

Contents

<i>Preface</i>	<i>xi</i>
<i>Acknowledgements</i>	<i>xv</i>
1. Emotion since Darwin	1
1.1. What is an emotion?	1
1.2. A biological approach to emotion?	5
1.3. Darwin and 'the expression of the emotions in animals and man'	7
1.4. Cannon and the 'utility of the bodily changes in pain and great emotions'	8
1.5. James and feelings as the basis for emotion	9
1.6. Development of the emotions	11
1.7. Learning and emotion	12
1.8. Cognition and emotion	13
1.9. Biology and emotion	13
2. Releasers and state-dependent reflexes	17
2.1. Apologia	17
2.2. Neuroscience and emotion – a brief digression	17
2.3. Neurophysiology and emotion	18
2.4. Releasers and emotion	21
2.5. Reflexes and goal-directedness	22
2.6. Electrical stimulation of the brain and goal-directed behaviour	24
2.7. Electrical excitation versus natural excitability	28
2.8. The neural basis for the release of behaviour	28
2.9. Releasers, state-dependent reflexes and emotion	31
3. Purpose and emotion	33
3.1. Teleonomy, a redefinition of purpose	33
3.2. Teleonomy versus teleology	34
3.3. Emotions and teleonomy	36
3.4. Teleonomy and its implication for a unitary view of emotion	38
4. Expression: a window on the emotions?	40
4.1. Why do emotions produce expressions	40
4.2. Are human expressions innate or acquired?	42
4.3. The description of expressions	45

viii *Contents*

4.4. Identical forms of expression with different teleonomy	47
4.5. Is there a one-to-one link between an expression and an emotion?	48
5. Are physiological changes epiphenomena of emotion?	51
5.1. Why do physiological changes accompany emotion?	51
5.2. Could physiological changes play a role in emotion?	52
5.3. Autonomic and hormonal discharge in emotion	53
5.4. Emotional feeling after the elimination of peripheral feedback	55
5.5. Do visceral reactions differ in different emotions?	57
5.6. Emotion-specific release of hormones	57
5.7. Emotion-specific changes in autonomic response	59
5.8. Do visceral reactions determine what emotion is reported?	62
5.9. Conclusion	65
6. Somatic influences on the emotions	67
6.1. Do physiological changes determine emotion?	67
6.2. Effects of peripheral sympathectomy	67
6.3. Non-surgical manipulation of the sympathetic system	69
6.4. Emotion after the removal of hormonal influences	70
6.5. Secretions of the pituitary–adrenal cortex as controllers of emotion	72
6.6. False feedback experiments	72
6.7. A role for heart rate changes	74
6.8. Conclusion	75
7. Optimal foraging and the partial reinforcement effect: a model for the teleonomy of feelings?	77
7.1. Teleonomy, physiological change and feeling	77
7.2. How can you assess teleonomy of behaviour?	78
7.3. Optimality and the partial reinforcement extinction effect (PREE)	79
7.4. Omission of reward and the generation of frustration	81
7.5. Accounts of the PREE in terms of frustration	83
7.6. Simple associative accounts of the PREE	84
7.7. Attention, aftereffects, toughening up and frustration	87
7.8. Behavioural separation of after-effects, stimuli of frustration and toughening up	87
7.9. Pharmacological separation of after-effects, stimuli of frustration and toughening up	88
7.10. The teleonomy of feelings	90
8. Do emotions mature or differentiate?	93
8.1. Teleonomy and procreation	93

<i>Contents</i>	ix
8.2. Emotional development and emotional maturation	94
8.3. Do innate emotional expressions imply innate emotions?	95
8.4. Immediate effects of separation from parents	96
8.5. Distinct emotional reactions in the neonate	97
8.6. The effects of perinatal manipulations on adult behaviour	100
8.7. Long-term effects of early environment on adult behaviour	101
8.8. Do emotions mature and differentiate?	103
9. Cognition, learning and emotion	105
9.1. What place has learning in the analysis of emotion?	105
9.2. Radical behaviourism and cognitive learning theory	107
9.3. Limitations on the valid use of cognitive terms in learning theory	109
9.4. The use of emotion words without colloquial implications	111
9.5. The development of two-process theories of learning	111
9.6. Emotion and the release of species-specific behaviour	115
9.7. Emotion as an antidote to motivation	118
9.8. Motivation versus emotion	121
9.9. Emotion as a critical aspect of instrumental conditioning	124
9.10. Conclusions	128
10. Interaction of the components of emotion	130
10.1. Dialectical and non-dialectical interactions in emotion	130
10.2. The influence of the face on emotions	132
10.3. Facial expressiveness as a personality characteristic	135
10.4. Autonomic reactions and achievement	137
10.5. Hormone–behaviour interactions	138
10.6. Invisible interactions	140
10.7. Some implications for the study of emotion	140
11. Of mice and men	143
11.1. From mouse to monkey to man	143
11.2. The lachrymose ape	145
11.3. Separation distress – a general emotion?	148
11.4. Where do the innate human expressions come from?	150
11.5. Effects of electrical stimulation of the brain in humans	153
11.6. If rats are like little furry men, are mice like diminutive rats?	155
11.7. Is there frustration in rats and humans?	159
11.8. Cognition and corticosteroids	162
11.9. Emotionality in rat and man	164
11.10. Conclusion	167

12. Biology and emotion: some conclusions	169
12.1. What is an emotion?	169
12.2. A biological approach to emotion?	173
12.3. Specification of emotions	175
12.4. Darwin as the father of the psychology of emotion	175
12.5. Emotion, drive and state-dependent reflexes	176
12.6. Teleonomy and emotion	178
12.7. Comparison of the components of emotional reaction	179
12.8. Development, learning and emotion	181
12.9. The way forward	182
12.10. A specific example	185
12.11. Envoi	191
Glossary	192
Notes	196
References	204
Index	219