# The Australian Society Of Rheology, Inc.

## 2021 Industry Lecture Series

CAV Reg. No. A0055806E

## Calendar details

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| Date: | **Tuesday, 5 October 2021** |
| Time: | **3.00 pm – 4.00 pm (Melbourne Time)** |

Event registration link:
https://www.eventbrite.com.au/e/australian-society-of-rheology-industry-lecture-5-october-2021-registration-177651138337

## Invited lecture

**Speaker: Dr. Lionel Pullum** (Research and Development Engineer - Retired)

**Presentation Title: Some examples of non-Newtonian rheology in the mineral industry (and some which are not)**

**Abstract**

Slurries and solid suspensions are ubiquitous throughout the mineral processing, chemical and process industries. Unfortunately, the interaction between solid particles and fluids, especially non-Newtonian fluids, is generally poorly understood. Slurry behaviour is often wrongly attributed to non-Newtonian fluid mechanics, whereas it is often due to simple particle/boundary interactions, but determining which one is difficult, when you are armed with preconceived notions, especially with slurries which are normally opaque. In many of the process operations, slurries are deliberately kept at low concentrations to supress any non-Newtonian interactions so that the component phases and species can be readily manipulated separately, e.g. in flotation or solids separation.

Sometimes by design, or because of the materials' properties and where slurry concentrations are sufficiently high, non-Newtonian carrier fluids or slurries are produced, and these normally take the form of visco-plastic fluids. Fluid mechanics of particle/fluid flows, non-Newtonian flows, and combinations of the two, are complex, and process equipment design is not usually cognisant of this complexity, often being based on Newtonian or low concentration solid/fluid flows. The result is that processes may operate inefficiently, with high wear or severe scaling issues.

In this short presentation, I will discuss examples of non-Newtonian flows used in the mineral industry and process issues that were erroneously attributed to non-Newtonian behaviour. Many of the insights into these flows have been obtained through flow visualisation studies in the laboratory, examples of which will be given.

**Speaker's biography**

Lionel Pullum, ostensibly a retired research and development engineer, was trained to be a production engineer in London, during which he obtained his degree in Mechanical Engineering, and a doctorate in pneumatic conveying. He has been a practicing consulting engineer since 1989. Prior to that he was a senior research scientist at the CSIRO's Division of Mineral and Process Engineering. He has worked with most of the mining and mineral-processing companies in Australia as well as many production companies, either through direct consultation or through collaboration with other companies or research organizations. These companies include: Alcoa, Alcan, ASEA Brown Boveri, Barclay Mowlem, BHP Billiton, Comalco, De Beers, Golders and Associates, ICI, Lightnin Mixers, NRG, Queensland Alumina, Rio Tinto, Weir Group, Western Mining and Worsley Alumina. He was retained as a consultant by the CSIRO from 1992 where he was also appointed as an honorary fellow. His experience in two phase solid/fluid flows covers most aspects of mineral processing and he has been actively involved in various types of industrial suspensions ranging from supersonic dilute pneumatic systems to ultra-high concentration non-Newtonian hydraulic systems. His main interests in research are complex coarse particle/fluid and hybrid flows, in which he has an international reputation and was coordinator of an international research group investigating this area. He has been asked to provide expert advice on six separate occasions in subjects ranging from pump and valve design to food processing equipment. Work areas include hydraulic conveying, mixing, comminution, mill design, separation, precipitation and suspension rheology.

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