

---

# Contents

---

<b>Preface</b>	<b>xi</b>
<b>Acknowledgments</b>	<b>xiii</b>
<b>1. Introduction</b>	<b>1</b>
Purpose of the book	1
Structure of the argument	2
What is meant by <i>Art</i>	2
What is meant by <i>representational</i>	3
Problem of style	5
What is meant by <i>perception</i>	6
Role of realism	7
<b>2. Information and invariants</b>	<b>9</b>
Structure and information	9
<i>Gibson's theory</i>	10
Sources of structure in the light	11
<i>Visual solid angle analysis</i>	12
<i>Visual information I: gradients and occlusion</i>	14
<i>Visual information II: motion</i>	15
<i>Visual information III: invariants</i>	17
<i>Classes of invariants</i>	18
Perceptual objects and events	20
<i>Types of events</i>	21
Geometrical mappings	22
<i>Mathematical functions</i>	23
Geometrical transformations	25
Groups of transformations	28
Geometrical hierarchy of transformations	31
<b>3. The hierarchy of geometry in visual perception</b>	<b>33</b>
Metric geometry	33
<i>Concept of Equivalence Class</i>	34
<i>Metric transformations in perception</i>	35
Similarities	37
<i>Similarity transformations in perception</i>	38
<i>Similarity and the horizon</i>	40
<i>Summary</i>	42
Affinities	42

*Parallel projection*  
*Compression*  
*Fundamental character of parallel projection*  
*Equivalence classes*  
*Affine invariants*  
*Growth and aging*  
 Projective geometry  
*Central projection of a plane onto a parallel plane*  
*Central projection of a plane onto an intersecting plane*  
*Projective invariants*  
 Geometry and vision

#### **4. The appearance of things in the world**

Ecological information and rigidity  
 Transformations and equivalence classes  
 The concept of shape  
 Canonical form  
 Caveats and constraints  
*Ordinary environment*  
*Geometry and the "real world"*  
 Concept of group in perception

#### **5. Pictorial perspective: structure in the light reflected from pictures**

"Truths" of artistic vision  
 What looks lifelike?  
 Role of cultural convention  
 Consequences of cultural style for the consumer  
 Tacit knowledge of construction rules  
 Two views of representation  
*Conventionalism*  
*Resemblance theory*  
*Resemblance theory II*  
 Pictures and optical structure  
*Pictures as types of mappings*  
*Invariants of each projection type*  
*Constraints*  
 Characteristics of pictorial projections  
*Visible versus ideal*  
*Mechanical conditions and form*  
*Prototypical examples of pictures in each geometry*  
 Pictorial projections and the presence of "perspective"  
 Exercise of artistic option  
 The categorization system

#### **6. Station point options: analysis of style**

Construction rules and realism  
 European painting  
*Single station point assumption*  
*Moderate distance assumption*  
*Oblique angle assumption*  
 Japanese painting  
*Single station point assumption*

<i>Optical infinity distance assumption</i>	145
<i>Oblique angle assumption</i>	154
Northwest Coast Indian art	157
<i>Multiple station point assumption</i>	160
<i>Optical infinity distance assumption</i>	163
<i>Oblique angle assumption</i>	166
Egyptian art	168
<i>Multiple station point assumption</i>	169
<i>Optical infinity distance assumption</i>	174
<i>Frontal-parallel angle assumption</i>	175
<b>7. Invariant information: analysis of style</b>	<b>177</b>
Utility of the analysis	177
Metric invariants and Egyptian art	180
<i>Scale reduction and similarity</i>	180
<i>The "Shape" invariants</i>	181
<i>Shape and the number of station points</i>	184
Affine invariants and Japanese art	188
Affine invariants and Northwest Coast Indian art	195
Projective invariants and Western post-Renaissance art	198
<b>8. Compositional demands in two and three dimensions</b>	<b>202</b>
The role of representation in art	202
What is and is not <i>Art</i>	204
Two-dimensional spatial layout	205
Some two-dimensional concepts from the field of art	207
Gestalt principles and concepts from art criticism	208
Styles emphasizing two-dimensional composition	210
<i>Egyptian art</i>	210
<i>Northwest Coast Indian art</i>	213
<i>Romanesque manuscript painting: twelfth century</i>	215
<i>Cubism</i>	218
Styles emphasizing three-dimensional composition	225
<i>Renaissance art</i>	226
<i>Japanese art</i>	229
<i>Ice Age cave art</i>	232
<i>The art of the Bushmen</i>	235
A categorization scheme	238
<b>9. The categorization system</b>	<b>240</b>
Scenes with many surfaces	240
Dominant planes and characteristic aspects	242
Options and styles	247
<i>Some concepts from art history</i>	249
<i>Composition and projection</i>	250
Classification and geometry	253
<i>Familiar styles</i>	255
<i>Additional styles</i>	256
Conclusions	266

<b>10. The developmental question</b>	<b>267</b>
Development in art	267
"Developed" art	268
Cultural development: empirical evidence	269
Development in children's art	271
<i>Traditional analyses of children's art</i>	272
<i>The absent endpoint</i>	277
Systems of projection in naive art	278
Canonical form	280
Divergent perspective	283
Children and primitives	284
<b>Appendix A: Affine transformations</b>	<b>289</b>
Skew reflection	289
Skew compression	289
Hyperbolic rotation	290
Elliptic rotation	291
Shear	292
<b>Appendix B: Cross-ratio of lines and the harmonic property</b>	<b>293</b>
Harmonic property	293
<b>Appendix C: Trigonometric functions and the gradients</b>	<b>294</b>
Trigonometric functions	294
Purdy's exposition of the gradients	294
<b>Appendix D: Natural perspective: a history of structure in the light</b>	<b>299</b>
Information and appearance	299
Structure in the light to the eye: history of visual angles	300
<i>Euclid</i>	300
<i>Question of resemblance</i>	305
<i>Problem of appearance</i>	306
<i>The Renaissance painters</i>	308
<i>Perceptual propositions</i>	308
<i>"Little pictures"</i>	310
Extravisual information	311
<i>Descartes: physiological reductionism</i>	311
<i>Berkeley's contribution</i>	314
<i>Hermann von Helmholtz</i>	317
James Gibson: theory of ecological optics	322
<b>References</b>	<b>325</b>
<b>Name index</b>	<b>334</b>
<b>Subject index</b>	<b>336</b>