CONTENTS

PREFACE / xi ACKNOWLEDGMENTS / xiii NOTES TO READERS / xv TABLE 1: ACRONYMS USED IN THIS BOOK xvi MAP 1: PRESENT-DAY RANGES OF CANNABIS xvii Introduction to the Multipurpose Plant Cannabis / 1 In the Beginning: Circumstances of Early Human Contact with Cannabis / 1 A Brief Summary of the Long and Diverse History of Relationships between Cannabis and Humans / 6 What Shall We Call These Plants? / 6 Should We Praise or Condemn This Multipurpose Plant? / 9 What We Discuss in This Book / 10 **Natural Origins and Early Evolution** of Cannabis / 13 Introduction / 13 Basic Life Cycle of Cannabis / 13 Ecological Requirements of Cannabis: Sunlight, Temperature, Water, and Soil / 17 Cannabis Origin and Evolution Studies / 17 Central Asia: Vavilov and the Origins of Cannabis / 19 Cannabis and Vitis / 22 Theories for South Asian Origin of Domesticated Cannabis / 23

Ethnobotanical Origins, Early Cultivation, and 3 Evolution through Human Selection / 29

Summary and Conclusions / 26

Model for the Early Evolution of Cannabis / 24

Introduction / 29

1

2

First Contacts: Origins of

"Human-Cannabis" Relationships / 30

Transitions to Cultivation and Civilization / 31 Earliest Uses of Cannabis: Useful Traits for

Ancient People / 32

Evolution of Cannabis through

Human Selection / 35 Disruptive Selection / 35 Origin from Weedy Populations / 36 Natural Hybridization: Introgression

versus Isolation / 37

Artificial Hybridization / 38

Atavism / 39

Isolation of Populations / 40

Population Size and Changes

in Variability / 41

Evolutionary Effects of Dioecy / 41

Effects of Human Selection on Sexual Expression

for Different Products / 43

Seeds / 43

Fibers / 43

Marijuana and Hashish / 43

Sexual Dimorphism and Selection / 45

Phenotypic Changes

during Domestication / 46

Seeds / 47

Fibers / 48

Inflorescences / 49

Directional Evolutionary Changes / 49

Cannabinoid Profile / 49

Timing of Floral Maturation / 50

Evolution of Cannabinoid Phenotypes / 50

Geographical Distribution of Cannabinoid

Phenotypes / 53

North America / 54

Western Europe / 54

Eastern Europe / 54

Central America and the Caribbean / 54

South America / 54

Middle East / 54

East Asia / 55

Indian Subcontinent / 55

Southeast Asia / 55

Equatorial Africa / 55

South and East Africa / 55

Summary and Conclusions / 57

The Cultural Diffusion of Cannabis / 59

Introduction / 60

Methodology: The Multidisciplinary Approach / 60

Types of Archaeobotanical Evidence Phase 4: Diffusion to the New Worldfor Cannabis / 62 1800 to 1945 / 130 Seeds / 63 Phase 5: Expansion after World War II-1945 to 1990 / 130 Fibers / 63 Phase 6: Artificial Environments and the Pollen / 66 Proliferation of Industrial Hemp-Fiber and Seed Impressions / 67 1990 to the Present / 130 Other Carbonized and Summary and Conclusions: Cannabis's Dispersal Chemical Remains / 67 from an Evolutionary Point of View / 132 Phytoliths / 69 Written Records of Cannabis's Presence and Use / 69 5 History of Cannabis Use for Fiber / 135 Nonhuman Agencies Affecting the Geographical Introduction / 135 Range of Cannabis / 70 Textile Basics / 135 Human Impact on the Dispersal and Expanding Historical and Archeological Evidence for Geographical Range of Cannabis / 71 Cannabis Fiber Use in China / 137 Early Relationships among Humans and Hemp Fiber Use in Clothing, Lacquerware, Cannabis in Central Asia / 74 Weapons, and Ships in Ancient China / 145 Fishing and Hemp / 75 Traditional Korea / 148 Hemp, Humans, and Horses in Eurasia / 77 Contemporary South Korea and North Korea / 149 Scythians and Cannabis / 83 Ancient Japan and Hemp / 153 Archeological and Historical Evidence for the Ancient Evidence from South Asia, Southwest Spread of Cannabis / 84 Asia, and Egypt / 157 Diffusion throughout East Asia / 84 Ancient Mediterranean Region / 159 Diffusion from Northeastern China into Ancient Europe North of the Mediterranean / 165 Korea and Japan / 93 Spread of Hemp Fiber Use to the Diffusion into South Asia / 98 New World / 181 Archaeobotanical Evidence from South Asia / 99 Some Aspects of the Modern History Diffusion into Southwest Asia and Egypt / 100 of Hemp / 185 Diffusion into Europe and Cannabis and Paper / 187 the Mediterranean / 103 Advent and Early History of Papermaking in Romania / 106 China / 187 Bulgaria / 107 Hemp Paper in Ancient Korea Hungary / 107 and Japan / 192 Poland / 108 Dispersal to North Africa and Europe / 193 Baltic Region / 108 Hemp Paper Production in North America / 196 Finland / 111 Summary and Conclusions / 197 Austria, the Czech Republic, and Slovakia / 112 Germany / 113 6 Food, Feed, and Oil Uses of Hemp / 199 Switzerland / 114 Introduction / 199 Northern France / 114 Human Food and Animal Feed Uses of Iberian Peninsula / 115 Hemp Seeds / 199 Netherlands / 115 Early Hemp Seed Use in China: Neolithic Period Sweden / 115 through the Han Dynasty / 201 Hemp Seed Oil in Ancient China / 203 Norway / 116 Ancient Evidence for Traditional Production and Denmark / 116 Use beyond China / 204 British Isles / 117 Korea / 204 Mediterranean Region / 118 Japan / 205 Summary of Dispersal Phases within South and Southwest Asia / 206 and Beyond Eurasia / 124 Central and Eastern Europe / 206 Phase 1: Primary Dispersal across Eurasiaca. 10,000 to 2000 BP / 124 Mediterranean and Western European Regions / 207 Phase 2: Spread into Africa and Southeast Asia-ca. 2000 to 500 BP / 125 Present-Day Hemp Seed Production Phase 3: Diffusion to the New Worldand Use / 208

Summary and Conclusions / 209

1545 to 1800 / 129

Historical Aspects of Psychoactive Cannabis Use for Ritual and Recreation / 211

Introduction / 211

Discovery of the Euphoriant Properties of

Cannabis in Eurasia / 213

Central Asia / 214

China / 218

Taoism and Tales of Ma Gu / 219

India and Nepal / 221

Was Soma Cannabis? / 224

South Asian Psychoactive

Cannabis Products / 225

Hindu Acceptance of Ritual Bhang Use / 228

Shiva Worship and Cannabis / 228

Other Occasions on which Bhana

Was Used / 229

Worship of the Bhang Plant / 230

Mongols and Cannabis / 231

Southwest Asia, the Mediterranean, Africa,

and Europe / 232

The Advent of Cannabis Smoking: Tobacco

Meets Hashish / 238

Summary and Conclusions / 240

Ethnobotanical History and Contemporary Я Context of Medicinal Cannabis / 241

Introduction / 241

Early East Asian Medicinal Cannabis Use / 242

South and Southeast Asian

Medical Traditions / 243

Egyptian Medicinal Cannabis Use / 245

Cannabis in Early Middle Eastern and Later

Islamic Medicine / 246

African and South American Medicinal

Cannabis Use / 248

European Medicinal Cannabis Use / 248

Present-Day Western Medicinal Applications

of Cannabis / 252

Summary and Conclusions / 256

Nonpsychoactive Ritual Uses of Cannabis / 257

Introduction / 257

Hempen Rituals of Major Religions: Shamanic

Influences Survive Repression / 258

Archeological Remains from Ritual Contexts:

Central Asia, China, and Europe / 258

The Hmong: Spirit Travel in Healing, Life Cycle,

and Funerary Rituals / 260

China: Shamanism, Taoism,

and Confucianism / 263

Korea: Shamanic Funerary Rites, Confucian Mourning, and Ancestor Worship / 268

Japan: Shamanist, Shintō, and Buddhist

Hemp Traditions / 271

Europe and the Middle East: Judeo-Christian

Hemp Rituals / 278

Hangings: Hemp Cordage and Hempen Executions / 291

Conclusions / 293

10 Recent History of Cannabis Breeding / 295

Introduction / 295

European Hemp Breeding / 295

North American Hemp Breeding / 298

Introduction of NLD Cannabis to

North America / 300

Breeding History of NLD Varieties / 300

Introduction of BLD Cannabis / 302

Recent Trends in Cannabis Breeding / 305

Summary and Conclusions / 309

Classical and Molecular Taxonomy of 11 Cannabis / 311

Introduction / 311

One, Two, or Three Species? / 312

History of Cannabis Taxonomy / 314

Recent Advances in Cannabis Taxonomy / 317

Genetic and Historical Model for the Evolution of

Cannabis Biotypes / 320

Recent Geographical Distributions

of Cannabis Biotypes / 323

Europe and the Former Soviet Union / 324

China / 325

Central Asia, Afghanistan, and Turkestan / 326

India and Nepal / 327

Southeast Asia / 329

Africa and the Middle East / 330

New World / 330

Summary and Conclusions / 331

12 Hypotheses Concerning the Early Evolution of Cannabis / 333

Introduction / 333

Prehistoric Climate Change and

Plant Distribution / 333

The Pleistocene / 335

The Holocene / 337

Early Human Dispersals / 341

Plant Speciation and Colonization / 342

Pleistocene Refugia / 345

Postglacial Population Expansion / 351

Speciation Rate / 352

Early Evolution of Cannabaceae: The Hemp and

Hop Family / 353

Breeding Systems and Reproductive Strategies as Clues to Geographical Origin / 356

Angiospermy / 356

Annuality / 357

Anemophily / 357

Dioecy / 358

Sex Determination / 359

Reconstruction of a
Cannabaceae Ancestor / 360
Summary and Conclusions / 362

13 Cannabis and Homo sapiens / 365

Introduction / 365
The Long-Term Relationship / 366
Summary of *Cannabis*'s Evolution / 367 *Cannabis*'s Influence on the Evolution of Human Culture / 368
A Case for the Social Benefits of *Cannabis*'s Psychoactivity / 369

Human Influence on Cannabis's Evolution / 370
Environmental Impact of the
Human-Cannabis Relationship / 373
Coevolution of Cannabis and Humans:
Fresh Concepts / 373
Present Position of the Human-Cannabis
Relationship / 377
Remaining Questions and
Future Directions / 379

TIMELINE / 383 REFERENCES / 389 INDEX / 427