Physical modelling: laboratory models

Physical Parameter	Unit	Multiplication factor
Length	[m]	λ
Structural mass:	[kg]	$\lambda^3 \cdot \rho_F / \rho_M$
Force:	[N]	$\lambda^3 \cdot \rho_F / \rho_M$
Moment:	[Nm]	$\lambda^4 \cdot \rho_F / \rho_M$
Acceleration:	[m/s^2]	$a_F = a_M$
Time:	[s]	$\sqrt{\lambda}$
Pressure:	[Pa=N/m^2]	$\lambda \cdot \rho_F / \rho_M$

Physical Modelling of Shell Cove Boat Harbour Entrance (NSW)

$$\frac{U_M}{\sqrt{gL_M}} = \frac{U_F}{\sqrt{gL_F}} = Fn$$

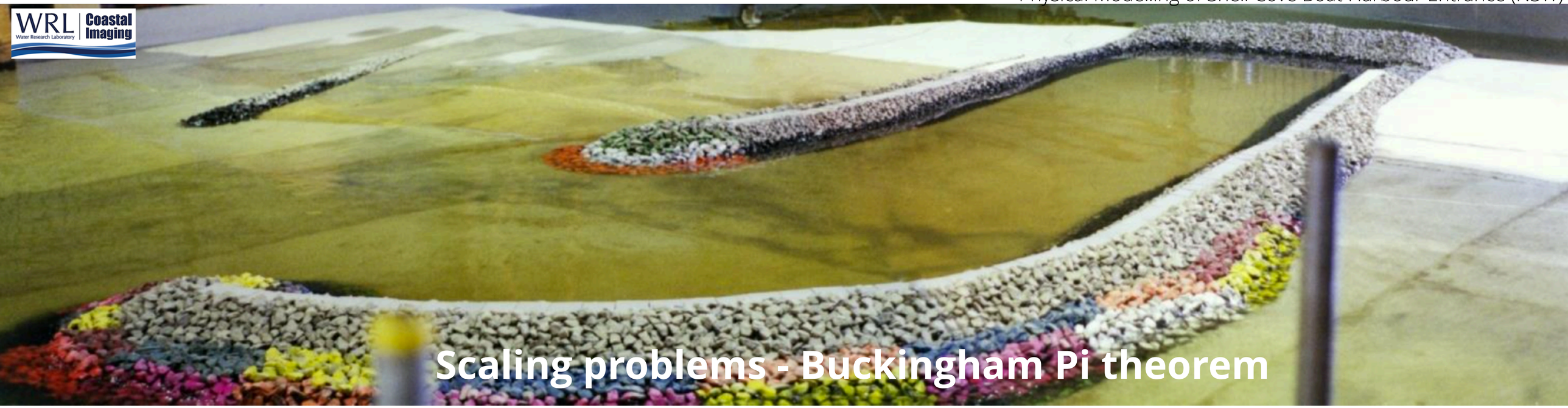
Froude scaling:

$$U_F = U_M \sqrt{\frac{L_F}{L_M}} = U_M \sqrt{\lambda}$$

Using the geometrical similarity requirement: $\lambda = L_F / L_M$

Physical modelling: laboratory models

Physical Modelling of Shell Cove Boat Harbour Entrance (NSW)



- Euler number: stream pressure versus inertia forces

$$\pi_3 = V^{-2}\, L^{-2}\, F^{1}\ \rho^{-1}\ \mu^{0}\, g^{0} = F\ /\ \rho\,(VL)^2 = Eu$$

- Other dimensionless numbers used in fluid flow physics:

Weber number — Cauchy number — Mach number — Strouhal number