

Table S1: **Correlation of protein age and length across 24 fungi and metazoa**

Species	Spearman ρ	p-value	Number of Proteins
<i>Schizosaccharomyces pombe</i>	0.05	0.0013	4987
<i>Aspergillus nidulans</i>	0.06	1.7e-09	9540
<i>Neurospora crassa</i>	0.11	1.1e-29	9820
<i>Ashbya gossypii</i>	0.03	0.055	4721
<i>Saccharomyces cerevisiae</i>	0.07	1.9e-08	5875
<i>Caenorhabditis briggsae</i>	0.04	9e-08	16330
<i>Caenorhabditis elegans</i>	0.13	1.8e-78	19986
<i>Anopheles gambiae</i>	0.12	1.1e-38	12456
<i>Drosophila melanogaster</i>	0.12	4.6e-42	13443
<i>Strongylocentrotus purpuratus</i>	0.06	1.2e-20	28605
<i>Ciona intestinalis</i>	0.12	4e-50	14179
<i>Danio rerio</i>	0.09	8.9e-36	21321
<i>Takifugu rubripes</i>	0.06	1e-13	18522
<i>Xenopus tropicalis</i>	0.04	7.7e-08	18022
<i>Gallus gallus</i>	0.06	1.8e-17	18228
<i>Ornithorhynchus anatinus</i>	0.11	2.2e-48	17950
<i>Monodelphis domestica</i>	0.07	3.8e-23	19470
<i>Canis familiaris</i>	0.10	1.7e-47	19304
<i>Bos taurus</i>	0.09	3.7e-36	21053
<i>Mus musculus</i>	0.31	≈ 0	26184
<i>Rattus norvegicus</i>	0.09	2.9e-47	27757
<i>Macaca mulatta</i>	0.07	3.5e-23	21904
<i>Pan troglodytes</i>	0.09	4.8e-36	19828
<i>Homo sapiens</i>	0.17	4.4e-122	19910

Using Dollo parsimony on the PPOD-PANTHER OrthoMCL database, the correlations between age and length are very similar to those reported in the main text. Nearly all species show a significant, though often small, positive Spearman correlation between protein age and length. The one exception is *Ashbya gossypii*. Human (Figure S5) and mouse show the strongest correlations overall.