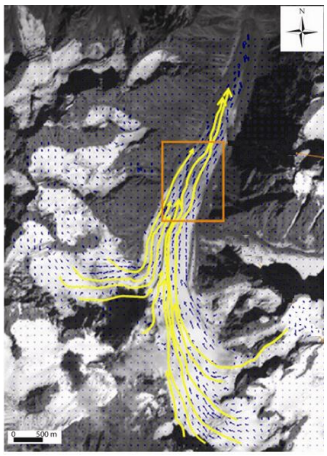
In this issue

And further research in pipeline

19th Century. Osborne Reynolds uses a dimensionless quantity discovered by George Gabriel Stokes to explore flows of fluids with different viscosities. 20th Century. Wilhelm Schmidt uses another dimensionless quantity to explore the role of viscous diffusion and mass diffusion in fluid flows. Later, Gerhard Damköhler uses yet another dimensionless number to understand the relationship between mass transport and chemical reactions. And now, scientists at IIT Hyderabad and Imperial College London have put together all three numbers to understand flows of multiple fluids that could mix and chemically react with each other (**page 841**). They have used numerical methods to understand fluid flows and find the evolution of patterns that have fascinated many generations of scientists engrossed in the study. After the initial laminar flows where the output increases with velocity, non-linearity sets in, and finger like protrusions, rolls and cork screw patterns emerge, changing the mixing, diffusion and reaction rates. Practical applications of such an approach are many, as the article points out. To give a down-to-earth example, visualize a drain into which an industrial chemical also flows. For a more profitable example, think of chemical engineering in crude oil pipelines.

Another freeware for scientific research

Glaciers melt – everybody knows that. But they also flow. On a slope, due to the pressure of the snow on top, glaciers exhibit fluid like behaviour. To measure this flow, scientists use stakes – push them into the snow and measure the displacement. It may appear simple. But fieldwork on top of glaciers is fraught with difficulties. As satellite technology developed, scientists started using a technique called synthetic aperture radar (SAR) interferometry where pulses of electromagnetic radiations are sent to the glaciers and the reflected waves are detected. Using the phase shift of the returning wave from successive passes of the satellite, the flow can be calculated with an accuracy of few centimeters per



day. But then, the Himalayan slopes are rugged. The angles at which the satellite 'sees' the glaciers, are different at different slopes and the errors have to be rectified to get a measure of the flow. Differences in temperature and pressure of atmosphere through which the waves have to pass also play havoc with the data. Then came the technique of optical image correlation: images at different times are correlated to track any movements. But then, successive images have to be registered accurately. The difficulties posed by the rugged terrains also remained a problem. Enter image processing software. Much of the tedious work was taken over by these tools. And now researchers from the IIT Roorkee and the Wadia Institute of Himalayan Geology have used the technique to measure the flow of the Chhota-Shigri glacier in Himachal Pradesh (**page 853**). What is fascinating is that the software used is freeware! And this research article has underlined the accuracy of the optical correlation method using these tools. So now it should not take much time, effort or money for scientists to use this method to measure the flows of other glaciers that feed the Gangetic plains.

What do dogs do in their free time?

If you have a pet dog, perhaps you already know their antics. But what about street dogs? What do they do during daytime? This is the question asked by scientists from IISER Kolkata. And they have collected statistical data on the activities of free ranging dogs sighted in three different urban environments covering all seasons (**page 874**). Take a look and you may wish that you could lead a dog's life too: they spend more than half the time lying down and lazing. But why this interest in free ranging dogs? Because man's best friend is often feared by many and, quite often, there is mass culling to control their population on the street. Data on population based ecological-behavioural studies are, therefore, useful in decision making based less on emotions like fear and more on scientific evidence. Besides generating data useful to urban administrators, the research communication throws up questions for further scientific study. For example, the data shows that the sex ratio in the sighted dogs is highly skewed towards females. What could be the reason? Is it because male dogs are more easily adopted as pets and are thus taken off from the streets? Or is it because the dog population has potential to grow in this particular ecological niche of human urban environment and, like the sex ratio in deer populations, (*Nature*, 1999, **399**, 407), will it get skewed towards males only when the population touches critical values?

– Science Media Centre, IISER Pune
e-mail: kp.madhu2000@gmail.com