Supplementary Material

Table of data used to compile Fig 2

Material	Energy density (by volume or weight, as specified)	Density (kg/m^3)	Horizontal launch speed (m/s)	Range (m)
Muscle	70J/kg[1]	1060[2]	1.41	0.31
Spring Steel	1.08MJ/m [3]	7900[4]	1.81	0.53
Filaree	761 kJ/m^3 ‡	500 ‡	3.93	2.62
Yew wood(dry)	500 kJ/m^3[5]	611 [6]	5.06	4.36
Shape memory alloy	1.1 kJ/kg [7]	6450 [8]	5.73	5.58
Poly (dimethyl) siloxane (PDMS)	1300 [9]	965[9]	6.09	6.3
Tendon	2.5 kJ/kg [5]	1120[10]	8.44	12.1
Kelp	2.6MJ/kg [5]	985 [11]	8.67	12.8
Rubber (natural)	3MJ/kg [5]	910 [12]	9.69	16.0
CNT yarn	3MJ/m^3 [13]	1400[13]	9.84	16.55
Polystyrene SMP	3261 J/kg [14] †	920[14]	17.11	50.07
Dual-network hydrogel	1160 J/kg [15]†	1000 (approximated as water, the major component of the hydrogel, due to lack of data)	18.60	59.16
Elastin	95 [3]	1300 [3]	24.18	100.0
Kevlar	40MJ/kg [5]	1440 [16]	29.24	146
Spider Silk	120 MJ/m^2 [17]	1250 [17]	52.30	468
CNT at 15% strain	7800 MJ/m^3 [18]	1400 [13]	398.47	27200

† Strain energy calculated from maximum strain in Hookean region, as:

$$E = \frac{1}{2} Y V \varepsilon^2$$

Where E is stored elastic energy (Joules), Y=Young's modulus (Pascals) , V = volume (metres cubed) and ε = strain (dimensionless). This yields J/kg when divided by the density in kg/m^3.

‡See below for assumptions underlying these figures.

Following the work of Evangelista et al., we assume 2.4% of stored energy is translated into horizontal movement. Standard equations of motion for constant acceleration are used to calculate trajectory, with drag neglected. Volume of the awn was taken to be $1x10^{-8}m^3$, assuming (in the absence of density data) a density of $500kg/m^{3,}$ intermediate between grass (1400 kg/m^2) and balsa (160kg/m^3). While this is not rigorous, the results are not very sensitive to such small changes in mass. Since the effect is constant across all calculations it does not affect the intercomparison of materials.