





**FOREST  
MICROCLIMATOLOGY**

**RICHARD LEE**

**Columbia University Press**  
*New York 1978*

# THE CONTENTS

<b>PRELIMINARY REMARKS</b>	<i>ix</i>
<b>SYMBOL LIST</b>	<i>xii</i>
<b>1. THE ATMOSPHERE</b>	<i>1</i>
1.1 Atmospheric Sciences	<i>1</i>
1.2 Radiation Climate	<i>2</i>
1.3 Atmospheric Motion	<i>5</i>
1.4 Thermal Climate	<i>10</i>
1.5 Atmospheric Moisture	<i>12</i>
<b>2. THE BIOSPHERE</b>	<i>16</i>
2.1 Forest Microclimatology	<i>16</i>
2.2 Radiant Energy	<i>18</i>
2.3 Local Winds	<i>21</i>
2.4 Environmental Temperature	<i>24</i>
2.5 Environmental Moisture	<i>28</i>
<b>3. RADIANT ENERGY</b>	<i>33</i>
3.1 Radiation Laws	<i>33</i>
3.2 Solar Radiation	<i>40</i>
3.3 Longwave Radiation	<i>65</i>
3.4 Geometrical Considerations	<i>71</i>
3.5 Net Radiation	<i>76</i>
<b>4. SENSIBLE HEAT</b>	<i>85</i>
4.1 Transfer Principles	<i>85</i>
4.2 Thermal Properties	<i>86</i>
4.3 Air Behavior	<i>89</i>
4.4 Heat Conduction	<i>94</i>
4.5 Heat Convection	<i>99</i>
<b>5. LATENT HEAT</b>	<i>108</i>
5.1 Energy Relations	<i>108</i>
5.2 Evaporation Principles	<i>110</i>
5.3 Transpiration Principles	<i>116</i>
5.4 Interception Losses	<i>128</i>

5.5 Total Evaporation	129
<b>6. METABOLIC ENERGY</b>	<b>138</b>
6.1 Metabolic Rates	138
6.2 Carbon Dioxide	140
6.3 Transfer Rates	142
<b>7. ENERGY BUDGET</b>	<b>147</b>
7.1 The Concept	147
7.2 Relative Magnitudes	148
7.3 Environmental Coupling	153
7.4 Area Relations	158
7.5 Temperature Relations	166
<b>8. SELECTED TOPICS</b>	<b>168</b>
8.1 Forest Climate	168
8.2 Forest Regeneration	176
8.3 Forest Growth	190
8.4 Forest Hydrology	196
8.5 Human Responses	210
<b>9. MICROCLIMATE OBSERVATION</b>	<b>216</b>
9.1 Purposeful Observation	216
9.2 Instrument Types	222
9.3 Instrument Arrays	242
<b>10. PROBLEM TYPES</b>	<b>250</b>
10.1 The Atmosphere	250
10.2 The Biosphere	251
10.3 Radiant Energy	251
10.4 Sensible Heat	253
10.5 Latent Heat	254
10.6 Metabolic Energy	255
10.7 Energy Budget	255
10.8 Selected Topics	256
<b>APPENDIX TABLES</b>	<b>259</b>
<b>SUBJECT INDEX</b>	<b>271</b>