A trail of creativity
1960- ?

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Robin Hood's Bay

Looking back I can see that my encounter with Robin Hood's Bay in the 1960s, which was established as a small community of inshore fisher folk in the 18th century, was my first contact with practical ecology. It shifted my perception of environment from molecules to landscapes.

The Bay spread its seascape magic to propel me towards the interdisciplinary issues of environmentalism. Scientists such as Rachel Carson and Barry Commoner were then claiming that living things other than humans are deserving of consideration in reasoning about the morality of political, economic, and social policies. This new cultural mode of thinking about applied ecology was reinforced when I was asked to be the lead biochemist on Knut Schmidt Neilsen's Alpha Helix expedition to the Amazon Basin. Flying over just part of this vast ecosystem, I gazed hour after hour upon this seemingly infinite blanket of green. The impression of immensity is similar when viewed from the Amazon River itself, or from its tributaries, particularly the Rio Negro, where the expedition was based. From the fantail of the research vessel, after dinner reflections on the immensity of the forest and its steady progression of cloudy, rainy thunder heads presented an incredible cosmic monotony as one view of the shoreline blended unnoticeably into another. From both perspectives, the overwhelming reaction to the blanket of trees and water that stretched from horizon to horizon was an epiphany of the vastness of evolution.

Cardiff

Two years later, in 1969, from the position of Reader in Endocrinology and Metabolism at Sheffield, I was invited to apply for the Chair of Zoology in the University of Wales at Cardiff. Much to my surprise I was offered the post. The attraction to me was the environment. Wales is a predominantly mountainous peninsula located between England and the Irish Sea, covering 8,023 square miles. It has terrestrial habitats and many protected areas rich in biodiversity, including three national parks and five Areas of Outstanding Natural Beauty. The national parks include: Snowdonia, Pembrokeshire Coast and Brecon Beacons. AONB include: Anglesey, Clwydian Range, Gower Peninsula, Llyn Peninsula and Wye Valley, which is partially in England. Wales also has many locations categorised as Site of Special Scientific Interest, Special Area of Conservation, Special Protection Area and Local nature reserve.

On the coast, a great diversity of species such as seals, dolphins, sharks, jellyfish, crabs and lobsters can be found. There are also seabird colonies on offshore islands, several species which can only be found in Wales and an orchid that is one of the most threatened plants in northwestern Europe.

All of this exceptional biodiversity existed adjacent to some of the most ravaged industrial sites in the world. Thus it was no accident that South Wales was central to launching large-scale schemes for land reclamation. This had begun in 1961 with the Lower Swansea Valley Project, which was a pioneering post-industrial land reclamation programme that cleaned up an area that was branded Britain's worst derelict landscape. In these various environmental contexts I saw Wales had exceptional opportunities for teaching and research in the new field of applied ecology and launched several cross-departmental initiatives in this direction.

In the lab I took up the ageing thymus as a model of cellular ecology, where the central question, still unanswered is ‘How does a mass of dividing cells know the shape and size it should be?’ When this process goes wrong, cancer is the result of uncontrolled cellular proliferation. On the other hand, human ageing is an expression of a relentless decline in cell mass from our second decade; an expression of the gradual failure of the biochemical management of cells to keep their youthful structural specification. This led me to cross the boundary between science and medicine where I found a temporary professional home in the British Society for Research on Ageing, eventually becoming Secretary and President. On the way, in partnership with John Phillips, who I had worked with in Sheffield, I obtained funds from the Wolfson Foundation to build a research lab in John’s University of Hull to study the endocrinology of ageing.

Into business

Eventually, in the 1980s the Cardiff departments of zoology, botany, microbiology and applied biology were merged. Tired of an unproductive administrative load and endless search for diminishing departmental resources, I took early retirement as Emeritus Professor and set up my own business consulting in pharmacology, environmental management and computer assisted learning. It was being involved

with creating the Cardiff University Industry Centre that had given me the confidence to 'think business'.

At around this time, my interest in environmental management was triggered by an invitation from the Secretary of State for Wales to be a founder member of the Countryside Council for Wales. This led to the chairmanship of the UK Conservation Management System Consortium a' not for profit' UK organisation which develops and supports software to help nature site managers to produce long term adaptive management plans. I have been re-elected each year since 1998.

Towards a cosmopolitan syllabus

It was in my early days in Cardiff that I began to develop multidisciplinary frameworks to promote nature conservation curricula for learning the core skills and competencies to care for a planet in crisis. In my most optimistic moments I think that this is the best we academics can do. In other words it is no use drumming up people and tell them how to act, but rather to teach them to long for the immensity of the human journey with planet Earth and so build a personal body of knowledge to set out on the quest. As I have already said, I can trace this move towards environmentalism to Robin Hood's Bay, which is now virtually stripped of its rich intertidal fauna, by weekend cottagers and day trippers that was the delight of Fred Seagrove. In 1967 in the middle of Amazonia, four thousand kilometres from the sea, it was clear that even then the rainforest was being relentlessly raped for its gold and timber.

The late 1960s marked a general emergence of environmental awareness. As head of department I encouraged a small group of postgraduates to publish the Welsh Environment Journal. WEJ was a mixture of reviews, interviews and reportage, which highlighted Welsh examples of global environmental issues. It circulated throughout Wales and several copies turned up in the parliamentary library at Westminster, where they prompted a flow of congratulations from MPs who found the contents informed political debate. WEJ opened up student discussions about the limitations of narrow subject teaching in a world that was increasingly dominated by cross-subject environmental problems with political implications. During one of my field courses on the Welsh nature reserve of Skomer Island this grass roots student interest in curriculum reform emerged as a proposal for a new multi subject degree. Surprisingly, the idea was enthusiastically taken up by academic staff in all the pure and applied science faculties of the University. It became the philosophical thread for an honours course in 'Environmental Studies'. This course integrated the inputs from eleven departments, from archaeology, through metallurgy, to zoology. It ran successfully, attracting some of the most able students until the university merged with a neighbouring institution in the late 1980s, when the new policy was to abolish all cross-discipline teaching.

Education has always been the driver of political change to remove environmental barriers to human betterment. Towards the end of the 1980s, the University of Cambridge Local Examination Syndicate evaluated the Cardiff environmental studies course as the basis for a new subject about world development in their international GCSE. This evaluation had been prompted by the Duke of Edinburgh, Chancellor of the University of Cambridge, who in 1986 had directed UCLES to come up with a cross-curricular subject as a UK contribution to world development education. I met

with the UCLES team at a headteacher's conference in Cardiff and joined a group of Cambridge advisors and school teachers which eventually turned the Cardiff joint honours 'environmental studies degree syllabus into the GSCE school subject 'natural economy'. Natural economy was launched in 1991 as a part of the Cambridge University International GCSE examination system, the first example of a school syllabus being created to promote thinking about the future of a globalised humanity an educational movement for young and old called cosmopolitanism.

Natural economy

Although this period coincided with the creation of a root and branch educational reform to create a UK national school curriculum, there was no widespread demand for change with respect to the limitations of 'traditional subjects'. However, natural economy was taken up by UK schools within the independent sector and by European schools taking the International Baccalaureate. Namibia and Nepal adopted it under guidance from UCCLES as a subject to replace geography and biology at A level; using practical examples of these country's cross subject issues of economic development. The design was consciously interdisciplinary drawing on, for example, Biology, Economics, Geography and Anthropology and focusing on real-life situations, contexts and behaviours. It promoted the teaching of skills of systems thinking which was a key element of the original syllabus. The examination, now called environmental management', attracts thousands of candidates mostly from 'international schools'.

There are two meanings of natural when referring to economy:

- Being in a state regarded as primitive, uncivilized, or unregenerate.

- Of, relating to, or concerning nature, e.g. a natural environment.

In the first instance, 'a natural economy' defines a money-free barter system by which a producer exchanges his goods and services for others which he cannot produce. In the second instance 'the natural economy' refers to the managed processes by which various kinds of natural assets are acquired as raw materials to their final preparation for consumption or marketing.

My involvement with these cross-curricular matters of education coincided with the development of educational technology which I promoted as a way of teaching large numbers of students in small spaces, giving staff time for small group tutorials. Then came the advent of personal computers with several research initiatives being taken up in Wales. In this connection and in an effort to reach a wider range of students I worked with the European Community's Schools Olympus Satellite Education Programme based in North Wales on the Isle of Anglesey. The nearby Cwm Idwal mountain national nature reserve was used as a practical model for demonstrating conservation management as the practical element of natural economy beamed across Europe. A partnership was formed between the University of Wales, the UK Government's Overseas Development Administration and the World Wide Fund for Nature to produce a cultural ecology model of Nepal with the help of a sponsorship from British Petroleum. An interoperable CD version of natural economy for computer-assisted learning was created in the Department of Zoology at Cardiff with

a grant from DG11 of the EC. This work was transferred to the Natural Economy Research Unit (NERU), which I set up in the National Museum of Wales in the late 1980s.

SCAN

Shortly after the first global environment summit in 1992, a group of young people gathered together at the UK headquarters of the educational charity Peace Child International. They were funded by the UN to produce a young people's version of Agenda 21, which was entitled 'Rescue Mission Planet Earth'. It was published on International Earth Day in 1994. This was the first attempt to encourage young people to produce a syllabus for promoting cosmopolitanism. The aim was to network students as a force to conserve the resources of Planet Earth. As chair of a committee to promote the teaching of sustainable development in Wales, I promoted Rescue Mission to stimulated teachers and children in the old County of Dyfed to develop a practical scheme for harnessing the National Curriculum to meet the objectives of the Local Agenda 21. The scheme developed as an all-Wales bilingual programme named SCAN (Schools in Communities Agenda 21 Network) and as an online educational framework of cultural ecology, which eventually took root in the National Museum in Cardiff.

To mark the Johannesberg 'Rio Plus 10' Environment Summit (2002) a selection of topics from Rescue Mission was produced by children of Cardiff schools as a guide for others to join with SCAN and produce their own mission in Wales with long-term plans for environmental improvements in home and neighbourhood. The fundamental educational philosophy behind SCAN in the 1990s was to promote a practical move towards a more locally based and neighbourhood-focused education. Yet it is only now being accepted that this is the only practical route to move people towards sustainable behaviours.

Interdisciplinary knowledge and know-how about making and operating community action plans for sustainable living are bound together with locality. Community cannot be distinguished from locality because it is locality, in terms of such factors as history, demography and income, that sets the agenda for how the community functions.

At this point it is worth defining the above interdisciplinary area of citizen participation in neighbourhood action, which is wider than natural economy or environmental management. The working definition of ‘natural economy’ for the Cambridge syllabus was ‘the organisation of nature for production.’

Where does politics fit in? From the time of the Brandt 1980 report it has been clear that all nations have to cooperate more urgently in international management of the atmosphere and other global ‘commons’ and in the prevention of irreversible ecological damage. This political imperative was embedded in the environmentalism surrounding the Rio Earth Summit and the Agenda 21 which extends actions from government to families, individuals and communities, which all have a role to play. This can only happen through participatory governance within the local political economy. Political economy deals with the laws governing the production and distribution of goods and services, in other words the organisation of people for

production. It was John Ruskin who brought political economy into line with modernism by insisting that production and consumption patterns should be re-drawn in a way that would create a just and fair society. His vision was of a society that allowed individuals to achieve a higher plane of being or wholeness (a "felicitous fulfilment of function"). Most importantly, he sought to prove that the political economists employed faulty reasoning and the implausible concept of economic man to prevent the emergence of this just society and the associated 'whole' or perfected man. Political economy and natural economy are then two sides of the coin of universal human betterment and are encompassed within two-way interactions between culture and ecology. It is in this politicised area that environmentalism entered politics under labels like conservation, or public health, preservation of nature, smoke abatement, municipal housekeeping, occupational disease, air pollution, water pollution, home ecology, animal protection or many other topic areas.

Actually, the practical outcome of cultural ecology is the making of community action plans for environmental improvements by managing local ecosystem services . The CMS Consortium, which develops and promotes the use of software databasing for planning and recording biodiversity management plans, linked up with several UK communities through their local authorities to test the suitability of the CMS software package for volunteers carrying out environmental improvements. The most successful effort came from the small Suffolk village of Parham, which adopted a community version of the CMS to carry oout a village environmental appraisal to celebrate of the millennium and used the CMS to make a biodiversity action plan to manage hedgerows, ponds and three village greens. Suggestions for simplifying the CMS professional package for volunteers resulted in a community management system based on a PC network of electronic diaries.

COSMOS

Becoming a citizen in today's world focuses learning on *cultures of sustainability with multi-subject organised syllabuses*. This defines the COSMOS project.

Current work in COSMOS involves creating and testing the elements of a global distance concept mapping for communities in the form of a prototype 'citizen's environmental network'. The latter was envisaged almost two decades ago in the UK Strategy for Sustainable Development, where it was referred to as a community tool for the Biodiversity Strategy. The aim was to spread ideas and achievements about operating plans for environmental improvements as an exercise in interactive citizenship. It was to be pump-primed by Government and then run by community volunteers, but nothing has happened in the interim to realise this community-led objective. COSMOS provides on-line resources to promote the creation of local special areas of sustainability and make the long-term action plans necessary for the community to move towards sustainable development. These plans should give priority to strengthening local groups and institutions using local resources to meet local needs. Regarding the value of cross-curricular educational frameworks, this is certainly testified to by the fact that there are between one and two million unique visitors to the COSMOS web sites each year and several hundred people register for my blog every day.

Musing on creativity

Can we tease out any principles of creativity from this personal scientific heritage trail?

Looking at my own brief encounter with the evolution of gill electrolyte metabolism as a post-graduate student and the emerging lateral signposts which eventually led me (and are still leading me) to explore new areas of knowledge, I think I can, retrospectively define a congenial environment that allowed my own creativity to flourish. As a recipe it has to foster systems thinking to express :

- openness to **novelty** in ways of thinking;
- the acceptance of personal **differences** in origins and mind set;
- **divergence** from conventional understanding.

The necessary socio-scientific structure has to include a willingness to reward divergence in thinking. This covers flexibilility to allow

- negotiation of change to a new status quo;
- risk taking with no fear of the consequences of failure
- and leadership to promote working together.

Another important set of questions then emerges concerned where these behaviours originate. In particular, can they be taught, when teachers are usually selected for their orthodoxy not their novelty.

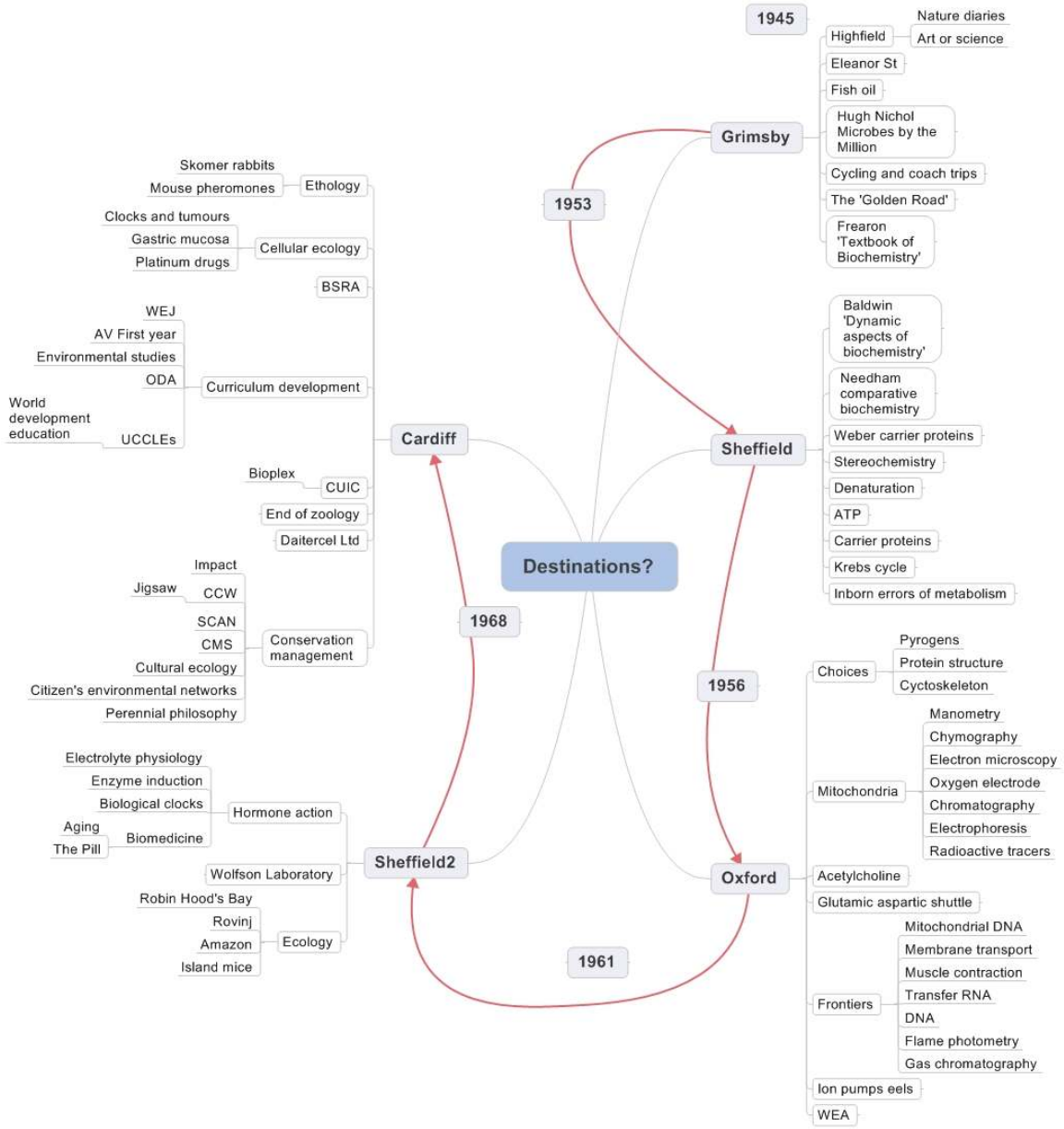
Finally, there is the big question as to the whether scientific creativity can produce the personal fingerprint of an idea that is a universal feature of artistic creativity. As scientists we can only discover the preformed material structure of nature and we measure our success by giving ourselves prizes of various kinds. Krebs received the Nobel Prize for his 'discovery' of the citric acid cycle. But if he had been only slightly slower off the mark, one of at least three others would have arrived within a year or two at this particular winning post of scientific endeavour. The discovery of natural selection and the lines of enquiry that led to it from Wallace and Darwin comprise other profound example of the inevitability of scientific discoveries being made from different starting points. In contrast, there will only ever be one expression of the horrors of war communicated by Picasso's painting inspired by the massacre of Guernica.

The truth of Picasso's message to make 'visible' human pain has been known since humankind first learned to predict future outcomes of group actions. But, Picasso also intertwined his message with images promoting the search for light, which brings artists in line with the real motivation of scientists which is to produce a behavioural change beyond the imagination in anticipation of things to come. As the 'modern monk' Thomas Merton says

> *Do not depend on the hope of results. When you are doing the sort of work you have taken on, you may have to face the fact that your work will be apparently worthless and even achieve no worth at all, if not, perhaps results opposite to what you expect. As you get used to this idea, you will start more*

and more to concentrate not on the results, but on the value, the rightness, the truth of the work itself.

You will see an outline of my research path to the present in the following mindmap.



http://www.suffolkkemps.info/creativity/

http://rescuemissionplanetwales.wikispaces.com/