# On the colour of oceans and freshwater bodies:
## why does it change and why does it matter?

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It is a matter of everyday observation that the colour of water changes with time and location. These colours are beautiful and have inspired the arts world for centuries. But they are also a source of much information to scientists who study water. In the early days of ocean-colour research, Secchi (1865) proposed a standardised method for measuring water clarity. This was followed by Forel (1890) and Ule (1892) who proposed a scale for classifying water according to its colour. The reports of the Continuous Plankton Recorder surveys (Hardy, 1935) have been incorporating a Phytoplankton Colour Index since 1948. Such developments in scientific observations of colour were paralleled by theoretical developments: Sir CV Raman, a Nobel-prize-winning physicist from India, was the first to demonstrate that the deep blue colour of clear ocean waters came from optical properties of the water itself, and not from reflection of the blue skies, as had been suggested earlier. Nowadays, our interest is in knowing why the colour deviates from blue in different locations. The change in colour can arise for several reasons: suspended sediments in coastal waters or in the outflow of rivers that turn water brown; coloured dissolved organic matter that renders the water a yellow-orange colour if present in high concentrations; or phytoplankton – minute, free-floating, single-celled plants that are present in practically all natural bodies of water, but in varying concentrations – that turn waters green.

We have come a long way from the early days of aquatic-colour research, to the age of satellite observations of water colour. But what motivates this research? The scientist's preoccupation with water colour arises from the coded information that it carries, on the types and concentrations of substances present in water. Of particular interest is the use of satellite observations to study phytoplankton. Though invisible to the naked eye because of their small size, their collective impact on our planet is huge: through photosynthesis, they convert inorganic carbon into organic material. Globally, this contribution from phytoplankton to the planetary cycle of carbon is comparable to that of terrestrial plants and trees. The organic material produced by phytoplankton sustain practically the entire population of larger organisms in the upper ocean. In this talk, I will present some aspects of my research into phytoplankton and ocean colour, jointly with many colleagues from around the world, but above all, with Trevor Platt. I dedicate this talk to all of them.