

Appendix C

Milestones in the Evolution of the Earth and Its Biosphere

Event	Years before present	Event	Years before present
	Ga		Ma
Sun and accretionary disk formed	4.57	Divergence of protostomes	670
Earth accretion begins	4.55	Freshwater algae	600
Moon formed	4.51	Appearance of chordates	600
Earth's accretion essentially complete	4.47	Microscopic sponges	570
Earliest known zircon fragment	4.404	Gondwana formed	650–550
Earliest surviving continental crust	4.03	Cambrian explosion	533
End of intense impacts	3.9	Pangea formed	450–250
First hyperthermophiles	3.8–3.5	Land plants	450
Cyanobacteria dominant	3.5–2.5	Transition between fish and amphibians	365
Oldest microfossils	3.465	Vascular plants dominant on land	360
Spurt of continental growth	3–2.6	Permian mass extinction	250
First indications of eukaryotes	2.7	Radiation of modern insects	245
Eukaryotic/prokaryotic mats	2.3–1.5	Gymnosperms dominant	200
<i>Grypania</i>	2.1	First mammals	195
Diversification of marine algae	1.8–1.1	<i>Archaeofructus</i>	140
Rodinia formed	1.32–1.0	Placental mammals	85
Algal mats, primitive lichens	1.5–0.85	K/T boundary impact	65
Radiation of sulfide-oxidizing bacteria	1.06–0.64	Prosimians	54
		Hominids begin to evolve	20
		Hominid bipedalism	4
		Homo sapiens	0.05