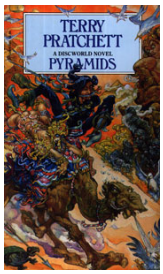
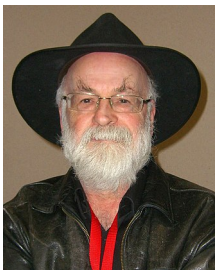
Pyramids by *Terry Pratchett*, Corgi, 1989 (341 p.)




Terry Pratchett

Flatland by Edwin Abbott Abbott (1884) is well known, describing a two-dimensional world and how its inhabitats interact with the third dimension. It is often used as a model to explain how we, living in a three-dimensional world, should understand a fourth, or higher, spacial dimension. However, the idea of the author was to write a parody of the Victorian society. In a similar way, Terry Pratchett (1948-2015) invented *Discworld*, a flat planet in the form of a disc, and wrote in the period 1983-2015 not just one novella but 41 books about it which could be classified as "comic fantasy". His books were a hype for a whole generation and just like for *Flatland*, mathematician Ian Stewart, (and biologist Jack Cohen), collaborated with Pratchett in four books to discuss *The science of Discworld*.

There are obvious parallels between our society and the society of *Discworld*, only the events in the novels are following a Monty Python type of logic. The book *Pyramids* is the seventh book in the series, and I just single this one out because it does not happen often that you literally laugh out loud with its unbridled mathematical humour, and because it is featuring "the greatest mathematician of all times".

The story plays in Djelibeybi (meaning the baby of the river Djel) which is the *Discworld* analogue of ancient Egypt in our world. The main character is Pteppic (pronounce Teppic), son of the pharao who is raised as an assasin outside the country (in our world Assasins were an IS-like terrorist sect in Persia and Syria of the 11-13th century). When his father dies, he has to become the new king while his father is being mummified and a pyramid, the biggest ever, is built in his honour in 3 months time. Pteppic has some reasonable modern ideas, but the country is ruled by Dios, the high priest who "interprets" the ideas of the king in his own way to prevent any change at all. The previous king, assumed a semi-god, is supposed not to die and is still wandering around in the palace unable to communicate with the living, but having problems, his legs being stuffed with straw and his brains and bowels stored in a separate container. He and Pteppic try to prevent the construction of the pyramid which he never wanted, but Dios has it built anyway.

Ptraci was a concubine of the father and is supposed to commit suicide when the king dies. Because she refuses, she is brought to trial before Pteppic, who sets her free, but Dios interpreted this as that she will be thrown to the crocodiles the next day. Pteppic decides to rescue her during the night and flee with her to Ephebe (the analogue of ancient Greece). The energy concentrated in the pyramids makes them flare every 24 hours, but the enormous mass concentration of the new pyramid, which does not have a capstone yet, influences the space-time continuum and workers are getting déjà vu experiences and they are starting to remember things they were going to say in the future. Some cataclysm happens when space-time is rotated over 90 degrees, the gods and all previous rulers of the country return and the armies of two neighbouring states Ephebe and Tsort are starting a war (Trojan war) because Djelibeybi, which was a buffer state, has disappeared. Pteppic however returns, destroys the big pyramid, pushes Dios back to the first pharao, and everything returns to normal. He leaves the throne to Ptraci who introduces all the necessary reforms.

The adventure of Pteppic and Ptraci fleeing the country (part 2) and their stay in Ephebe (part 3) before their return are the parts of the book that made me want to review it here. They chose a camel as a vehicle for their escape. Camels are detached from their environment, their extensive digestive system gives them the time while ruminating to do mathematics and their curled lips allow them to solve quadratic equations. So they have a general aptitude to do higher mathematics. However they are smart enough to keep it a secret for humans since they do not want to end up being guinea pigs in their labs. And the escape animal they had chosen happened

to be the greatest mathematician of them all. Its name was You Bastard. Since it sensed the growing instability in the space-time continuum it starts calculating: "Let V equal 3. Let τ equal $\chi/4$, *cucuccud*... Let κ/y be an Evil-Smelling-Bugger differential tensor domain with 4 imaginary spin coefficients..." while Pteppic and Ptraci try to force it to move. It goes on computing while Dios is about to order soldiers to fire arrows that can "turn a charging hippo into three tons of mobile kebab", until "Let legs equal four..." and off they go. During the whole trip we learn about You Bastard's computations to control the bio-mechanics of its hazardous movements "...let speed be gallop". Slowing down needs complicated instructions to each leg separately while the two passengers try to hold on its back. Camels have an advantage over humans to do mathematics because they do not have fingers. When humans are confronted with parametric differentials they have an instinctive tendency to start counting fingers. Camels don't. They just go with numbers and so they contemplate more easily "...Let $z = e^{i\theta}$ *cudcudcud* Then $dz = ie^{i\theta}d\theta$ or $d\theta = dz/iz$...".

So You Bastard and its passengers escaped the collapse of the country which leaves only a crack in the surface as a fractal scar behind. They arrive safely in Ephebe, land of philosophers dressed in togas, bald headed and with long beards. The country is ruled by a Tyrant, but the Tyrant is elected every five years (not to be confused with what they do to tomcats, bulls, etc. to make them stop fighting and behaving more peacefully) using a system called mocracy (not to be confused with mockery). The first thing they experience is an arrow shot at them. You Bastard *cudcudcud* computes the point of impact in the sand before it actually happens. On a dune they see is a sign "axiom testing area" and a smaller one "caution-unresolved postulates". Behind it they meet Xeno (Zeno) whose slaves are shooting arrows at tortoises. Xeno claims these are the fastest animals ever. Shooting an arrow after it will never hit the target. But his companion Ibid (Aristotle) assures that tortoise is often on the menu and they are running out of tortoises. The one case where the tortoise has beaten the hare was because the hare was dead.



Pteppic is introduced to Xeno's colleagues during a Symposium, actually a knife-and-fork-tea. There is Copolymer (Homer), the greatest story teller, Iesope (Aesopt), the greatest teller of fables, Antiphon (Aristophanes), the greatest writer of comic plays, Pthagonal (Pythagoras), an acute man with an angle. The latter is grumbling over his pie because the ratio of the circumference over the diameter is not 3 or 3.5 or 3.3 for that matter, but no, it is 3.141 and lots of other figures. Pthagonal explains that pyramids are dangerous things. Their energy accumulates time and flares are needed to burn it. By building bigger and bigger pyramids, time has built up and it has turned space-time over 90 degrees. This rotation means that length is height, height is breadth, breadth is width and width is time. "There's four of these bastards". So you would get younger or older by walking sideways. Because that is obviously impossible, since "you would age another mile with every birthday", therefore, he concludes, the kingdom must have popped outside through a crack in space. "You can twist time and space all over the place if you are not careful." "Traveling in width is the real trick". And he concludes by asking: "Three point one four one, what sort of number d'you call that? Somewhere somebody should have built a universe with a decent, respectable value of pie, not some damn number that never comes to an end, what kind of —" and then he collapses because he had too much wine.

In a dream Pteppic meets Khuft, a camel herder, that became the first pharaoh after he discovered the river Djel that had not been there before (big bang). Something made it real. "I always thought it was the camels" says Khuft.

Adhemar Bultheel