New approaches in Integrable Quantum Field Theory

Gleb Kotousov
Building 2a, 401

Australian animals:

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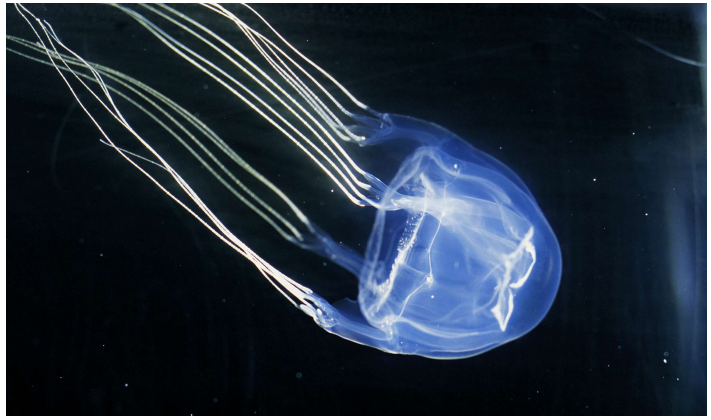
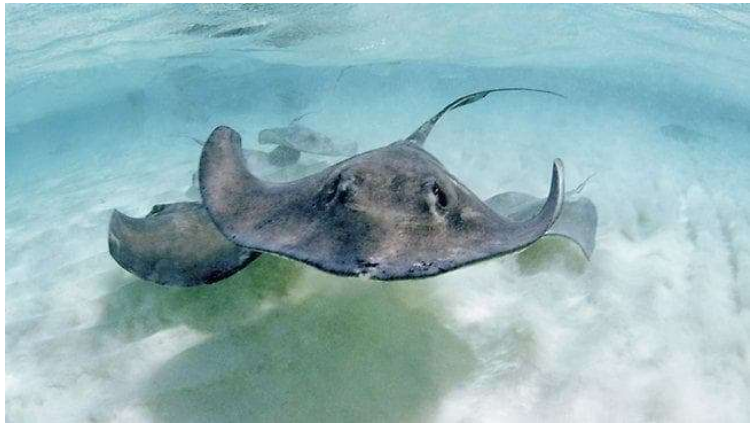
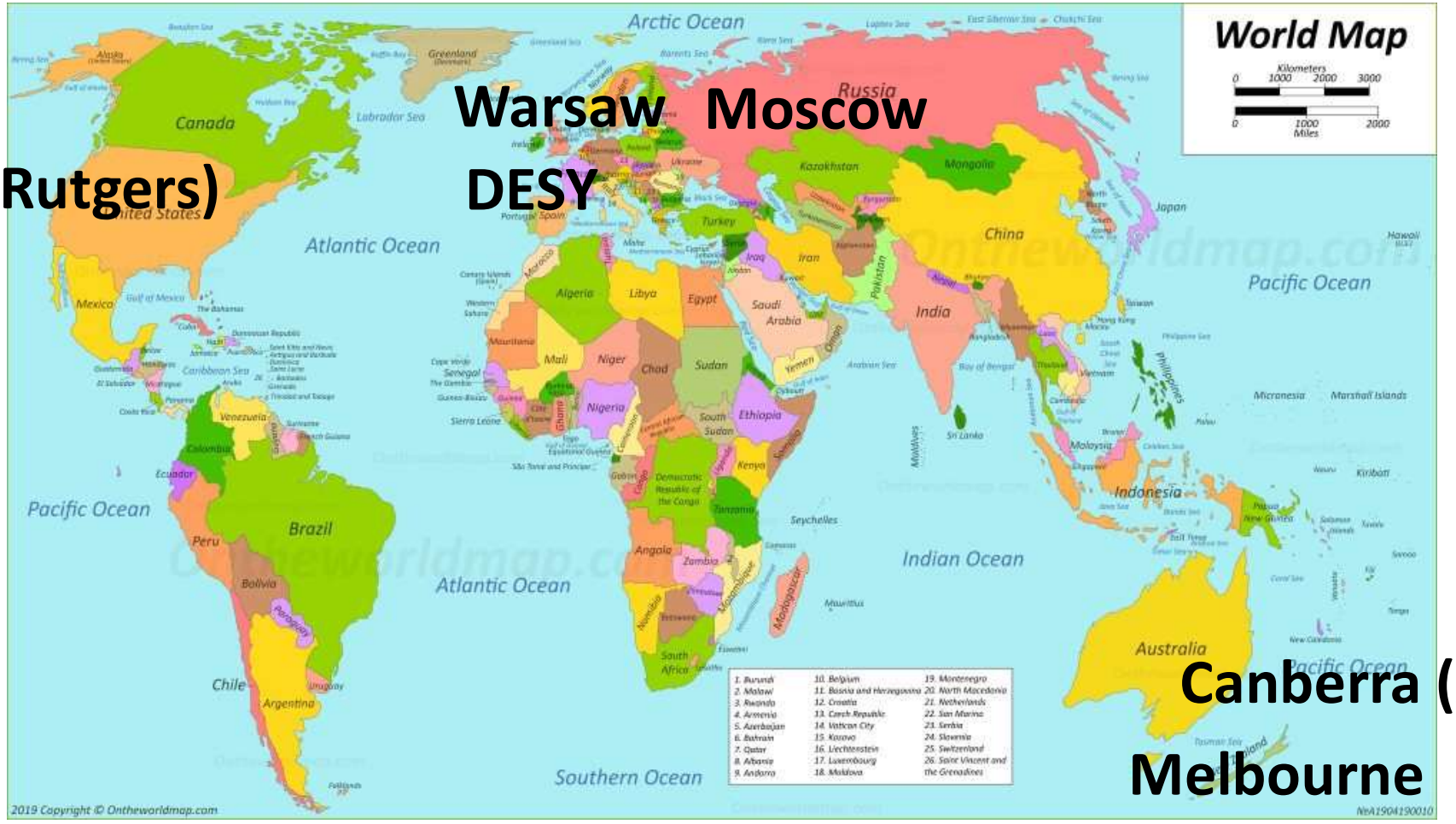




Hobbies

Life



Warsaw Moscow

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Research: Exactly Soluble Models

- Large class of (effectively) 1D quantum many body systems that are solvable via the Bethe ansatz [Bethe '31]
- **Used to explore fundamental concepts in physics:**
- Ising model, first solved statistical mechanics model exhibiting a phase transition [Onsager'44]
- 8 vertex model, used to test hypotheses connected to scaling [Baxter '72]
- Kondo model, first model exhibiting asymptotic freedom and was a testing ground for the RG approach [Wilson'75; Wiegmann '80; Andrei'80]
- **Some models can be realized in the lab:**
- Lieb-Liniger Bose gas, realized in ultra-cold 87Rb atoms confined to a 1D optical trap [Paredes et al.'04; Kinoshita, Wenger, Weiss'05]

Integrable Non-Linear Sigma Models

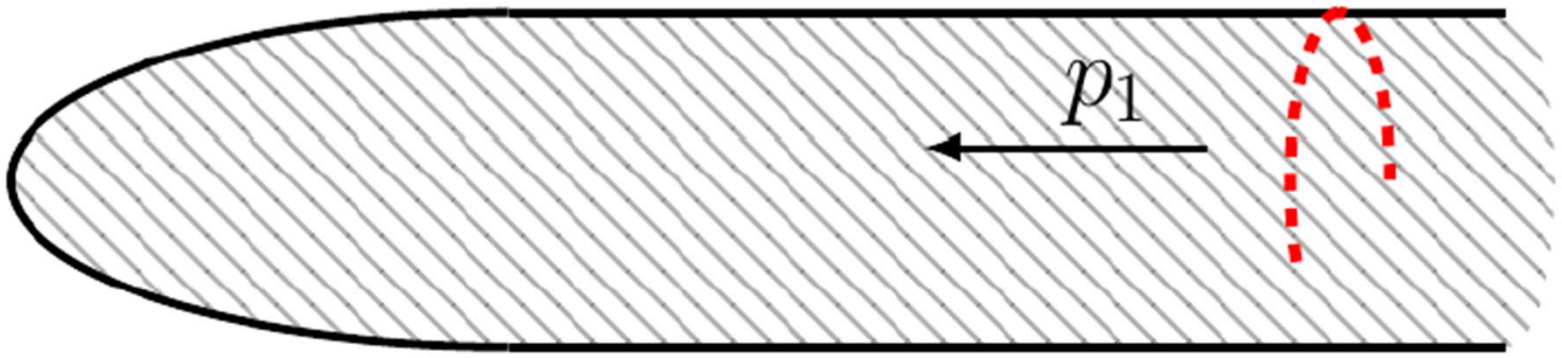
- E.g. the cigar (2D Euclidean black hole):

- Lagrangian + boundary conditions:

$$\mathcal{L} = (\partial_\mu \phi)^2 + \tanh^2 \phi \, (\partial_\mu \alpha)^2$$

$$\alpha(t, x + R) = \alpha(t, x) + 2\pi k$$

$$\phi(t, x + R) = \phi(t, x)$$



First ever photograph of 2D black hole

Conclusion

- Australian animals
- Swimming
- Life
- Research
- Integrable Non-Linear Sigma Models
- Observation in nature