



This completely revised edition provides a synthesis of the forces that shaped the evolution of the human growth pattern, the biocultural factors that direct its expression, the intrinsic and extrinsic factors that regulate individual development, and the biomathematical approaches needed to analyze and interpret human growth. After covering the history, philosophy, and biological principles of human development, the book turns to the evolution of the human life cycle. Later chapters explore the physiological, environmental, and cultural reasons for population variation in growth, and the genetic and endocrine factors that regulate individual development. Using numerous historical and cultural examples, Social-Economic-Political-Emotional forces are also discussed. A new chapter introduces controversial concepts of community effects and strategic growth adjustments, and the author then integrates all this information into a truly interactive biocultural model of human development. This remains the primary text for students of human growth in anthropology, psychology, public health, and education.

Barry Bogin is Professor Emeritus of Biological Anthropology, Loughborough University, UK and Professor Emeritus of Anthropology, University of Michigan-Dearborn, USA. Bogin is a member of the University of California San Diego/Salk Center for Academic Research and Training in Anthropogeny (CARTA), USA. He has expertise in human physical growth and development, nutritional ecology, evolutionary biology, Maya people, and human adaptation. The focus of his research is to explain how social, economic, political, and emotional forces influence human physical development. He has authored more than 230 books, articles, book chapters, and popular essays.

Image credits: hadynyah / E+ / Getty Images
(front cover) and Frans Lemmens / Corbis
Unreleased / Getty Images (back cover)

Cover designed by Hart McLeod Ltd

CAMBRIDGE
UNIVERSITY PRESS
www.cambridge.org

ISBN 978-1-108-43448-5



9 781108 434485 >

Introduction	1
Anthropology and Growth	2
Maya in Disneyland	3
Growth and Evolution	10
Growth Theory	12
Human Auxology	18
The Organization of This Book	19
1 Background to the Study of Human Growth	22
Why Grow and Develop?	22
Historical Background for the Study of Human Growth	23
Prehistory and Early Historic Period	26
The Latin West and the Renaissance	28
Embryonic and Fetal Development	33
Longitudinal Studies of the Eighteenth Century	34
Statistical Approaches of the Nineteenth Century	37
Politics, Heredity, Environment, and Growth	38
“Race” and Growth	44
Twentieth-Century Research	47
Other Basic Research Related to Growth	63
Technological Developments	64
Endocrines and Growth Control	65
Growth Theory	69
Conclusion	71
2 Basic Principles of Human Growth	72
Stages in the Life Cycle	72
Prenatal Stages	72
Birth	81
Postnatal Life	102
3 The Evolution of Human Growth	143
Vertebrate and Mammalian Foundations for Human Growth	143
Mammalian Growth	146
Mammalian Reproduction	149
Brains and Learning	156
Stages of Mammalian Growth	160

The Human Difference	163
Primate Growth Patterns	169
Of Brains and Bodies	176
The Human Adolescent Growth Spurt Is Unique	177
Some Important Differences between Human and Nonhuman Primate Growth	183
A Philosophy of Human Growth	184
4 Evolution of the Human Life Cycle	187
Human Biocultural Ecology	189
Biocultural Ecology of the Human Life Cycle	190
Life History and Stages of the Life Cycle	191
The Evolution of Ontogeny	193
From Heterochrony to Evo-Devo	196
Evo-Devo Is Not Enough to Explain Human Growth and Development	201
Human Childhood	202
Weaning	202
Feeding the Greedy Brain	205
The Passage from Childhood	209
Juveniles Feed Themselves and Become "Helpers at the Nest"	212
How and When Did Human Childhood Evolve?	212
<i>Homo</i> "Rocks"	219
The Evolution of Adolescence	222
Did Neandertals Have Adolescence?	224
Who Benefits from Childhood?	230
Cooperative Breeding vs. Human Cooperation in Reproduction	230
Human Biocultural Reproduction vs. Cooperative and Communal Breeding	233
Childhood and Biocultural Reproduction	234
The Allometry of the Growth of the Human Child Releases Nurturing and Care-Giving Behaviors	235
The Nature of Human Biocultural Reproduction	241
Why Do Humans Rely upon such Diversity in Kinship and Allocare Strategies?	245
Biocultural Reproduction and Lifetime Reproductive Effort	247
Why Adolescence?	254
The "Valuable Grandmother," or Could Menopause Evolve?	264
Conclusion	272
5 Growth Variation in Living Human Populations	273
Population Differences in Body Size	273
Population Differences in Rate of Growth	279
Why Are Pygmies Short?	286
Differences in Growth between Boys and Girls	287
Population Variation in Skeletal, Dental, and Sexual Maturation	289
The Extensive Interacting Matrix of Variables Associated with Population Variation in Growth, Development, and Maturation	295

Ego Crescere, Ergo Sum Phaenotypo	298
Body Proportions	298
Secular Trends	309
What Do Secular Trends Mean?	320
Population Differences in Body Composition	325
The Significance of Population Variation	329
Adaptive Value of Body Size in Human Populations	330
Human Growth under Adversity	332
Trade-Offs in Human Growth and Development	335
Hope for the Future	337
6 Genetic and Neuroendocrine Regulation of Human Growth	339
Genetics of Human Development	340
Back to the Homeodomain: Genes, Evolution, and Growth	345
Genome-Wide Association Studies	347
Twin Studies As an Approach to the Genetics of Growth	353
Correlations in Growth between Biological Relatives (Non-Twins)	364
The Effects of Genetic Aberrations on Growth	368
Epigenetic Factors	372
Endocrinology of Growth	375
The Growth Plate and Its Role in Size Variation	392
Other Growth Factors	397
Summary of the Neuroendocrinology of Growth	401
7 What Makes People Grow? Love, Hope, Community Effects, and Strategic Growth in the Context of Environmental Factors Influencing Human Development	403
Community Effects and Strategic Growth	410
Nutrients and Food	415
Infection and Psychosocial Stress in Guatemala	423
Material and Emotional Security	426
A Review of Failed Attempts to Overcome Insecurities and Poor Growth	428
A New Perspective on Stunting and Nutrition	435
Famines and Starvation	436
The Milk Hypothesis Rejected	441
Vitamin D ₃ : The Effect of a Specific Nutrient	452
Month of Birth Effect	462
Migration and Urbanization	463
What Makes Migrants Grow?	474
Sex, Sport, and the Community Effect in Height	478
You Can't Be Too Rich or Too Tall	480
Bringing It All Together – Evolution, Ecology, SEPE, Biocultural	
Reproduction, Community Effects, Strategic Growth, and Human Life History	488

8 A Biocultural View of Human Growth	490
Biocultural Interactions in Contemporary Populations	491
The Most Important Discoveries about Human Growth, Development, and Maturation	498
Unsolved Problems for Future Research	500
Coda	505
 <i>Glossary</i>	 506
<i>References</i>	515
<i>Index</i>	561

Color plates can be found between pages 306 and 307.