

In this issue

The bio-philosopher

When Prof. John Bonner (along with his wife Ruth) came to Bangalore as the Raman Visiting Professor we became good friends. He recently sent me a copy of his book *Life Cycles – Reflections of an Evolutionary Biologist* (review on page 798). Next to acquiring a good friend it is said that the best thing one can do is to acquire a good book. I seem to have had the best of both worlds. I read the entire book almost at one sitting and found it exciting, for it presented to me for the first time an integrated view of the life sciences. Being parochial I was also happy that the idea of writing this extraordinary book came to him when he was in Bangalore! In the introduction he says:

I do not look at biology and its major themes in a conventional manner. I pull biology apart and put it back together in a way that is quite different from that of the average biologist in the street. I do not do this just to play games or just to be different – I do this because I think many of the more conventional approaches miss the important point as they bear down on details that fit in with the views of the moment. My objective is to achieve a more cohesive, a more profound view of the science of life – one that has a greater inner consistency and a greater meaning.

Yes, he seems to have achieved a greater consistency than most others. One wonders whether the awkward word invented by Jan Smuts – ‘holistic’ – could be applied to this view of biology.

John Bonner has created a special niche for himself in biology. He is considered the

world's greatest authority on 'slime moulds'.

I have devoted my life to slime moulds. This may seem to be a peculiar occupation – narrow at best, slightly revolting at its worst.

When I heard that he was the authority on slime moulds I asked him, with great humility, what a slime mould was. He looked at me with a tolerant smile wondering how men who look apparently intelligent had never heard of slime moulds. 'Slime moulds are minute organisms that live in the soil. They feed as separate amoebae; and in many respects both as to size and appearance, they resemble our white blood corpuscles. They feed on bacteria and after they have cleaned an area of food they do remarkable things; they stream together by aggregation to form multicellular mass of cells (ten to hundred thousand strong). This mass of cells behaves as an individual multicellular organism and acts most unexpectedly. For example, this slug will go towards light; it moves around; after a period of wandering it sends a small fruiting body into air' – and his story goes on and on. His eyes flash (alas his hair cannot float) and speaks as though he has drunk the milk of paradise!

He is an accomplished and humorous man – so full of fun and of life.

As a young man I gave some lectures at University College in London where he (J. B. S. Haldane) was professor of genetics and after the first lecture, I met

him in the 'Gents'. I hardly knew him then, but as I was washing my hands, he suddenly boomed at me 'Bonner we do not make jokes in lectures in this country', I nearly slid into the sink, but had enough strength to say 'Those weren't jokes – I was just nervous'.

I too have been overwhelmed and frightened by this remarkable bushy eyebrowed Englishman who was really very very gentle. I have often wondered why Providence after endowing him with so much missed giving him a sense of humour. But John Bonner, I can assure you, is humorous and also funny even when he is not nervous. More modest a man it is difficult to meet. While delivering the Gandhi Memorial Lecture at Raman Research Institute he said:

How can I connect my modest life time interest in biology with the ideas and thoughts of a Giant who did so much not only to change India, but to change the whole world. The answer is that I can only fail and this lecture will be a testimony to that failure.

And in his characteristic manner he went on about his favourite topic. People who come to know the slime mould intimately (as he had) become lyrical and philosophical about it. Some even have tried to use it to prove the existence of the vital force. Some have likened it to human society. Yes, like Tennyson's flower on the wall John Bonner sees the universe in this micro-organism. He delivered his lecture 'On Dividing the Labour in Cells and Society', a theme so unifying that Gandhi might have liked it.

For 60 years in his researches, he has always picked the right

questions, designed incisive experiments to get at the answers and presented his findings in articles which have been models of scientific writing. I had the privilege of 'planning and processing' some of his selected papers on cellular slime moulds for publication. The volume, when it came out, received rave reviews. Bonner is perhaps one of the few scientists who conforms to Buffon's dictum.

To write well is to think well and to render well; it is to possess at the same time intellect, soul and taste.

We also publish in our Historical Reminiscences section (page 793) his article on 'My first 60 years - The spread of biology down to the level of the gene'. We are eagerly awaiting the second instalment 'My second 60 years'

S. R.

Trapping solar energy

A variety of sources exist for deriving conventional form of energy. The principal source of energy being burning fossil fuels. It is well recognized that energy derived from fossil fuel has caused major problem in environmental pollution through greenhouse gas emission. The annual emission world wide of the principal components of greenhouse gas, methane, CO₂ and chlorofluoro compounds amounts to 8500 million tons of carbon equivalent. Moreover, petroleum scarcity looks very

obvious - based on the annual consumption and resource position of fossil fuels. It is anticipated that around 2020-2035, crisis in oil supply will dominate world energy future. The time has come to seriously look forward for alternate sources of energy that is non-polluting, renewable, safe and economically viable. Examples of renewable sources of energy are solar energy, hydro power, hydrogen, etc. and these are not necessarily nonconventional in the present day world. The nonrenewable sources of energy constitute oil shale, nuclear fusion energy, etc. The necessity of the world is a precise mix of energy/economy, both conventional fossil fuel and renewable energy systems.

Solar energy, which is abundant, forms a rich source of renewable energy. The total radiation energy from the Sun or Earth's surface is 1.53×10^{18} kWh/a of which around 1.5% is absorbed by the land surface of earth. Of this only 1% can be used in the form of heat, electricity and various biochemical energy. Comparing this amount with world energy consumption (1.10×10^{14} kWh/a), it turns out that solar energy offers around 2.5 times more energy consumed in accordance with existing technology.

Of different forms of utilization of solar energy, chemical routes for trapping solar energy offers interesting innovative opportunities. The research inputs in these specific areas form the basis of future

technology. The components of chemical routes are essentially in the form of photoelectricity, photocatalyst and artificial photosynthesis. Molecules and materials have to be designed for devices which exhibit appropriate functions, such as solar energy capture, solar energy conversion and energy storage. The existence of solar arrays using silicon to micro devices, solar batteries has been in existence for some time. The present day demands are much higher, and economic feasibility is the corner stone for success. Molecular aspects of photosynthesis offer a new vista to look into exciting world of molecular electronics, molecular computers, memory devices and others driven by solar energy. Newer, fresher and bold attempts have to be made to seek routes to successfully harness solar energy.

As one observes, economic needs, environmental concern and energy demand have to be fully integrated in the present day world without compromising any one of the needs. The development of newer methods, routes and technology to utilize solar energy is expected to take big strides in the coming decades. In this issue (see special section, pages 703-752) some of these problems have been addressed and a few excitements in these areas are outlined. The need of the day is to promote the growth with sustained efforts using integrated approach.

V. Krishnan