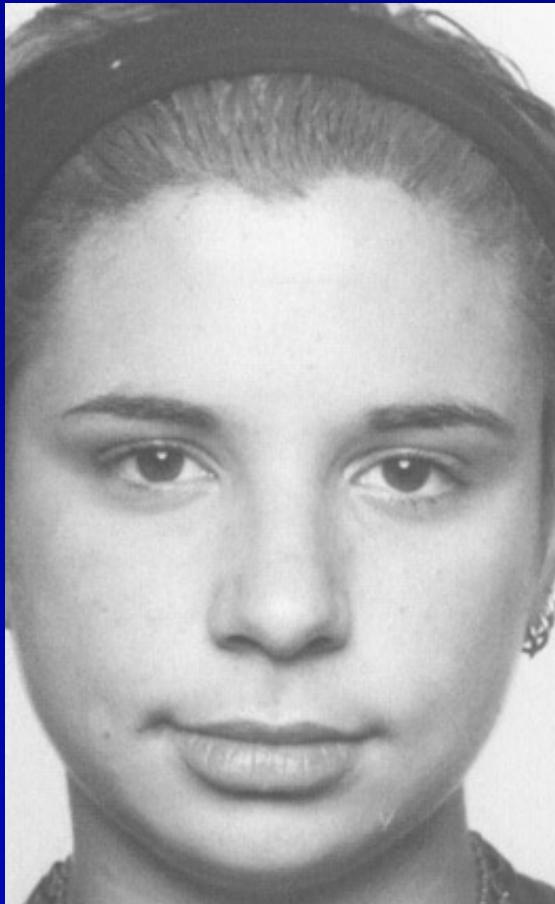
- 
- Jaw tightly clenched
  - If teeth exposed, mouth has rectangular shape
  - Thinning of lips
    - Subtle but frequent
    - Earliest sign
  - Lower jaw can be forward
- 
- 
- 



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# Recognizing Anger



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# Recognizing Anger



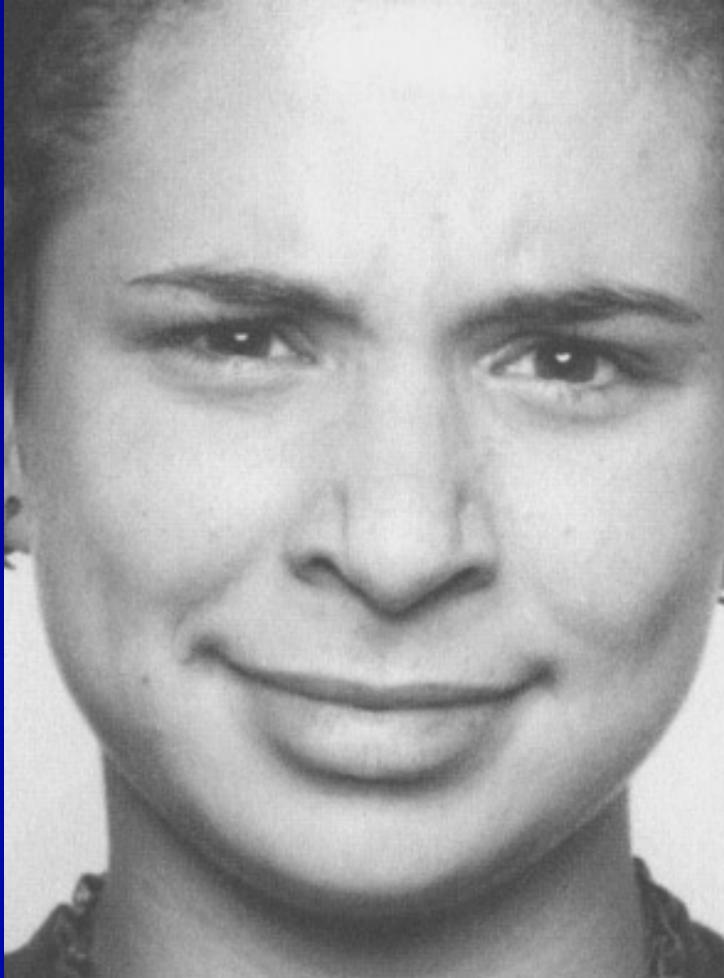
- Glaring eyes
  - Raised upper eyelids
  - Possibly tensed lower eye lids
- Muscle of difficulty
  - Tighten up area around eyes
  - Mental and physical difficulty cause it to contract
- Eyebrows lowered and brought together



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# Anger



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# Surprise and Fear

- Fear has been studied more than any other emotion
- Hard to distinguish the surprise and fear
- Surprise is a temporary expression, which often converts into other expressions

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# Recognizing Fear



## Eyes

- Upper eyelids raised as high as possible
- Tensed lower eyelids
- Eyebrows raised and slightly closer together
- Eyes staring straight ahead

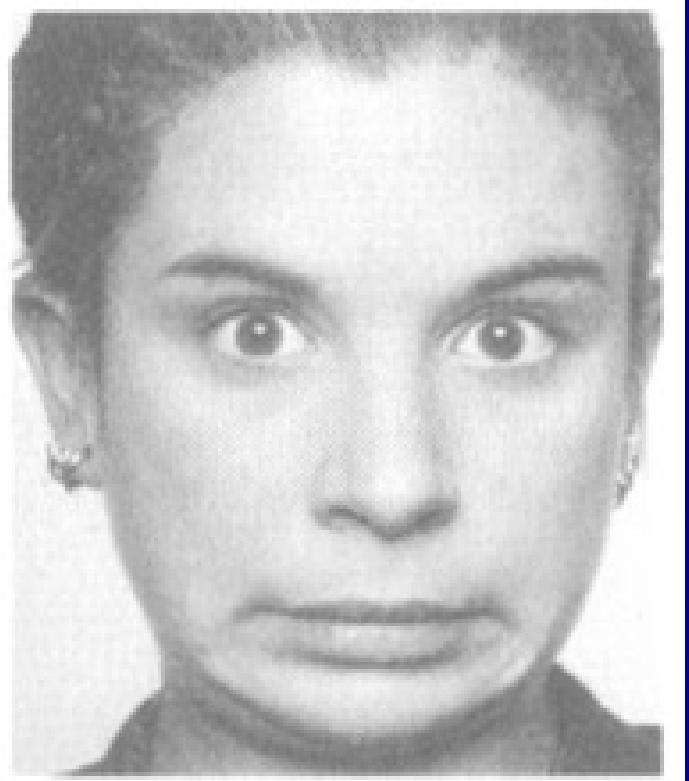
## Mouth

- Lips stretched horizontally
- Possibly dropped jaw

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# Surprise and Fear

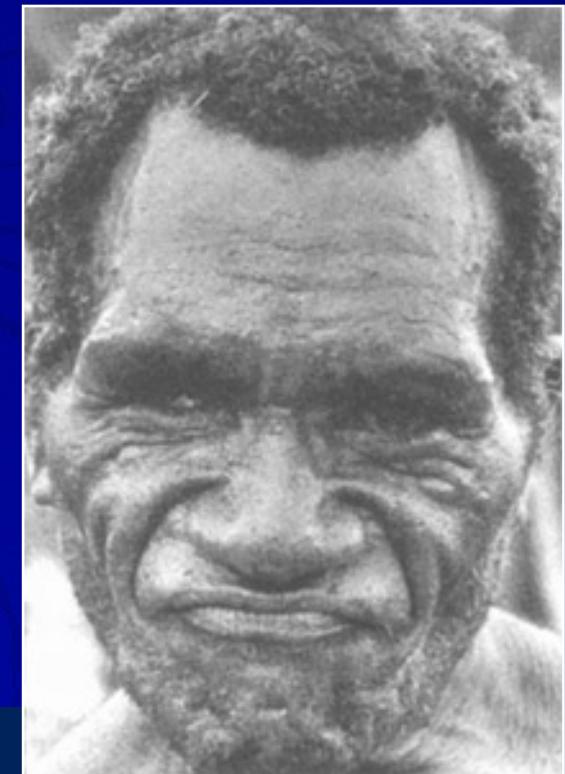


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# Disgust and Contempt

- 
- Subtly different from anger
  - Rarely photographed in comparison to the other emotions
  - Paul Rozin
  - Interpersonal triggers:
    - Strange, deceased, misfortunate, morally tainted
- 



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# Recognizing Disgust and Contempt



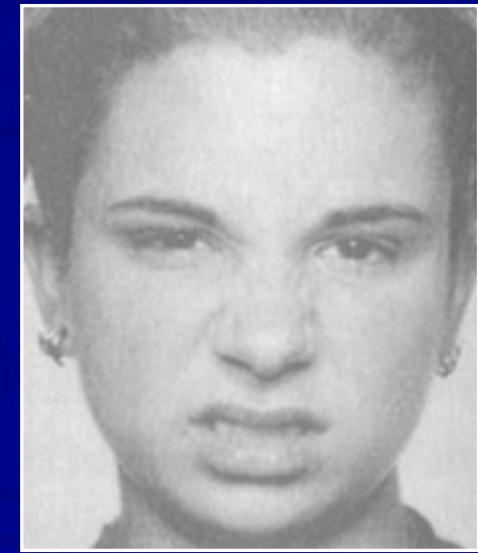
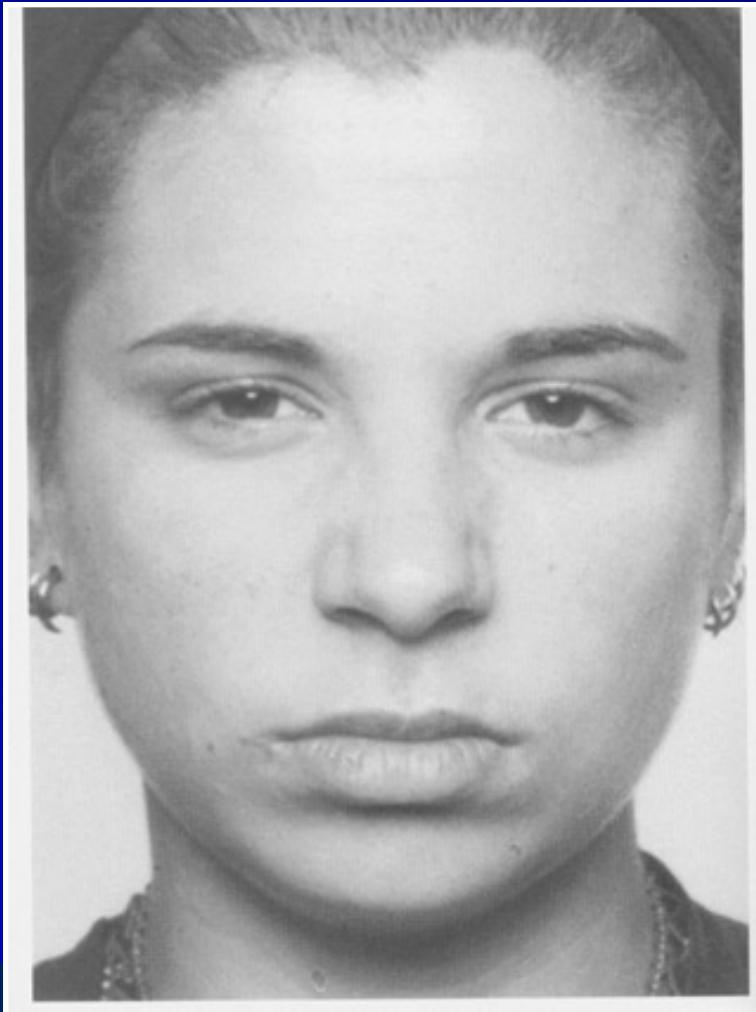
- Active muscles around nose
- Eyes can be relaxed comparatively to anger
- Can be limited to one side of the face
  - Feeling of imbalance
- Lowered eyebrows
- Raised upper lip
- Combinations:
  - Disgust and anger
  - Contempt and smile



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# Disgust and Contempt



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# Happiness

- More general term
  - Describes a state of mind
- Emotions invoked differ from all the other facial expression categories
- 16 Categories of enjoyable emotions

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# Recognizing Happiness



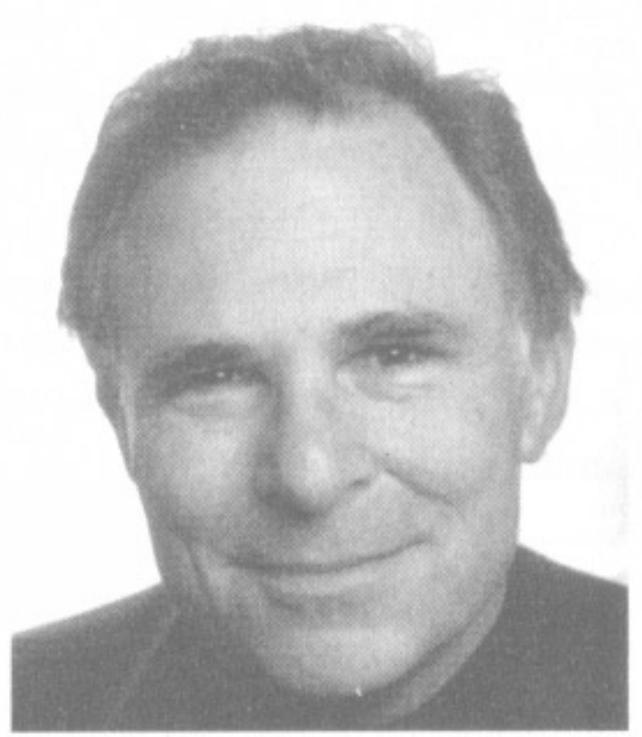
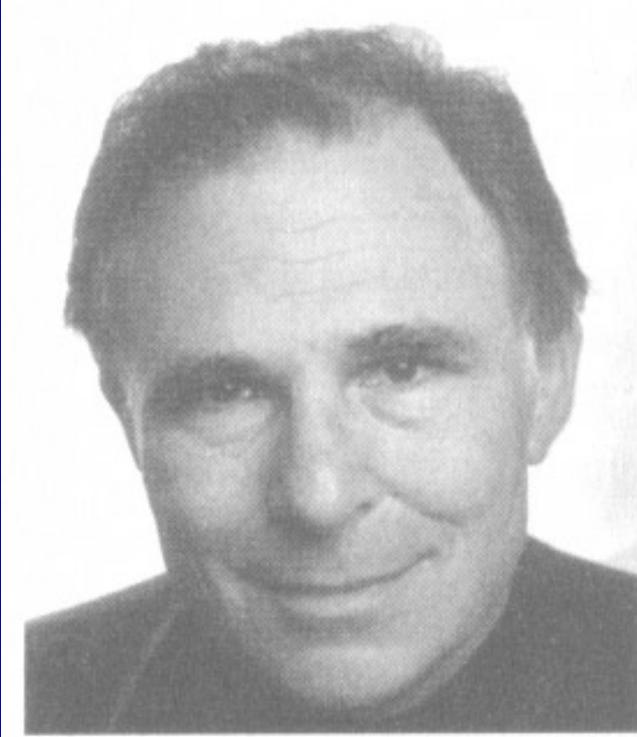
- Duchenne Smile
  - Orbicularis oculi
  - Can not be voluntary
- Fake smiles



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# Happiness



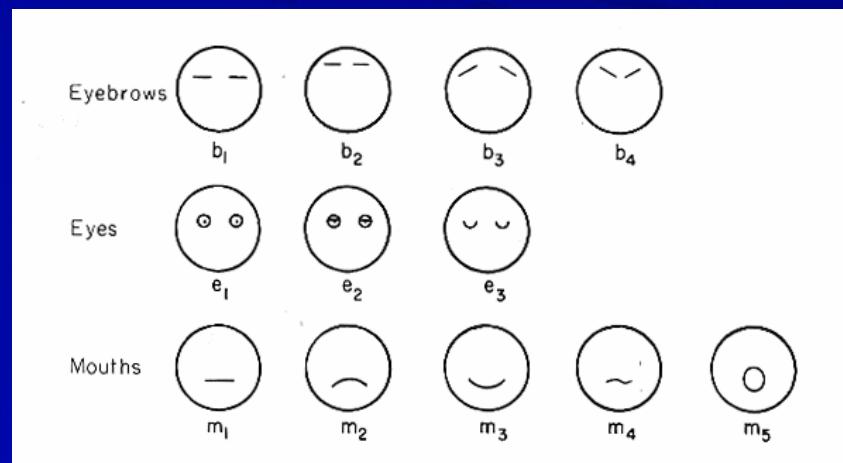
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# Cross-Cultural Facial Expression

## ■ Cüceloglu's experiment (1970)

- 60 line drawings of facial elements
- Showed to students in US, Japan and Turkey
- Concluded that facial codes are common to different cultures



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# Universality of Facial Expressions

- 
- Ekman and Friesen's experiment (1971)
    - Over 3000 still photographs
    - Showed to 4 different language groups
    - Proved that facial expressions are universal

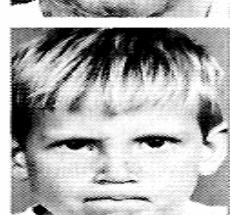


	Japan	Brazil	Chile	Argentina	United States
Happiness	87	97	90	94	97
Fear	71	77	78	68	88
Surprise	87	82	88	93	91
Anger	63	82	76	72	69
Disgust/Contempt	82	86	85	79	82
Sadness	74	82	90	85	73
Number of Observers	29	40	119	168	99



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	United States (N=99)	Brazil (N=40)	Chile (N=119)	Argentina (N=168)	Japan (N=29)
		97% Happiness	95% Happiness	95% Happiness	98% Happiness
		92% Disgust	97% Disgust	92% Disgust	92% Disgust
		95% Surprise	87% Surprise	93% Surprise	95% Surprise
		84% Sadness	59% Sadness	88% Sadness	78% Sadness
		67% Anger	90% Anger	94% Anger	90% Anger
		85% Fear	67% Fear	68% Fear	54% Fear
					66% Fear



# Sadness in Animation



- Upper eyelids drop
- Inner corners of eyebrows raised and brought together
- Raised cheeks

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# Anger in Animation



- Jaw tightly clenched
- If teeth exposed, mouth has rectangular shape
- Glaring eyes
- Raising of upper eyelid
- Eyebrows lowered and brought together

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# Fear in Animation



- Upper eyelids raised as high as possible
- Tensed lower eyelids
- Stretch lips horizontally
- Dropped jaw
- Eyebrows raised and close together

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# Disgust in Animation



- Active muscles around nose
- Eyes can be relaxed
- Can be limited to one side of the face

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# Happiness in Animation



- Most frequently observed in animations
- <> Fake smiles

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# Animating Facial Expressions

- Anthropomorphism



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# Animating Facial Expressions

- Voice as preprocess or post-process?
- Exaggeration in facial features

