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"It's so thin!"

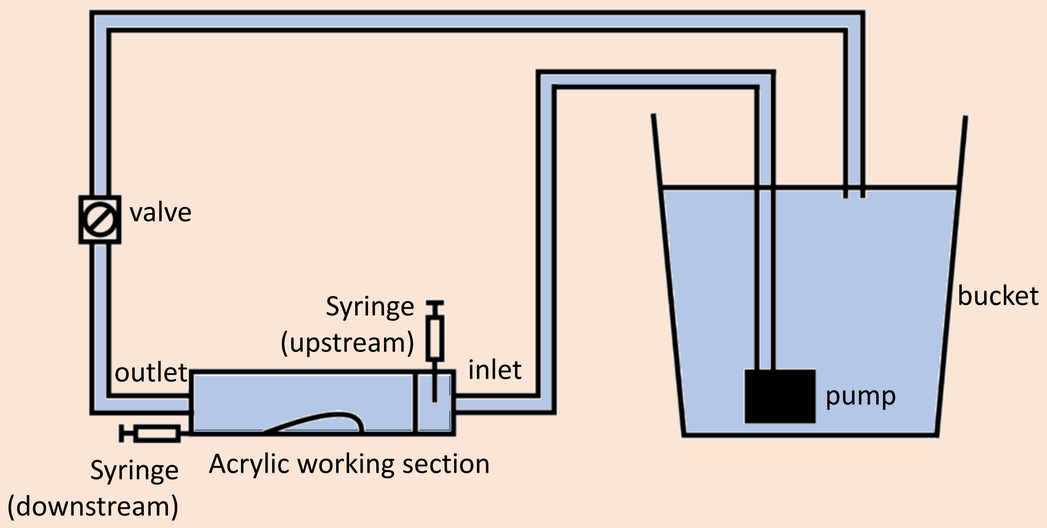
Visualising the boundary layer – at home

Overview

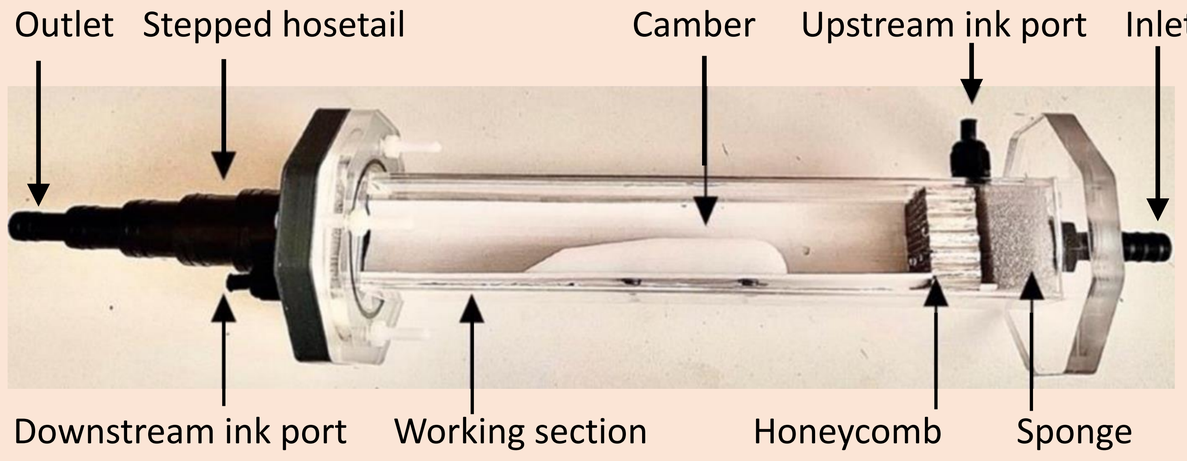
Experimenting at home[1]

- Water tunnel experiment – at home
- One each per 2nd year student
- Ink-in-water visualisation
- 3 hour online session conducting experiments
- Focus on boundary layer behaviour
- All images generated by students

Equipment

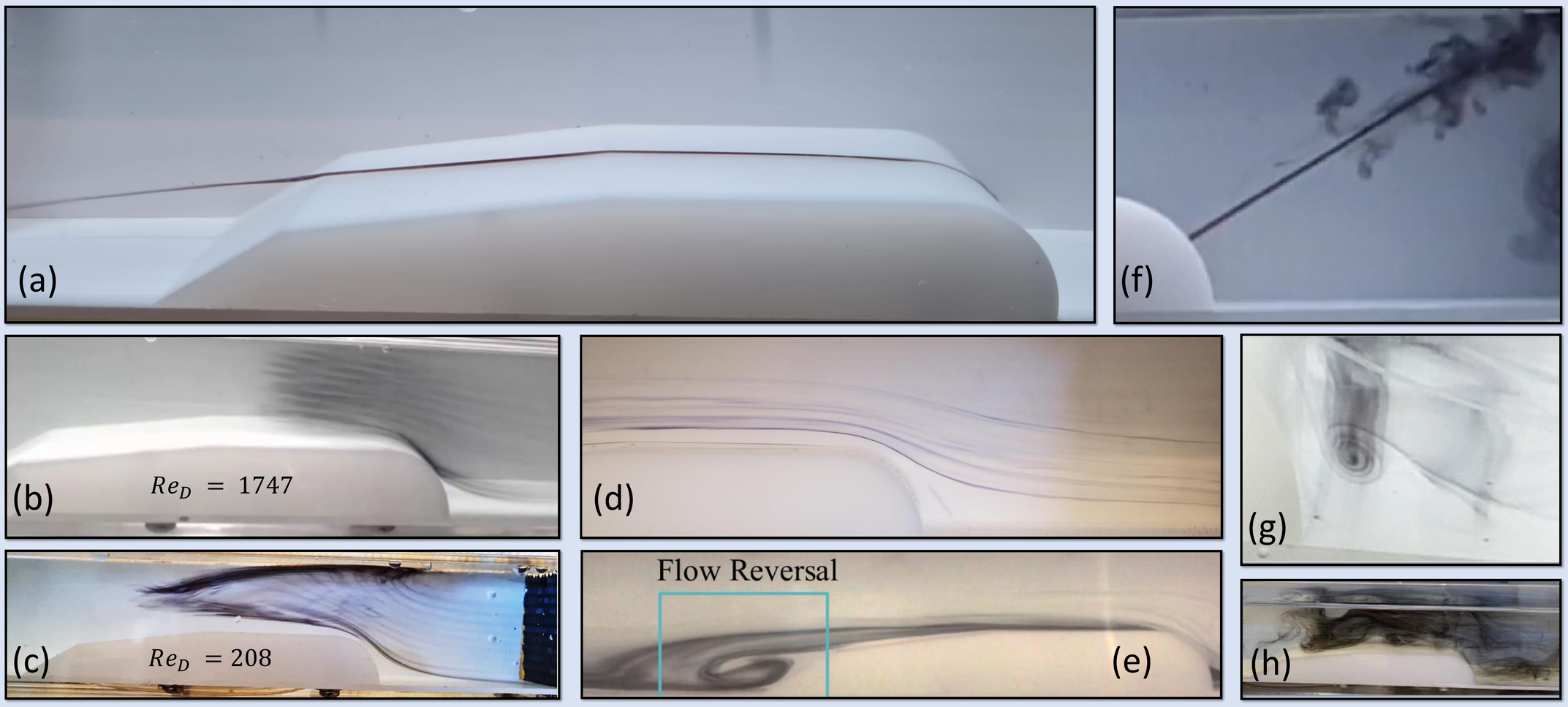


Water flow loop kit sent to students[2]



Acrylic working section with obstacle[3]

Results



(a) Boundary layer behaviour visualised with ink injection[4]. (b), (c): Reynolds number effects[4].
(d) Streamlines[5]. (e) Flow reversal[6]. (f) Jet[2]. (g) Separation at stagnation[7]. (h) turbulence[8].

Future

The kits will continue to be used in the classroom, with the new 'one each' teaching model. Use will be extended to other experiments (hydrostatics, Bernoulli, etc.) enabling regular use in the classroom or at home. Observing and measuring complements theory at each step of learning, and becomes as natural to use as pen, paper and computer.

All images by UG students: 1: O. Quarks, 2: E. Tang , 3: G. Motta, 4: A. Castagna, effect of Reynolds number, 5: J. Helsby. 6: J. Ibrahim SalahEldin Mohammd, 7. I. Ng. 8. F. Rivieccio.
Rig developed by P. B. Johnson and K. Blackney. Production models by Northern Cast Acrylics Ltd. For more info contact: peter.johnson@imperial.ac.uk