Days and Deep Time

A mathematical companion to the Dorot timeline

Dorot research edition

3 November 2026

Abstract

Can a proposed conversion connect creation days with billions of years? This appendix distinguishes arithmetic consistency, model assumptions, and physical elapsed time. It checks a constant trillion-fold conversion, introduces an explicitly illustrative six-day allocation, and compares these with cosmic proper time in a flat expanding universe. A fitted numerical correspondence does not establish a literal six-day physical age. The interactive companion is available in the application's appendix; this document records its equations and limitations.

1 Two ages, two measurements

The universe's age is approximately 13.8×10^9 years, while Earth's geological age is approximately 4.54×10^9 years [2, 3]. These refer to different intervals. Earth's formation is roughly 9.26 billion years after the Big Bang under those rounded values. Geological dating is not obtained by dividing a cosmological age by redshift.

2 The interpretation being examined

Gerald Schroeder's public article associates a 5.5-day count with a factor of order 10^{12} [1]. This appendix checks that public explanation. It does not claim to reproduce every equation or textual interpretation in *Genesis and the Big Bang* or *The Science of God*. Its geometric example below is our own normalized teaching model, not a derivation attributed to those books.

3 A signal interval is stretched

Normalize the cosmic scale factor to $a(t_0) = 1$. For two adjacent emissions connected to an observer by light, with negligible scale-factor change over each short interval,

$$\frac{\Delta t_{\text{obs}}}{\Delta t_{\text{emit}}} = \frac{a_{\text{obs}}}{a_{\text{emit}}} = 1 + z. \tag{1}$$

For adjacent null paths the same comoving separation gives

$$\frac{c\,\Delta t_{\text{emit}}}{a_{\text{emit}}} = \frac{c\,\Delta t_{\text{obs}}}{a_{\text{obs}}}. \tag{2}$$

Thus a source interval of one second at $z = 1$ is observed as two seconds. This is cosmological time dilation of a signal sequence, not a rule for dividing the entire history of the universe by one endpoint factor [4, 5].

4 Check the constant-factor arithmetic

Use a Julian year of exactly 365.25 days, each of 86 400 SI seconds. Let Y be a numerical duration in years, D a numerical duration in days, and K an assumed dimensionless global conversion factor. Then the *assumed* mapping is

$$D = \frac{365.25Y}{K}, \qquad Y = \frac{DK}{365.25}. \tag{3}$$

For the frequently discussed value $K = 10^{12}$,

$$D(13.8 \times 10^9, 10^{12}) = 5.04045 \text{ days}, \tag{4}$$

$$Y(5.5, 10^{12}) = 15.0581793 \times 10^9 \text{ years}. \tag{5}$$

They do not match exactly. To force 13.8 billion years to correspond to 5.5 days one can solve

$$K_{\text{fit}} = \frac{365.25(13.8 \times 10^9)}{5.5} \simeq 9.1644545 \times 10^{11}. \tag{6}$$

This value is fitted from the target, not independently predicted. Using the same assumed trillion-fold factor on Earth's 4.54 billion years instead gives 1.658235 days, further illustrating why the two ages must not be interchanged.

5 An illustrative unequal-day allocation

Suppose six consecutive labelled days contain durations L_i, with a chosen ratio $q = L_{i+1}/L_i$, where $0 < q \leq 1$. Normalize the total to a chosen Y:

$$L_i = Y\frac{q^{i-1}}{\sum_{j=0}^{5} q^j}, \qquad \sum_{i=1}^{6} L_i = Y. \tag{7}$$

At $q = 1/2$ and $Y = 13.8 \times 10^9$ years the durations are approximately 7.010, 3.505, 1.752, 0.876, 0.438, and 0.219 billion years. These values preserve the selected total by construction. They do not derive either that total or the ratio from the Friedmann equations. For a fractional label $u = n + f$, with n whole days and $0 \leq f < 1$, the interface uses linear interpolation inside the next slice:

$$A(u) = \sum_{i=1}^{n} L_i + fL_{n+1}. \tag{8}$$

Consequently the allocation at $u = 5.5$ is $Y - L_6/2$, not the result of Equation (3). The two widgets represent different assumptions and must not be combined as one derivation. Neither determines whether the ordering of physical developments matches the text of Genesis.

6 Cosmic proper time

A spatially flat FLRW metric is

$$ds^2 = -c^2dt^2 + a^2(t)\, d\mathbf{x}^2. \tag{9}$$

A comoving observer has $d\mathbf{x} = 0$. Since $ds^2 = -c^2d\tau^2$ for a timelike worldline,

$$d\tau = dt. \tag{10}$$

Expansion does not turn the proper age on this clock into a few days [4]. A change of time coordinates can relabel events, but a physical elapsed-time claim also needs an observer's worldline and the metric along it. A photon has no rest frame that supplies such a clock.

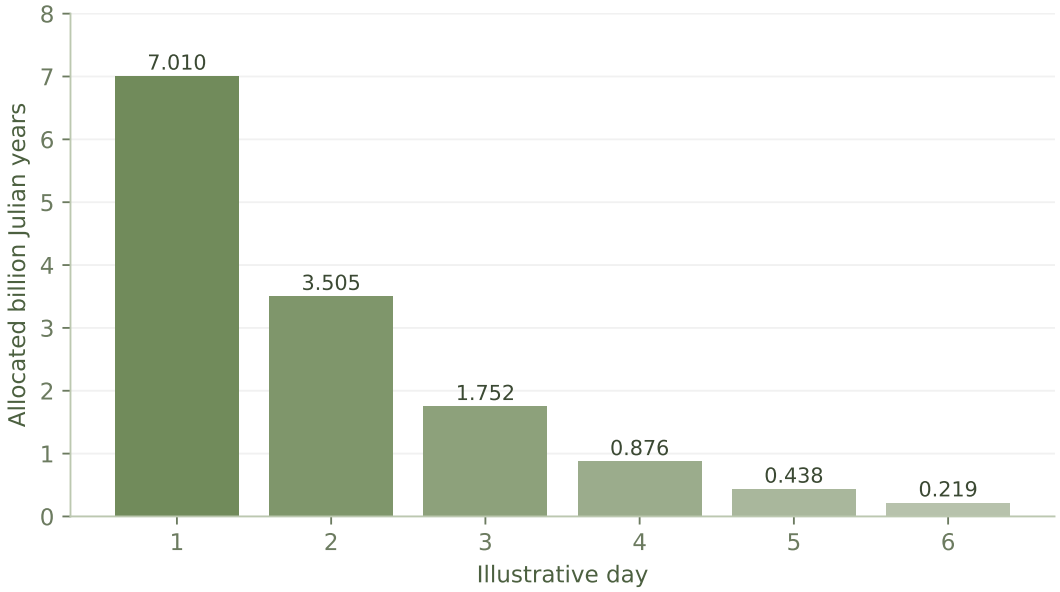


Figure 1: A normalized geometric allocation, not a physical creation clock.

7 A simplified expanding-universe calculation

For a flat radiation–matter–cosmological-constant illustration,

$$H(a) = H_0\sqrt{\Omega_r a^{-4} + \Omega_m a^{-3} + \Omega_\Lambda}, \tag{11}$$

$$\Omega_\Lambda = 1 - \Omega_m - \Omega_r, \tag{12}$$

$$t(a) = \int_0^a \frac{da'}{a'H(a')}. \tag{13}$$

The demonstration uses $H_0 = 67.4\ \mathrm{km\,s^{-1}\,Mpc^{-1}}$, $\Omega_m = 0.315$, and an illustrative fixed $\Omega_r = 0.000092$. The first two values are close to Planck 2018 base-ΛCDM inference [6]. This is a pedagogical background model, not a reproduction of the full Planck calculation or likelihood. It omits inflation, changing relativistic particle species, and neutrino-mass evolution. With $x = \ln a$, the numerically stable form is

$$t(a) = \frac{1}{H_0}\int_{-\infty}^{\ln a} \frac{e^{2x}\,dx}{\sqrt{\Omega_r + \Omega_m e^x + \Omega_\Lambda e^{4x}}}. \tag{14}$$

The implementation applies Simpson's rule with 2048 even subintervals and truncates the lower limit at $x = -32$. The omitted early tail is negligible for the displayed ages. It converts H_0 to seconds using

$$1\ \mathrm{Mpc} = 3.0856775814913673 \times 10^{19}\ \mathrm{km}. \tag{15}$$

Age calculations use $365.25 \times 86\,400$ seconds per Julian year. Tests compare step counts and the analytic matter-only limit

$$\Omega_m = 1, \quad \Omega_r = \Omega_\Lambda = 0 \quad \Longrightarrow \quad t(a) = \frac{2}{3H_0}a^{3/2}. \tag{16}$$

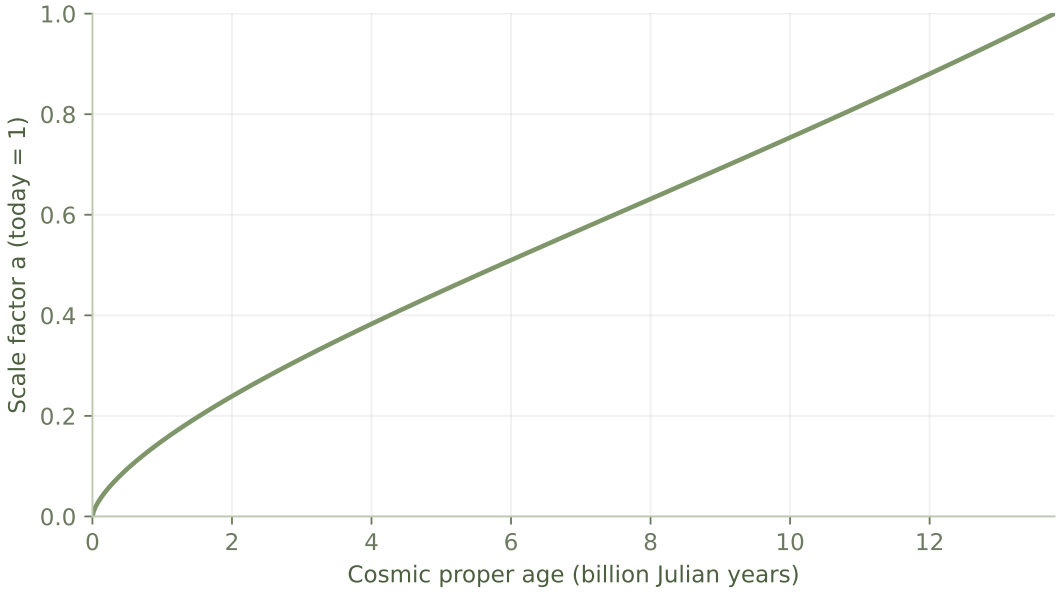


Figure 2: Scale factor versus cosmic proper age in the stated reference model.

8 What the calculation establishes

1. Expanding space stretches short observed signal intervals.
2. A chosen conversion or allocation can map numerical billion-year durations onto a few labelled days.
3. A fitted numerical match does not establish that the labels are literal Genesis days measured by a physical observer.
4. Standard cosmological proper time and geological dating continue to describe billion-year ages.

A stronger reconciliation would need independently justified initial conditions, clock definitions, time evolution, and event ordering. These are substantive physical and interpretive requirements, not consequences of a single ratio.

References

[1] G. Schroeder, *The Age of the Universe*, public author article. https://www.gerald-schroeder.com/articles/the-age-of-the-universe. Accessed 3 November 2026.

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[4] N. Wright, *Cosmology Tutorial, Part 2*; cosmology FAQ. https://www.astro.ucla.edu/~wright/cosmo_02.htm.

[5] D. W. Hogg, *Distance measures in cosmology*, arXiv:astro-ph/9905116. https://arxiv.org/abs/astro-ph/9905116.

[6] Planck Collaboration, *Planck 2018 results. VI. Cosmological parameters*, A&A 641, A6 (2020). https://arxiv.org/abs/1807.06209.