

# GEOLOGIC TIME SCALE

GEOLOGICAL SOCIETY
OF AMERICA



CENOZOIC				MESOZOIC						PALEOZOIC						PRECAMBRIAN			
AGE POLARITY PERIO		AGE	PICKS (Ma)	AGE (Ma)	PERIOD	EPOCH	AGE	PICKS (Ma)	UNCERT. (PLy.)	AGE (Ma)	PERIOD	EPOCH	AGE	PICKS (Ma)	(m/k·)	AGE (Me)	EON	ERA	BDY. AGES (Me)
7 C1 GUATES 2 G2 G2 7 A C2A 5 3 A C3A 4 C4 4 C4	A. HOLOCENI PLEISTOCEN PLIOCENE	L PIACENZIAN	- 0.01 - 1.8 - 3.4 - 5.3 - 6.5	70 - 31 23 32 63 33 63 80 33 63	7	LATE	MAASTRICHTIAN CAMPANIAN	66.4 74.5	÷ 4	360 ~	ERMIAN	LATE	TATARIAN KAZANIAN UFIMIAN KUNGURIAN ARTINSKIAN SAKMARIAN	245 253 258 263 268	-20 -24 -22	750-		LATE	900
3A C3A C4 C4 C4 C4 C5	<u>П</u>	TORTONIAN	- 11.2	90 -	ons		SANTONIAN CONIACIAN TURONIAN CENOMANIAN	- 84.0 97.5 88.5 - 91	4.5 2.5	280	_ 4_		GZELIAN KASIMOVIAN	286		1000 -	1 I		900
		SERRAVALLIAN	- 15.1	100	CE		ALBIAN	97.5	42.5	300 -	FEROUS PENNSYLVANIAN	LATE	MOSCOVIAN BASHKIRIAN	315 - 320	20	1250 -	ZOIC	MIDDLE	
SC CSC SD CSD SE CSE		BURDIGALIAN	- 16.6	110	ETA	EARLY	APTIAN	-113 -119	-14 19	340 -	CARBONIFEROUS MISSISSIPPIAN PENNSYLVANIAN	EARLY	SERPUKHOVIAN Z	333	22	1500-	ERO.		1600
68 C68		AOUITANIAN	- 21.8 - 23.7	130	CRE	NEOCOMIAN	HAUTERIVIAN	-124 -131	9 18	360 -	_	LATE	TOURNAISIAN FAMENNIAN	352 360 367	-1 8 110 112	1750-	OT		
25 - 7, GZ 7A GZA 7A GZA 7A GZA 7A GZA 7A GZA 7A GZA 7A GZA	CENE	CHATTIAN	<b>-</b> 30.0	140 - w14		NEO	BERRIASIAN	-138 -144	45 45	380 -	DEVONIAN	MIDDLE	FRASNIAN GIVETIAN EIFELIAN EMSIAN	374 380 387	→18 →18 →28	2000-	PR	EARLY	
11 c11 Y	OLIGOCENE	RUPELIAN	<b>Q</b> 0.0	150 M22		LATE	TITHONIAN KIMMERIDGIAN	152 156	112 -16	400-		EARLY	SIEGENIAN GEDINNIAN PRIDOLIAN	401 408 414	→122 →18 →12	2250-			
35 13 C1 C2		PRIABONIAN	- 35.6	160—— M27	SIC		CALLOVIAN	-163 -169	15 15	420 -	SILURIAN	EARLY	LUDLOVIAN WENLOCKIAN LLANDOVERIAN	421	-12 -12 -8	2500 -			2500
		BARTONIAN	- <b>40</b> .0 - <b>43</b> .5	180 - Services	AS	MIDDLE	BAJOCIAN	-176 -163	34	440 -	IAN	LATE	ASHGILLIAN CARADOCIAN	438	-12 -12 -16	2750 -		LATE	
45 20 CZC		LUTETIAN		198-1-061	JUR		TOARCIAN PLIENSBACHIAN	- 167 - 193	34 28 32	480	ORDOVICIAN	MIDDLE	LLANDEILAN LLANVIRNIAN ARENIGIAN	468	→ 16 → 16	3000-	AN		3000
50 21 21 22 22			- 52.0	200		EARLY	SINEMURIAN HETTANGIAN	- 198 - 204 - 208	18	500-	ORI	EARLY	TREMADOCIAN	488	20	3250-	RCHE,	MIDDLE	
55 23 223	E	YPRESIAN	- 57.8	210	SIC	LATE	NORIAN		18	520 -	IAN	LATE	TREMPEALEAUAN FRANCONIAN DRESBAGHIAN	-523	36		ARC		3400
60 25 C21	PALEOCENE	MAITSMAHT SELANDIAN DEMANAUL	- 60.6	230	IAS		CARNIAN	- 225 - 230	22	540 -	AMBRIAN	MIDDLE		540	28	3500 -		EARLY	
27 c27 28 c28 29 c28	PALEC	DANIAN	- 63.6 - 68.4	240	TR	MIDDLE	ANISIAN SCYTHIAN	- 235 - 240 - 245	10 22 20	560 -	<u> </u>	EARLY		570		3750-			3800?

## The Decade of North American Geology 1983 Geologic Time Scale

Compiled by Allison R. Palmer

Centennial Science Program Coordinator

Geological Society of America, P.O. Box 9140, Boulder, Colorado 80301

Preparation of the 27 synthesis volumes of *The Geology of North America* for the Decade of North American Geology (DNAG) is now in progress. In order to encourage uniformity among DNAG authors in the citation of numerical ages for chronostratigraphic units of the geologic time scale, an ad hoc Time Scale Advisory Committee was established by the DNAG Steering Committee in 1982. This advisory committee, consisting of Z. E. Peterman (Chairman) and J. E. Harrison, U.S. Geological Survey; R. L. Armstrong, University of British Columbia; and W. A. Berggren, Woods Hole Oceanographic Institution, was asked to evaluate numerical dating schemes that were either recently published or in press and to provide recommendations for the best numbers to use in preparation of a DNAG time scale. The chart on the opposite side of this page was developed from the recommendations of the Time Scale Advisory Committee.

Geochronometric ages (Ma, Ga) assigned to chronostratigraphic boundaries are subject to several uncertainties in addition to those introduced by the numerical dating methods themselves; boundary stratotypes for many units are not yet chosen, so disagreement exists about exact biostratigraphic placement and correlation of a boundary; and many materials that can be numerically dated are not known in good context with biostratigraphic data, so extrapolation to a chronostratigraphic boundary is commonly required. Furthermore, with respect to the late Mesozoic and the Cenozoic, differing numerical age calibrations of the magnetic polarity-reversal scale based on differing choices of scattered isotopically dated tie points, differing interpretations of the positions of biostratigraphic boundaries with respect to the polarity-reversal scale, and uncertainties in the meaning of isotopic ages derived from glauconies lead to disagreement about ages assigned to some chronostratigraphic boundaries.

With these caveats, the numerical ages given in this chart represent interpretations acceptable to the DNAG Time Scale Advisory Committee. The uncertainty bars for Paleozoic and Mesozoic ages are from data in Harland and others (1982). Uncertainty bars for the Cenozoic are not available.

Sources for the numerical ages and for the chronostratigraphic nomenclature are given below.

#### CENOZOIC

Berggren, W. A., Kent, D. V., and Van Couvering, J. A., 1984, Neogene geochronology and chronostratigraphy; in Geochronology and the geologic record: Geological Society of London (in press).

Berggren, W. A., Kent, D. V., and Flynn, J. J., 1984, Paleogene geochronology and chronostratigraphy, in Geochronology and the geologic record: Geological Society of London (in press).

#### MESOZOIC

Base of Campanian to end of Cretaceous

Berggren, W. A., Kent, D. V., and Flynn, J. J., 1984, Appendix, in Geochronology and the geologic record: Geological Society of London (in press).

Base of Aptian to base of Santonian

Harland, W. B., Cox, A. V., Llewellyn, P. G., Picton, C.A.G.,Smith, A. G., and Walters, R., 1982, A geological time scale:Cambridge, Cambridge University Press, 128 p.

Base of Hettangian to base of Barremian (dating and chronostratigraphic correlation of the "M" series)

Kent, D. V., and Gradstein, F. M., 1984, A Jurassic to Recent chronology, in Tucholke, B. E., and Vogt, P. R., eds., The Western Atlantic region, Volume M of The geology of North America: Boulder, Colorado, Geological Society of America (in press).

Note: Rhaetian has been eliminated from the Late Triassic chronostratigraphic scale following Tozer, E. T., 1979, Latest Triassic ammonoid faunas and biochronology, western Canada: Geological Survey of Canada Paper 79-1B, p. 127-135.

Base of Ladinian to base of Norian

Armstrong, R. L., 1982, Late Triassic-Early Jurassic time scale calibration in British Columbia, Canada, in Odin, G. S., ed., Numerical dating in stratigraphy: New York, John Wiley & Sons, p. 509-513.

Base of Scythian to base of Anisian

Webb, J. A., 1982, Triassic radiometric dates from eastern Australia: *in* Odin, G. S., ed., Numerical dating in stratigraphy: New York, John Wiley & Sons, p. 515-521.

#### **PALEOZOIC**

All numerical ages except those for the upper and lower houndaries of the Paleozoic are derived from Harland and others (see above, 1982, p. 52-55). Late Carboniferous numbers are for continentally based ages (N = "Namurian"; W = Westphalian; S = Stephanian). The marine-based ages are from Harland and others (1982, Fig. 5.6). The earlier estimate for the base of the Cambrian at 570 Ma is retained.

### PRECAMBRIAN

Harrison, J. E., and Peterman, Z. E., 1982, North American Commission on Stratigraphic Nomenclature, Report 9, Adoption of geochronometric units for divisions of Precambrian time: American Association of Petroleum Geologists Bulletin, v. 66, p. 801–802.

Copyright 1983 by The Geological Society of America. All rights reserved.