

The history of the study of water in science and art has interesting points of convergence and tells quite a story of the way humans have interacted with water over centuries. While many might regard water as little more than the humble content of every day tea and coffee, the study of water has been central to recent science and the human use of water in machines can be traced over millennia. Rivers have also captured the imagination of artists for centuries. Given it is essential for life it is perhaps no surprise that water holds a central and significant place in the world view of Māori and other indigenous groups.

Without going into too much of the science, the study of turbulence was central to the development of Chaos Theory. Edward Lorenz's computer model of the weather was a defining point. The onset of turbulence was compellingly studied by Ernst Libchaber, and even dripping taps have been studied in the name of Chaos Theory. Mandelbrot's ideas about scaling, self-similarity and fractals are important, as the scale change between dripping taps and weather systems indicates.

Some interesting imagery has arisen in the course of the study of flow and turbulence. A Von Karman Vortex Street sounds like an exotic location but is actually imagery from the study of turbulence, where Von Karman led the way. Here is an image below:



*Figure 1.* A Von Karman vortex street (digitally optimized). Source:

<http://lfmi.epfl.ch/files/content/sites/lfmi/files/images/Project%20Images/cyl-re140.jpg>

The images are made by having a small cylinder filled with dye, which has a smaller hole in it on the side in the direction water is flowing. As the flow rate increases, the line of dye becomes wavy, then spiral like forms branch off. Once the flow is over a certain rate, the street becomes completely turbulent. Karman Vortex Streets on rare occasions can be seen in clouds, showing that there is a general principle of flow being seen.

Many New Zealanders, whether or not Māori will intuitively recognise in the flowing forms above, the painted rafter patterns seen in Whare Nui (Meeting Houses). It turns out that Kowhaiwhai (the name of the technique of the painted rafter patterns) have origins in canoe paddle decoration for which there are early examples from Ngai Tamanuhiri, seen in the image below.



*Figure 2.* Painted Ngai Tamanuhiri hoe (paddles) collected on 12 October 1769, during Cook's first Pacific voyage, sketched on board the Endeavour by Sydney Parkinson. © British Library Board Add. 23920, f.71

It is striking that the whorls of flowing forms running up scales from the tiny to the large are found in both the science and the paddle decoration. A sense of flow escalating is also found in art, most notably in the drawings of Leonardo da Vinci.

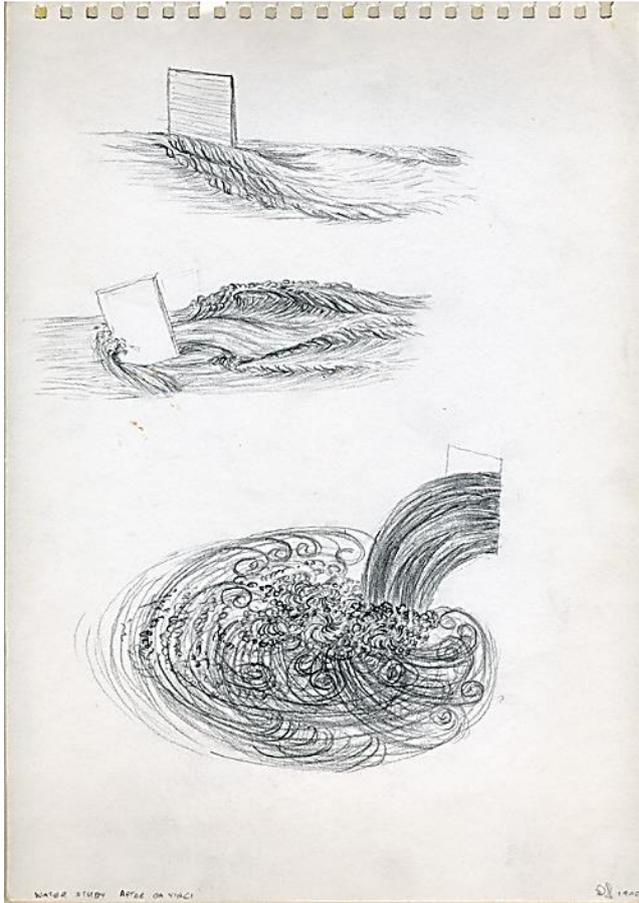


Figure 3. Ian Clothier (1990). *After da Vinci: studies of water passing obstacles and falling into a pool* c.1508-9. Pencil on paper.

Da Vinci was famous for among many other things likening the motion of the surface of water to hair. He used also used his studies of water to generate the grand fictions known as the Deluge Drawings, which capture the intensity of the artists view of water and nature.



Figure 5. Ian Clothier (1990). *After da Vinci: Deluge over a rocky landscape c.1513-15*. Pencil on paper.

Da Vinci was of course known for many things: scientist, engineer, sculptor, painter, armourer and his engagement with the technology of the day was notable. Water itself holds an interesting place in the development of technology, because the origins of the computer are traceable back through calculators to automata, then through to weaving looms and back further to water clocks. These reached a zenith of sorts around the 12<sup>th</sup> century Muslim Turkey. Al Jazari lived in the Islamic golden era, and is credited with bringing mechanics into engineering and combining these with a sense of beauty. The efficient and beautiful use of water are hallmarks of his work.

<iframe width="420" height="315" src="//www.youtube.com/embed/9q9G0S8fADQ" frameborder="0" allowfullscreen></iframe>

More recently, UK artist Susan Derges has blended art and science by submerging large photographic plates in estuarine waters and using a flash to take an image of the swirls and eddies created by sand moving in turbulent suspension.

[http://www.fotofest.org/ff2004/exhibitions\\_derges.htm](http://www.fotofest.org/ff2004/exhibitions_derges.htm)

And even more recently that that, the subject of water, flow, turbulence and Māori world view have been integrated by Māori New Zealander Jo Tito, whose work was included in the curated exhibition *Wai* in Albuquerque in 2012.



Fig 4. Still frame from the video *Wai* by Jo Tito, 2012.