英語講演会　事前申込不要

東北大学大学院工学研究科　次世代航空機研究センターからのお知らせ

TU Next Seminar in Applied Mechanics and Computational Engineering

沖縄科学技術大学院大学(OIST)の Chakraborty 准教授は、パイプ流れなどで理論と実験の双方から乱流スペクトルと摩擦抵抗との間のリンクを明らかにしたり、ソープフィルムを使った 2 次元乱流などで非常に優れた研究成果を挙げ、Nature や Science に複数の論文を発表している若手研究者です。　ホームページ：https://groups.oist.jp/ja/fmu

流体力学ユニットの研究ニュース：https://www.oist.jp/ja/groups/fluid-mechanics-unit-pinaki-chakraborty

日時：2017 年 10 月 19 日（木）, October 19th 2017, 16：00-17：00

場所：東北大学大学院工学研究科　機械・知能系共同棟 6F 611 号室 Room611 Research Building MAE

講師：Dr. Pinaki Chakraborty (Associate Professor,OIST)

演題：The states of flow in transitional pipes

In 1883 Osborne Reynolds discovered a peculiar state for flow of water in a pipe. This state corresponded to the transition from the quiescent, laminar state at low *Re* (Reynolds number, a dimensionless measure of the flow velocity) to the roiling, turbulent state at high *Re.* The laminar state is devoid of fluctuations; the turbulent state is inundated by a spectrum of fluctuations. The transitional state is distinct from the laminar and turbulent states, and consists of localized patches－Reynolds termed them “flashes”－of fluctuations alternating with plugs of laminar flow. Later work unveiled that the flashes come in two disparate states: “puffs,” which can maintain their shape or proliferate or fade away; and “slugs,” which continually expand. To summarize, puffs and slugs and turbulence appear to constitute three distinct states of flow. We take a closer look at the flashes.

First, we consider “laws of resistance” (which relate the fluid friction with *Re*). Intro-duced in Reynolds's original work, the laws of resistance furnish a quantitative diagnostic of the state of flow. While he succeeded in determining the laws of resistance for laminar and turbulent flows, the laws for transitional flows eluded him and remain unknown to this day. By properly distinguishing between flashes and laminar plugs in the transitional regime, we show experimentally and numerically that the law of resistance for laminar plugs corresponds to the laminar law and the law of resistance for flashes is identical to that of turbulence. We conclude that flashes are turbulent sensu Reynolds.

Next we consider the nature of the fluctuations in the flashes, about which little is known. Our experimental and numerical results suggest a startling conclusion: the fluctuations in the flashes partake in the well-known Kolmogorov energy cascade, the signature of high Re turbulent state. In other words, flashes are turbulent sensu Kolmogorov.

To wit, transition is not a distinct state: flashes are turbulent.

This work is in collaboration with Rory Cerbus, Chien-chia Liu, and Gustavo Gioia.

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