The mathematical basis of human intelligence

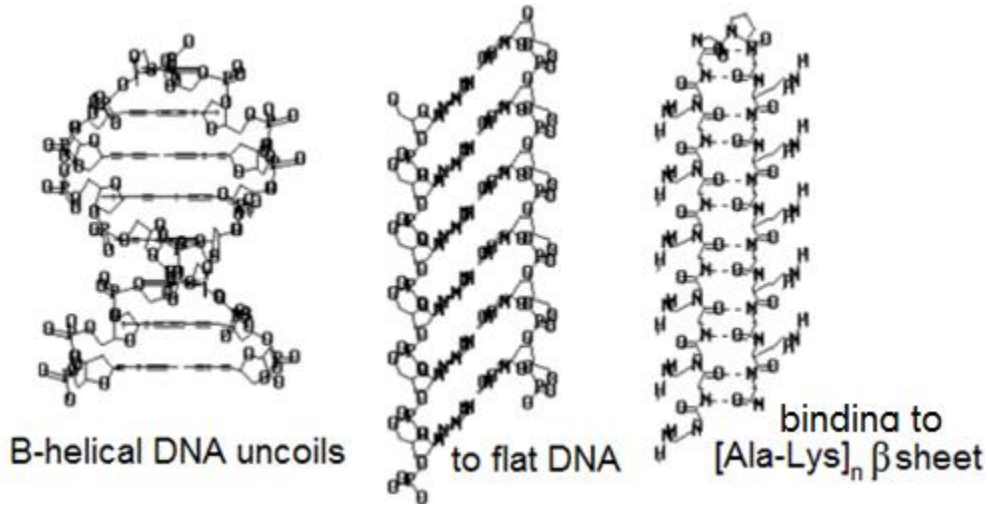

Figure 1 Pauling's flat protein uncoils the DNA B-helix

We learn in primary school that on the 6th day God created us and marvelled at his work. Before pocket calculators were invented, children recited arithmetic tables along with the alphabet. For managing pocket money and scoring games, counting on ones' fingers, using an abacus or mental arithmetic were essential skills. While programming early computers, I could reduce their instructions to nine operations. I proposed the 'minion' DNA-protein complex to explain it, extending my study of life's evolution.

Minions comprise 1,701 uncoiled B-helical DNA base-pairs bound to 189 flat anti-parallel β-sheet hairpin proteins with alternate neutral alanine, leucine, isoleucine and valine and basic lysine and arginine residues, proline making an asymmetric U-bend. Nine by sixty-three proton-ordered H-bond arrays join amino acid ω-amines to phosphates, connecting nine coils to complete the complex. Evolved to pack chromosomes for optimal replication, Fig. 2, they also afford a coiled abacus serving as biological clock and chip in the brain.

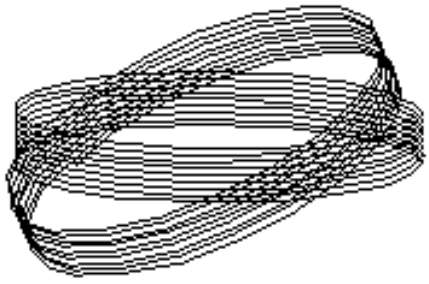

Figure 2 Minions copy 1,701 base-pairs with no un- or re-coiling

The neural network model of brain function fails to explain mental data analysis. Lateral thinking' enables gifted individuals to translate ideas from one

field of learning to another, analogy is a powerful intellectual tool. Binary networks merely distribute data at random, matchmaking is fortuitous. Minions encode sensory inputs, retrieving related memories and recognizing their logical relationships.

Minions count from 1 to 63^{18}, 0 and ∞ are unreal, using base-10 arithmetic to add, subtract, multiply and divide. Problems like those Dodgson's Mad Hatter posed to Alice at his garden party find nine answers, while sleeping on a problem, our dreams reveal them in technicolour, Fig 3. Qualities and colours match the mass, length and time associated with its inner and outer surfaces. A reference datum is established at ones' time of birth, enabling astrologers to relate it to personality.

Figure 3 Nine ways of thinking

E.g. the masses corresponding to ±4 are 33 million millionths of a gram & 500,000 tons, lengths 57 Ångstrom & 59 light years and times 54 days & 1.2 μseconds.

At cell division, nutrient starved tDNAs exchange guanyl- for adenyl-cyclase, synthesizing 'hook proteins', not transporting substrates. The hooks connect tissue cells, determining their shape, Fig 4. Gametes use one hook to mate, acquiring more as they develop up to five. Proving the 3-D *Five hook theorem* may be as challenging as its 2-D cousin, the *Four colour theorem*. Should a 6th develop, leucocytes attaching their hook prevents cancer and tumour growth.

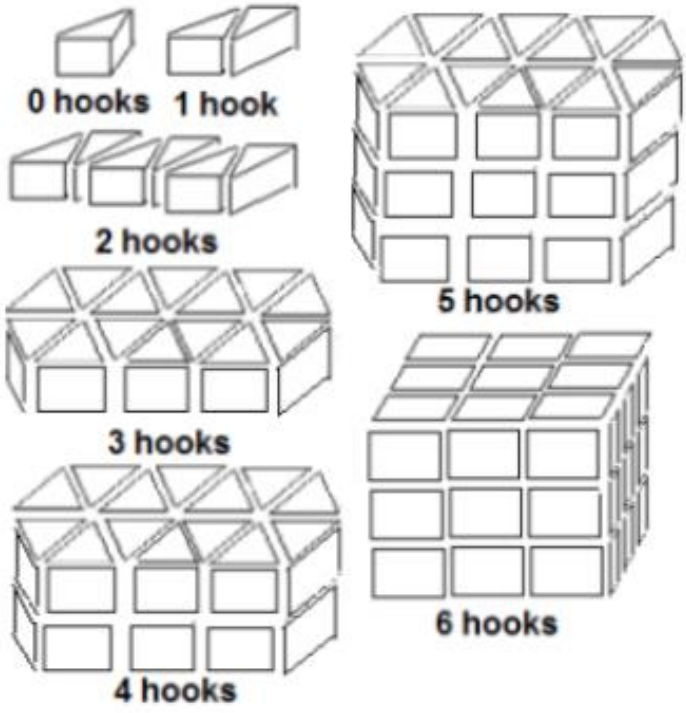

Figure 4 Amoebae, spirogyra, sponges, primitive worms, tissues and cancers have 1…6 hooks

Minions' nine tracks resemble musical clefs, spanning ~103 octaves, likewise, algebraic symbols have values. One type-**B** H-bond per minion track, Fig 5 opposes the rest, retaining one letter of an eighteen-character word and contributing a note to a representative chord. Minions with similar H-bond settings resonates. This recognition corresponds to algebraic equality, in a prepared mind successive resonances solve problems.

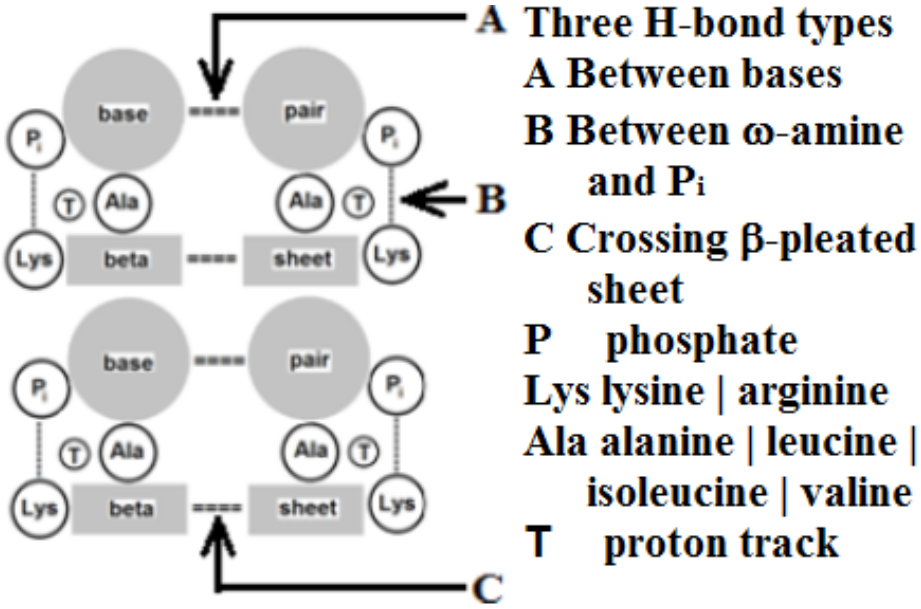

Figure 5 End view of adjacent minion tracks shows 3 sets of H-bonds, Ala signifies Leu, Ileu & Val and Lys Arg

When Newton introduced infinitesimal calculus, he felt free to invoke an infinite number of terms and made several questionable assumptions. Minions can count from 1 to 63^{18}, only finite series match reality. His laws of motion follow power laws but many natural phenomena are exponential in character. The logarithmic and geometric tables teams of ladies calculated have been replaced successively by slide-rules, calculating machines and digital computers.

Google searches alphabetically, using keywords to retrieve information. Minions assign everything to eighteen categories, not by matching colour, shape or function. Libraries use the Dewey Decimal system, it's not ideal but brings related books together. As reflected in the minion mirror, nature seems symmetric. When I first introduced minions, I'd identified eight metabolic pathways, its nine-fold symmetry suggested seeking a ninth, leading to my ideas for preventing heart attacks and breast cancer, they promise to increase longevity.

All random phenomena fit the 'bell curve' of Bayesian probability. *The exception proves the rule*, the less probable at its lower and upper extremities include the most interesting. Intelligence follows such a distribution, those with

exceptionally high IQ are likely to make wise decisions. As Churchill said, *'What is the use of living, if it be not to strive for noble causes and to make this muddled world a better place for those who will live in it after we are gone?'* To avoid opprobrium, it's their duty to explain them to those who'll benefit. Subjects with less intellectual ability afforded opportunities and care enjoy life. Ordinal and cardinal numbers measure quantity and quality respectively, gamblers confuse them, making poor decisions.

Synaesthetes interchange senses and associate colours and patterns with letters and digits. The congenitally blind and deaf benefit from substituting senses, e.g. The blind to use Braille, exchanging touch for sight. 'Neural network' theory dictates that our ears, eyes, noses, tongues and fingers send raw signals to different brain regions for analysis. The minions in our sense organ cells encode signals on receipt which may be recognized anywhere in the brain.

Minions are biological clocks, their time unit $\tau \approx 1.4$ thousand million millionths of a second, is the shortest we can appreciate. DNA is 'handed', chiral so the concatenated hydrogen bonds (**B** in Figure 5) always travels in the same direction to record it, determining the direction time takes. Times past, present and future have equal status. *History repeats itself*, the realization of prophecies such as those in the Bible or the quatrains of Nostradamus confirms it, wise men learn from past mistakes.

Michelson and Morley's determination of the speed of light c 1900 $_{AD}$ introduced discrepancies in atomic physics and cosmology, allowing for the 1 in 63^9 wrap-around counting errors minions make resolves them, Fig 6. Its verification could obviate spending scarce research funds on particle accelerators and rocketry. Evolution is slow and random, it enables change but doesn't determine the future course of events.

$$\left.\begin{aligned} \frac{d^2\Theta}{dt^2} &= \frac{\pi\beta^2}{2\sqrt{e\left([1+\beta]^{t/\tau}+[1+\beta]^{-t/\tau}\right)}} \\ \frac{d^2\Phi}{dt^2} &= \frac{\pi\beta^2}{2\sqrt{e\left([1+\beta]^{t/\tau}-[1+\beta]^{-t/\tau}\right)}} \end{aligned}\right\}$$

Figure 6 The Tyger time-gravity equation, using polar coordinates, θ and Φ, β = 63^{-9} = 1.39 * 10^{-15} and e is base of natural logs