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An Approach to Vocational Education
The Pastoral
Business with Ethnic Minorities
The Ubiquity of Blue
Rubens Allegories in Peace and War
'Real Genetic Engineering'
GOD: A literary and Pictorial History

From Plate Glass to Digital
New Uses for old Estuaries
Chaos and Complexities in the Game of Life
More Fear Than Talent
The millennium Atlas: British Butterflies
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Annual Reports

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AN APPROACH TO VOCATIONAL EDUCATION

Presidential Address by Dr. David Bethell, C.B.E.

Delivered on October 7 2002

One of the characteristics of the English language is that the meanings of words are often changed by usage over a period of time. Vocation and vocational are no exceptions. Five centuries ago, vocation meant "an action on the part of God of calling a person to exercise some special function, especially of a spiritual nature or to fill a certain position: divine influence or guidance towards a definite career"⁽¹⁾ The first universities were intended to meet the need of those with a vocation as defined, a calling to study theology, law or medicine, the three great vocations. Shakespeare echoes this concept of vocation in Henry IV Part 1, by the lines, "Why Hal, 'tis my vocation Hal; 'tis no sin for a man to labour in his vocation".⁽²⁾

The dictionary meaning today has not changed, but the usage has so that a vocational course is often thought of as a training for a skilled trade such as plumbing or cabinet-making. These two uses of the word - a calling or an occupation with a special fitness - presents confusion which in my view interferes with serious thinking about policy for education, particularly at secondary and higher education levels.

This confusion is widespread, for example, in 1979 the Yale University Alumni Magazine expressed the view that, "of all the areas in colleges and universities that will feel ... the growing vocationism of the young, the humanities will be the hardest hit"⁽³⁾. In other words, the majority of students regarded a university course as a training for a career and not as a cultural experience designed to train the mind to recognise the truth in whatever they studied which had been the norm over the last 200 years of American university education.

In this talk I will try to identify some of the problems caused by the concept now attached to the word "vocation" and to describe an approach to vocational education at university level based on my own experience as the Director of the former Leicester Polytechnic and some thoughts on vocational education at secondary school level.

Perhaps I should begin by

reminding you of the Government's remit to the new polytechnics created by mergers between colleges of technology, art and design and education and some specialist institutions in 1969-1970. The remit was simple: to be equal to but different from the universities. Of course, the remit only appeared simple - a good political slogan-type idea very hard to implement. To be equal to meant gaining the regard of the nation that what was taught and what was achieved by both students and academic staff could be compared with what was taught and achieved in the universities with their 500 year tradition. One can only properly compare like with like yet we were to be different so how could a comparison be made in any sensible way?

Whilst the polytechnics had a long tradition stretching back to the mediaeval craft guilds and had been associated with the chartered professional bodies from the 19th century onwards, their students did

not generally read for degrees but studied to pass the examinations of the Royal Chartered Professional Bodies like the Institution of Mechanical Engineers, the Chartered Institution of Building Services, etc. whose qualifications were recognised by the professions. Broadly, the difference between these qualifications and a degree was that the former was about learning and remembering facts whilst the degree was about learning to analyse problems and produce solutions. In my view, the power of the Chartered Institutions was something of a dead hand on educational development. At post-graduate level, the university student read for a Master's degree or a Doctorate by research. The polytechnic student was concerned with patents, inventing new devices or improving existing mechanical or other devices.

So, when the new polytechnics were designated in 1969, there were obvious fundamental educational differences in their traditions compared with those of

the universities. There were structural matters to address - for example, almost every department had its own specialist teacher of law and often of English. These isolated specialists had no subject leadership and I formed them into a Department of Law and a Department of Humanities with an academic leader as Head of Department: the staff were then accountable to peer review and were pointed towards academic development and research. Of course, the Department of Law soon wanted its own degree and a degree in Company and Employment Law was developed.

In Electronic Engineering, for example, the highest qualification was an H.N.D. (Higher National Diploma, a sub-degree course to produce higher technicians). But to attract well-qualified staff it was necessary to develop a degree. What would be the difference between the two courses, both being vocational? Similarly, the H.N.D. in Building Surveying wanted to offer a degree as did every other department. An examination of the curricula showed that if one wanted an electronic device repaired, you were looking for an H.N.D. man. If you wanted to develop a new electronic device or use electronics in a new way, you needed a graduate. Both were valuable and desirable members of society and having two different vocational courses gave applicants choice. In Building Surveying, the graduate became a specialist in estate management and property development, and the H.N.D. Surveyor was still needed.

There were other structural differences and two examples will

suffice: first, the polytechnics were not granted power to award degrees: their degrees were awarded by the Council for National Academic Awards (C.N.A.A.) founded by Royal Charter. But in that, the polytechnics were no different from Oxford and Cambridge Colleges which have never had the power to award degrees which are awarded by the universities to which they are attached. Similarly the institutions of London University (including Imperial College) cannot award degrees and the federated institutions of the University of Wales are in a similar position.

Secondly, a more fundamental difference was the merging of the leading Colleges of Art & Design into the Polytechnics. This provided a chance to implement a merger of C.P. Snow's Two Cultures, to bring together staff and students from technology and art with two quite different modes of learning, to acknowledge for the first time in higher education that intuition and analysis are equally important for the education of creative thinkers and inventors. We tried hard to show how artists and designers solved their problems and how technologists and scientists approach problem-solving and fuse the two. But more of that later.

Government policy for the development of a much larger range of vocational courses at university level in the polytechnics was at a more prosaic level. Their view was that the universities were not serving industry and commerce in ways which enhanced the economic performance of the nation (the universities and others

contested this notion!). The early 19th century universities appeared to have emulated Oxbridge with an accent on the Humanities and the Classics; the post-World II institutions, the so-called green-fields universities like Warwick and the former C.A.T.S. (Colleges of Advanced Technology) like Loughborough, were similarly accused by Government of following this route. What politicians always want is short-term successes, immediate results which will attract votes at the next election. So that the polytechnics were told that their research should be action research, a euphemism for short-term tinkering with industrial problems and not long-term investigations which could lead to fundamental, beneficial changes. Here perhaps it might be of interest to relate an experience in Germany. In 1975, the D.E.S. (Department of Education & Science) arranged for six polytechnic Directors to visit the German *fachhochschulen* and technical universities to study how they related to industry. We ended up our tour in what was then West Berlin at the *Freiuniversitat*. In the morning we toured the university and discussed policy etc with the Rektor and his senior Academic Staff and then were taken to Siemensstadt for luncheon with the Managing Director and the senior management of Siemens Electric. Who were they? They were the Rektor and the Senior Academic staff we had been with in the morning! We asked ourselves, "Could this happen in the U.K.?" and concluded "no", for the gap between academia and industry was too wide. The two cultures were different and the difference between looking for short-term solutions and educating for the

future economic health was marked and one of the important differences.

The difference in cultures between Germany and the U.K. had been brought home to me forcefully in 1964 when I was asked to represent the U.K. at the 200th anniversary of the Dresden Academy in what was then the D.D.R.(East Germany). Outside Dresden is the Schloss Pillnitz which housed a collection of German art and I was taken there on a Sunday afternoon. Discussing some of the paintings with one of the German professors, I mentioned that one artist had obviously been influenced by Renoir. A young man with who turned out to be his grandmother, very politely spoke to me and said he had listened to what I had been saying with interest for clearly until then he had been giving his grandmother wrong information. I asked him if he was an art student but did not understand his reply. My German friend translated, the young man was a plumber's mate! I wondered how many English plumber's mates spent Sunday afternoons taking grandmother around an art gallery trying to explain the paintings. Education creates the culture of a nation and how we think, and inculcates values as well as facts. I had hoped that the polytechnics in striving to be different in developing vocational education would address this problem.

After the publication by Government of a report on polytechnic academic salaries in the mid-1980s, polytechnics were able to appoint professors. Now, I have a very simple mind! For I thought that only those who were

worthy of the title were those who could profess to be acknowledged leaders in their own discipline and have their claim substantiated by their peers nationally if not internationally and this usually meant publication in refereed journals or for those in the humanities, in reputable scholarly journals. My Academic Board (the Senate) discussed the criteria we should apply to professorial candidates. One Head of Department led the debate, "Director", he said, "whatever we decide, we do not want banana-republic professors! !". Our criteria were tough along university lines and not along American lines where everyone teaching in a university has a title of some sort of professor. We decided that for each appointment a university professor and a leading researcher in industry would be appointed as external assessors. After each interview, I asked the question, "If this person was a candidate for a chair in your university, would he/she be appointed?" and the outcome depended on the reply. We did make one change from the university mode, we regarded significant patents as equivalent to research and I decided that no one in the Directorate, the Director, Deputy-Director or Assistant Directors could be appointed professor at Leicester Polytechnic - after all, we no longer practised our discipline, we were academic administrators.

Perhaps because of our imperial past, we are loathe to learn from other countries. In 1977 I was included in a small group of university vice-chancellors selected to be the first British higher education group officially to visit China since the 1947

communist take-over. We visited primary and secondary schools in cities and in rural areas, universities and factories and we were impressed by much of what we saw. Teaching method and curriculum development, for example, followed Mao's dictum, "Content (of class teaching) must be practical and only useful if so" with the slogan "Do not try to grow plants on the blackboard" and "intellectual education in the school has priority but must include practical labour and a respect for practical work. Aim for more skills but do not neglect culture". One might interpret the then Chinese view of education to be that teaching method must include both theory and practical application and that the curriculum must include cultural studies alongside major disciplines. Unfortunately, cultural studies in China was political education. The polytechnic degrees always included a mandatory and examined element of "general studies" to widen the cultural understanding of the student.

Another example from experience throws light on the problems of changing the teaching method to fit the needs of students and to question the curriculum and make sure that it is constantly updated. The Head of Electronic Engineering asked to discuss a problem with me. The problem arose from a request by two students from the Faculty of Art & Design who were on a Master's degree course in Product Design to be given a crash course in electronic engineering. They told him that they needed it in order to complete a project and that they could spare two weeks. The Head

explained that it took three years to bring B.Sc students to the standard they required and that their request could not be contemplated. They persisted and he gave in. His problem was that, at the end of the two weeks they had satisfied him that they had grasped the theory and practice of what he had taught and could apply this to their project. He was astonished and perturbed and said to me that he now worried, was the BSc curriculum too long: was the teaching method badly based: was the curriculum somehow unsuited to the degree? Well of course, the two M.A. students were bright - they would not have been on the course had they not been so for the course had far too many applicants. They had had 5 years of study, a foundation year in art & design, three years on a B.A. course in product design and were in the second year of the M.A. course. Their abilities and needs could not be compared with those of a B.A student. But the incident underlined a very important point often overlooked, that when well motivated, people can learn and understand complex matters which others, without motivation could not. Good teachers must enthuse and motivate their students.

But, after that diversion, back to learning from other countries. In France anyone having passed the Baccalaureat can, by law, choose the university at which he/she wishes to study. The university does not select its students, but the Ecole Polytechniques, the premier higher education institutions, do select their students. Each Ecole Polytechnique is sponsored by a Department of State so that there is some kind of loose manpower planning to meet the perceived

needs of the various departments of state. Is there a lesson here for the U.K.? that in a way not too rigid, we could ensure that the vocational needs of the country at the highest level are met whilst the remainder of the higher education sector provides for student choice?

Perhaps here, I should give you an example of how a vocational course can be both equal to and different from a university course. Interpol had been trying to find a university in the European Union which would teach or train a special section of the national police forces in art history to be able to identify and trace stolen art and be able to tell the difference between an original painting, a copy and a reproduction. The Nazi stealing of works of art was a problem for Interpol. They chose Leicester Polytechnic as we were willing to meet the challenge. As soon as this was known, the Insurance Companies and the High Street Banks became interested for they were faced with problems in recognising originals, copies, fakes etc for insurance claims and for collateral against loans. The students had to learn all the usual stylistic etc matters that a university course would teach but in addition they had to know all about scientific tests to establish the authenticity of a work of art and to know how to establish its current market value. The graduates obtained ready employment. Now, that I think was an excellent example of a vocational course - knowledge with a cultural appreciation and meeting the "equal to but different from" remit.

Time flies and I want to discuss albeit briefly, secondary school level vocational courses, but before

I do I must return to the question of research in vocational higher education. As I have already mentioned, the polytechnics were directed to undertake "action research" -short- term stuff. This was not acceptable nor was a simple emulation and duplication of what the universities did. In the 1963 Robbins Report on higher education there was the following piece on research: "The search for truth is an essential function of institutions of higher education and the process of education is itself most vital when it partakes of the nature of discovery"⁽³⁾.

Discovery, invention - that is the process which keeps the mind active and alert through research. Research largely depends on the personal interests of academic staff in their discipline and that had to be the starting point for developing research with a vocational flavour in my polytechnic. The outcome was mixed. We won a very large research award to develop electronic image recognition against the final competitor, Cambridge University I think because we presented a research team including two PhD fine-art students. Another success was a project for the German Air Force. You may recall that in the 1970s the F109 trainer aircraft often crashed killing the pilot and his trainer. The Department of Foundation Garments - yes, designers of bras! - were commissioned to investigate and discovered that the German Air Force pilots died through freezing to death during parachute descent. They designed a completely new flying suit which they tested in the Loughborough University's wind tunnel and ensured that it had good thermal insulation yet the material

could breathe. It solved the problem and saved lives. Then the British Olympic Ski Team asked the Department to design new suits which would be streamlined to assist speed and this they did bringing to the project their knowledge gained in the design of women's undergarments.

I related this example of unusual research from a source not used to undertaking research to a Colombian Government Seminar on Research Strategy in Bogota in 1990 where I had been invited along with the Deans of Research at the Universities of Harvard and British Columbia to advise the Government on a strategy to develop research and research degrees. Colombia with its population of 36 million has 130 private and 50 state universities including the Universidad Nacional de Colombia in Bogota founded in the 17th century. In 300 years only 3 PhDs had been graduated, two in theology and one in chemistry. Students went to the U.S.A., Spain and some to the U.K. to read for a PhD degree and this meant an outflow of foreign currency which the country could ill afford, hence the wish to develop doctoral level work in Colombia but at internationally recognised standards. Later I was told that the view that only rather narrowly defined traditional research was acceptable had been changed and a wider range of topics was allowed.

So far, I have commented on vocational education at the tertiary level and tried to show that "vocational" in today's usage can be equal to but different from the core of traditional academic study. I like Mr.Chris Woodhead's view

that, "A university ought to be an institution in which those young people who have the intellectual ability to benefit engage with the best that has been thought and written"⁽⁵⁾ and I would add that this also must apply to university level vocational courses.

It may be of interest to say something about architecture. We had a School of Architecture and a School of Building & Surveying both of which had been designated "centres of excellence" on the recommendation of H.M.I. and the relevant professional bodies. The School of Architecture valued aesthetics and design, the School of Building & Surveying since shedding its lower level work to a local Further Education College, had rapidly developed Estate Management, particularly urban estate management at undergraduate and post-graduate levels and was regarded by the profession and the D.E.S. as leaders in that discipline.

Possibly because the two Schools had a national reputation, the then Minister for Higher Education, Dr.Rhodes Boyson, asked me to chair a review ("inspect" was not the in-word) of the Architectural Association School in London (known as the A.A.School) and advise him whether the students should be eligible for grants. The School was a very respected private venture and, as such, the students had been excluded from the then local authority grant scheme enjoyed by university and polytechnic students. I accepted the request and, with a small group of architects reviewed the School interviewing staff and students, the premises, equipment, library etc. Almost all the teachers were

distinguished architectural practitioners who would give a day a week to the School. Only the Head and the Secretary were full-time.

A few weeks earlier, the C.N.A.A. had visited the School at its request to consider whether it should award degrees (the School awarded the prestigious A.A.Diploma) and had turned the School down. Why? because it had virtually no studios - the students worked at home or in their digs - and the School had no published procedures to maintain academic standards, it relied upon the recommendations of the distinguished visiting architect-teachers. None of this fitted the C.N.A.A.mode of operation and what they regarded as accountability. I found the staff and students invigorating and lively-minded and I took the trouble to contact and talk to some of the leading architectural practices in London about the A.A.Students and they all said the same thing. "If one wants a competent work-horse, a good assistant, don't employ an A.A.Diplomate: but if one wants a bloody-minded egoist who challenges everything and comes up with creative sometimes brilliant ideas, take on an A.A.Diplomate. I advised Dr.Boyson to bring the students at the A.A.School into the grant system.

As you may know, the universities were funded through the U.G.C. (University Grants Committee) whilst the polytechnics were funded through the N.A.B. (National Advisory Board) and a little time after I had reviewed the A.A.School, N.A.B. set up a group to review architectural courses

because there appeared to be a gross over-production and consequential unemployment after a 5-year full-time post-"A" level course. The group (all architects) reported and advised that the status quo should continue. Alone in the debate, I objected and said that, in my view, no review body should be chaired by someone from the discipline under review whether it was medicine, law or whatever for it was difficult for such a group to come to tough decisions on its own profession and it should be chaired by someone unconnected with the discipline.

As a result of stating what for me was the obvious, I was then appointed chairman of a joint UGC/NAB group to review all Town Planning Degree Courses in the U.K. and to report on the manpower needs of the country for town planners. I knew nothing about Town Planning but was able to ask awkward questions not only of the universities and polytechnics we visited but also of my committee members, all academic or practicing Town Planners. I won't bore you with what I found, but I will mention one very important incident. At the last Town Planning course we visited at a well-established university, the Vice-Chancellor and his Senior Pro-Vice-Chancellor asked to see me at the end of the visit. I expected some kind of complaint, but no, I was asked "was the department any good as the Head would be retiring soon and they wanted to know the kind of person to appoint as his successor". A sensible question, but one which surprised me for, because of the C.N.A.A. system that the polytechnics were subjected to, every polytechnic director knew

the weaknesses and strengths of the departments and courses. I was able to tell the V.C. that he had the best course in the U.K. and discussed how research in town planning seemed to take place or not take place in many institutions whilst at his university, the research was of a high standard. The idea that accountability for academic standards could be left entirely to the institution was, in my view, demonstrated not to be the best way to proceed.

Some of you may remember that the Leicester College of Education at Scraftoft was merged into the Polytechnic in the early 1980s against the wishes of the Polytechnic I should add. I recall that, during the negotiations, one lady County Councillor said to me that whilst she would be happy for her daughter to study at Scraftoft with its purpose-built, leafy campus, she could not contemplate her daughter studying in the Polytechnic's converted factory buildings in the city centre. Poor woman, but her view of education was shared by many who believed that the physical environment guaranteed high standards of scholarship and research. Of course, what matters most is the quality of the academic staff and the quality of their teaching and that comes way before pleasant buildings however nice it would be to have both.

Now I will begin to turn to comment on vocational courses at secondary school level in which U.K. Governments have shown a concern and interest over the last 20 years. It has to be said that the general public do not regard what are known as "vocational" courses and qualifications at G.C.S.E. and

"A" levels as of equal standing to "academic" courses and qualifications. National Policy takes note of this general view - this was the reason given to me by the then Secretary of State for Education why the polytechnics were re-designated universities in 1990-92. The same general perception is applied to the degree as against a diploma. In Hong Kong, where loss of face is even more important than in the U.K., the Government is introducing "associate degrees" and no longer use the term "higher diplomas". This will enable them to claim that by 2012, 60% of the relevant age group of the territory will be in higher education. According to the Hong Kong Government the associate degree "is expected to provide an enriched education at post-secondary level that prepares students for work, further study, leisure and active citizenship"⁶

By contrast, in France, "fewer lycee pupils are choosing to take a general or technology baccalaureat that would entitle them to a place in higher education, but are opting instead for vocational courses or apprenticeships"⁷ French schoolchildren are kicking a much more general trend.

On the question of snobbery, not only in educational terms but in careers, perhaps we should remind ourselves that Viscount David Lindley, the son of the late Princess Margaret, grand-son of King George V, is a cabinet-maker, a carpenter who makes very beautiful furniture. Such a career and the training it required to develop the skills needed would have been unthinkable for a member of the Royal Family a

generation ago.

In the U.K. in 1999, 35.6% of 21 year-olds graduated but only 14% of British employees have intermediate-level vocational qualifications compared with 46% of German employees. According to the Construction Industry Training Board we need 29,000 plumbers and 35,000 electricians over the next 5 years if we are to be able to meet practical needs⁸. This forecast lack of skilled tradesmen is replicated in other industries. This means that if the country is to be able to call on the practical skills needed for manufacture and maintenance we must somehow make the mastering of a considerable body of knowledge where a student is taught the techniques needed to perform a particular task attractive and valued and the valuing must start at secondary school level. It seems to me that there will be no solution to this problem until the difference between education and training is not only clearly recognised but regarded as equally important. Of course, this will not be so unless training includes regard to cultural studies. Here, surprisingly, we can learn from the Chinese - a point I made earlier: "Aim for more skills but do not neglect culture"⁹. If this kind of approach was adopted, and if the teachers could be found who could deliver the teaching of skills in ways which an understanding of a wider culture is nurtured, then we might achieve two important objectives: to admit only those young people to universities who can benefit by that kind of education (and not distort university education to fit the intake), and to ensure that we have a well-trained, valued technician

class many of whom, incidentally, might have careers which command better salaries than many university graduates. The endemic academic snobbery which regards any kind of university course as superior to all courses of training might become a thing of the past.

Apart from developing a system which is meant to ensure that talent of all kinds is catered for - no square pegs in round holes - the present drop-out rate from universities would be radically reduced.

What needs to be done? First, we need to review our GCSE and "A" level examinations to offer real choice, as the French have done with their general and technological baccalaureat, two streams equally valued by parents, employers and society generally. In doing this we would be simply implementing the report of the Royal Commission on Technical Instruction which reported in 1884, the report of the Special Commission on Higher Technological Education (the Percy Commission) in 1945 and the report of the Scientific Manpower Committee (Barlow Committee) in 1947¹⁰ and other reports on our failure to produce an educational strategy to ensure that we had a skilled interface at all levels which was also valued equally instead of a hierarchy of educational qualifications based on outmoded criteria, a system that would offer real choice to pupils and match their aptitudes and abilities.

There are signs that such thinking has been noted by Whitehall. The White Paper of September 2001 provided increased flexibility for

the 14-19 year group and suggested the introduction of an over-arching award to be called a Matriculation Diploma and that by 2004-5 over 25 % of the age group will enter Modern Apprenticeships before they are 22 years of age. All the 16-17 year olds with 5 GCSE passes (to include English and mathematics) will be entitled to a Modern Apprenticeship place within a national framework. Those not ready to enter the Modern Apprenticeship Scheme will be able to enter a contract with an employer in a programme to be called Entry to Employment. Sector Skills Councils are to be set up to reduce skills gaps and shortages, to improve productivity, to increase opportunities to boost the skills and productivity in all the work-force (a kind of continuous adult learning process) and to improve learning in all sectors - apprenticeships, higher education and occupational standards. There are to be Centres of Vocational Excellence with £100 million devoted to a 3-year initiative designed to improve vocational skills in the Further Education Sector.

If all these initiatives succeed, breaking the trend of past initiatives to the same ends, vocational education will at last be valued in the U.K. Higher Education, the universities including the new ones, will, by their research, invent new products, the Further Education Sector will supply highly skilled technicians and the secondary schools will have prepared their pupils to enter Further and Higher Education as well-motivated, well-qualified students. One can only hope that these plans will mature successfully and meet the

aspirations of all young people for a worthwhile and valued contribution to national life. Is this a dream or can it really happen?

Well I hope so. And here I end this approach to vocational courses mainly at degree level

drawing on my experience as Director of was Leicester Polytechnic "the equal to but different from" institution which had its name changed to satisfy the ignorance of many parents who

believed that only an institution called a university could deliver a good education. How fortunate I was to head such an institution for 18 years and I look back with pride and pleasure.

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THE PASTORAL

Professor R. P. Draper

Emeritus Professor University of Aberdeen

Lecture Delivered on October 21 2002

Dr. Johnson's definition of the pastoral as 'a poem in which any action or passion is represented by its effects upon a country life' is wider than the traditional requirement of shepherds and shepherdesses, but also too narrow in seeming to exclude drama and the novel. The association of the pastoral with the idea of the Golden Age also needs to be stressed.

Pastoral is a sophisticated rather than naive genre, and awareness of the contrast between its idyllic qualities and the harsh realities of the real world is frequently present. Vergil's Eclogues, for example, express delight in the virtues of a settled and creative pattern of country life, but are played out against the background of anxiety and uncertainty created by the civil wars which preceded the establishment of the Roman empire. Among English pastorals Marlowe's 'The Passionate Shepherd to his Love' may seem purely idyllic, but it quickly received an antithetical reply from Sir Walter Raleigh. Nevertheless, the permanency of its appeal is evidenced by a number of imitations and adaptations, including Donne's 'The Bait' in the seventeenth century and, in the twentieth century, C. Day Lewis' ironic invitation to sample the delights of economic recession and Babette Deutsch's more feminist 'The Dispassionate Shepherdess'.

Shakespeare's *As You Like It* is a pastoral comedy. Its principal characters are assembled in the Forest of Arden, where they engage in dialogues with each other which expose different versions of pastoral to humorously critical examination. Duke Senior expresses a comfortably courtly view, though one that does not exclude 'the icy fang / And

churlish chiding of the winter's wind.' Silvius is the extravagantly woe-begone lover of conventional pastoral. The absurdity of his attitude is grossly parodied by Touchstone. Rosalind's immediate reaction is one of sympathy, but she later proves just as sharp a critic both of Silvius and his haughty mistress, Phebe. She likewise ricks the conventional

postures of Orlando, though she is deeply in love with him. Touchstone seems to debunk everyone, including Corin. Some commentators regard him as the play's central, critical intelligence; but that role really belongs to Rosalind. She embodies the essentially Shakespearean blend of criticism modified by sympathy. Jaques is the play's odd man out.

Milton's *Lycidas* is in the tradition of the pastoral elegy such as Vergil's *Eclogue V*, which laments the death of an idealised Daphnis, but ends by exalting him from the woods to the stars. Milton; however, Christianises the elegy. His lament for the drowning of Edward King develops an emotionally persuasive pattern of fall followed by rise. Although phases of bitter disappointment and indignant protest come near to breaking the mould of pastoral, they are nevertheless contained within it; and ultimately the sense of desolation is transmuted into the high, Christian vision of redemption by the 'dear might might of him that walked the waves'. Yet the poem ends on the quiet note of 'Tomorrow to fresh woods, and pastures new', which returns to the more customary level of pastoral.

Among later writers Wordsworth stands out by virtue of his experiment, in the *Lyrical Ballads*; with plain language and characters from "humble and rustic life". *Michael*, subtitled 'A Pastoral Poem', tells a familiar story of contrast between the innocence of pastoral life and the corruption associated with court or, in this case, city. But its essential theme is lapse of continuity, symbolised by the unfinished sheepfold that was to have been the joint work of Michael and his son. The poem becomes a lament for the extinction of the traditional pastoral way of life.

With Thomas Hardy that way of life is still extant; he understands it, and writes about it, as an insider. There is a literary element, especially in an early work like *Under The Greenwood Tree*, but

the great pastoral scenes in his novels are drawn from real life, and depict real people. The old, however, is under threat from the new, which is represented not only by nineteenth century snobbery, greed and selfishness, but also its enlightened attitudes towards education and its innovations in managerial methods and machinery. In *Tess of the D 'Urbervilles*, for example, the alien driver of the new threshing machine at Flintcomb Ash and Tess, with the other field-workers, symbolise antithetical ways of life: 'He served fire and smoke; these denizens of the fields served vegetation, weather, frost, and sun.' Yet for all that, Hardy refuses to sentimentalise the old. In his essay, 'The Dorsetshire Labourer', he recognises that the erosion of the past also brings progress for country people, and he comments wryly that 'It is too much to expect them to remain stagnant for the pleasure of romantic spectators.'

Finally, D. H. Lawrence is a successor to Hardy, as his unfinished *Study of Thomas Hardy* reveals. There he develops a theory in which all life, including that of human beings, is seen as a process of germination in the dark of 'blood-consciousness', followed by a bursting into the light and flower of 'mental-consciousness', followed by a return once more to the darkness -- with such a continuous relationship between dark and light being seen as a necessary condition of vitality and creativity. In *The Rainbow* this continuity between the human and the natural is exemplified in the initial description of the Brangwen farmers' way of life, which becomes a Lawrentian version of the Golden Age. But dissatisfaction

with the 'drowse of blood-intimacy', particularly on the part of the Brangwen women, leads to an urge towards 'the spoken world beyond'. In successive generations the implicit balance between darkness and light comes under increasing strain till in the life of Ursula, representative of the modern world, it is disastrously broken. Her nightmare vision of the horses symbolises the thwarting and perversion of natural energies by a catastrophic over-development of 'mental-consciousness'.

Lawrence's later work continues this theme. In *The Plumed Serpent* and *The Woman Who Rode Away* he seems to be searching for the lost Golden Age in the imaginative reconstruction of an Indian civilisation prior to the excessive development of 'mental-consciousness', but the result is a false idealisation of primitive savagery. *Lady Chatterley's Lover* is a more successful image of recovered balance, but still much inferior to *The Rainbow*. It is in the poems of *Birds, Beasts and Flowers* and *Last Poems* that Lawrence is at his best. For example, in 'Snake' a dialogue is fashioned between two voices within his own self, one sympathising with the snake and one representing his 'accursed human education'. The debate is tilted towards the snake, but both voices influence the form and texture of the poem. This quiet dialogue conveys a balance simply by being what it is, and comes nearest in Lawrence's later work to reviving the true spirit of pastoral.

THE BRITISH AND HOW TO DEAL WITH THEM: DOING BUSINESS WITH BRITAIN'S ETHNIC COMMUNITIES

Ram Gidoomal, C.B.E.

Chairman: Winning Communications Partnership

Lecture delivered on Nov 4 2002

If you pick up Britain's Richest Asian 200 or a similar Rich List you see an impressive documenting of achievements across the business and social landscape of Britain. There are the front runners like Lakshmi Mittal, Britain's richest Asian, and the Hinduja brothers, probably Britain's most publicised Asian millionaires. Between them they are worth around £2 billion. But there are also successful Asians whose assets are smaller but whose achievements are every bit as impressive. They flourish as entrepreneurs, creating the businesses that have made them wealthy – and they have also made their mark in established businesses. Some are recent arrivals in Britain; some are from families who have lived in the UK for several generations.

Looked at any way you like, such catalogues of achievement are records of which the ethnic communities in Britain can be justifiably proud.

Turn aside from the corridors of power and the watering-places of the very wealthy and visit Britain's inner cities, and from that perspective the ethnic communities look very different. Communities surviving on dwindling niche markets and often receiving less than their entitlement of the national economic cake, under-resourced and with crumbling infrastructures, often become virtual ghettos. The residents of such areas were primarily attracted there by the presence of large numbers of people who shared language, culture and mother country. But those advantages can quickly become disadvantages, for example when somebody takes a job in an Asian-speaking restaurant because he or she has limited command of English, only to find that the self-contained world of the restaurant minimises opportunities to develop skills in English language speaking.

Social and economic disadvantage frequently turns into social unrest and violence, and this was plain for everybody to see in the disturbances in Bradford, Oldham and other northern cities in 2001. The pictures we saw on our TV screens then were a million miles away from the success stories of the rich lists.

The big picture

The question that many of us, who work in public and private sectors serving ethnic communities, face is this: Is there a realistic prospect of a Britain that will be truly multi-cultural, multi-skilled, multi-faith; in which the abilities and talents of every community contribute to a diversity that enriches the whole of society – or must we concede the arguments of the British National Party and others, who claim that the riots of summer 2001 only go to show that Britain is doomed to an ethnically fragmented future, that shoring up disadvantaged and under-achieving communities is a recipe for national disaster, and that the best way of dealing with this particular problem is to make it as easy as possible for as many people as possible from the ethnic communities to return to their mother country?

A house divided?

The poverty of the second argument is very easy to see. It simply fails to stand up to scrutiny. Talk about getting rid of the ethnic communities as a way of rescuing the UK's economic future ignores the fact that those same ethnic communities represent so valuable a contribution to the British economy that if they disappeared tomorrow, the consequences would be disastrous. Britain's South Asians, for example – a community of around 1.85 million – has a disposable income of between £7.5 billion and £10 billion. The UK Indian community (reported as 929,000 in 1999) is the largest of any country in the world outside India. Indians have access to global business resources that mainstream British business can only envy: the world-wide diaspora facilitates movement of expertise, finance and goods in a way

that readers of this newspaper almost certainly take for granted. But many UK majority communities invest large sums in re-inventing that particular wheel.

Those who believe that Britain should quietly lose its ethnic minorities and 'go it alone' ignore – if they ever recognised it – the fact that, for example, in many professions and businesses (such as dentistry) ethnic communities are the backbone of the workforce; that many service industries are overwhelmingly staffed by ethnic minorities; and that ethnic minorities own almost three-quarters of all independent retail outlets. (Incidentally, when did the UK last 'go it alone, anyway? For centuries, Britain has been voluntarily and involuntarily the adopted home of ethnic groups as diverse as the Danes and Romans and the Dutch and the Romanians. Ethnic diversity is written into the landscape of Britain, its language and its customs, and has been so throughout the Christian era.)

A family of diversity

So is there a realistic prospect of the multi-cultural Britain, a place where diversity is celebrated and business flourishes across the ethnic spectrum?

If anybody has cause for realism, it is somebody like Dr Mohammed Ali, Director of Bradford's Quest for Economic Development UK. QED was set up in 1990 to explore ways of bringing Bradford's ethnic minority communities into the overall business community of the city. Ali is not anxious for communities to lose their values and identities: he wants Muslims to celebrate their Muslim heritage, not merge into the grey invisibility of some sort of ethnic mix. But his vision is of the various communities not merging into one, but overlapping: so that where they have common interests or have the opportunity to work together, they can be enabled to do so by removing the barriers that hinder that process. QED has for example invested considerable effort in helping Asian children to master difficult educational concepts by providing a 'homework club', staffed by speakers of Asian languages from their own culture. It's not an alternative to the state school system, but a way of returning children to that system equipped to stand on a more level playing ground, in order to be less disadvantaged by comparison with children from the majority community.

In that sense, an ethnically mixed, diverse and viable society is by no means a pipe dream. Despite the setbacks of the past eighteen months and the more recent backlash following the atrocities committed in September 2001 in America, Ali has seen considerable progress over the years – though, always the realist, he considers that it will be another ten years at least before QED will be able to see its task as even partly completed.

A rocky road ...

The goal, for Bradford and for the UK as a whole, is realistic – but there's a lot standing in its way.

One of the problems in celebrating the present diversity and richness of the Asian community in Britain is that it's all too easy to become complacent or naïve. It is certainly true that those who have become wealthy in the ethnic communities have a fine record of helping those less fortunate, in investing in the community and in particular the next generation. Gulam K. Noon, for example, who has supplied quality Indian food to airlines and supermarkets for many years, actively supports and promotes a number of young people's activities, and Manubhai Madhvani, whose family has major industrial interests in Uganda, has done considerable work in bringing faith communities together. There are many more. Philanthropy is a great tradition among Asians (one of the latest examples is the The Indus Entrepreneurs [TIE] scheme for mentoring and encouraging entrepreneurs), but there is no significant 'trickle-down' effect where the wealth at the top automatically makes those further down the line rich in their turn. On the contrary, the gap within communities is in many cases actually widening.

The popular mainstream media, who are often charmed by the success stories and the glamour of successful entrepreneurship, are as liable as anybody to present a glowing picture of our ethnic communities that masks the very real problems that exist. They are problems that are not going to go away on their own.

Fault lines

The ethnic communities are often superficially successful in business but are in reality fragile. They are like the glass domes you see in science fiction films, placed on the surface of inhospitable planets.

Inside, they seem to be perfectly functioning mini-worlds, in which everything is balanced and working. But outside, there are forces over which the residents of the dome have no control; forces which are already creating weaknesses that will eventually destroy the vulnerable ecosystems of the globe. Like fault lines that open gradually but end up threatening the stability of whole landmasses, there are pressures being faced by Britain's ethnic communities that, left unsolved, could destroy their economies.

Let us look at six of these fault lines.

- **The finite market.** Some look at the ethnic minority business communities with a certain amount of envy. 'They have a ready-made market: Samosas! Saris! Bollywood epics! – they've cornered the market in so many goods. They must be coining it!' And so they often are, selling goods and services backed by specialist knowledge, cultural familiarity and access to sources. Their customers define themselves: even if the local MacDonalds sold samosas, Asians would go to an Asian shop because they want to buy samosas from people who know what a samosa is.

But the market that at first seems so enviable is also highly limited, in at least two ways. There is a finite number of people in the ethnic communities. Those people are a profitable market, but to go beyond them and expand one's business into new areas demands a new approach and a shift in strategy that few businesses are equipped to branch out into. Secondly, outside interests are invading the niche markets of the ethnic communities. Some supermarkets sell Asian food made by Asian chefs (often working outside the UK) who are able to produce authentic Asian cuisine. With the enormous buying power of the large chains and their willingness to sustain a loss-leader for several months, small Asian retailers have sometimes been forced out of business by outside competition. The very factors that made the closed market of the ethnic community a profitable one actually contain the seeds of the destruction of that same market.

Considerable research is being done into ways of dealing with the problems of finite markets and closed economies in the ethnic minority business

communities. 'Breakout' involves a number of factors, including the role of second-generation entrepreneurs, the capability of ethnic businesses to handle changes implicit in approaching wider markets, and the extent to which existing networks and relationships will have to adapt to the new situations that will be created by successful breakout. If issues like these are not resolved, the future may be bleak for some currently viable businesses and even communities.

- **Lack of support** Britain has only recently recognised the wealth of resource in the ethnic communities – arranging fact-track entry, for example, for qualified and expert immigrants who have skills that the UK sorely needs, for example in IT. But there is still a reluctance to support home-grown initiatives in the ethnic communities. Those communities have a higher than average entrepreneurial character. In some parts of London, for example, 10% of new business start-ups come from the 5% ethnic minority population. But there is a history of entrepreneurs having to seek funding from overseas: one example is Paresh Kotecha, whose funding for a major refurbishment of Aston Hotels came from Singapore. British banks lost £25 million of business.

The implications for the future of UK entrepreneurship are serious, and in the short term the UK is simply investing in other countries' prosperity.

- **Ethnic capital flight** There are many other ways in which the 'ethnic capital' of the UK – the stock of skills and expertise that has arrived almost by default and has been expanding as the ethnic communities have expanded – is likely to diminish and is already diminishing. Problems such as poor command of English and a lack of understanding of the UK job application system have kept many qualified people in the ethnic communities from gaining appropriate jobs in Britain. Nick Hardwick, CEO of the Refugee Council: 'Some 75% of all the refugees who come here are professionally qualified and yet they're cleaning toilets, if they get a job at all. It's a crazy waste of talent.'

Add to this that fact that growth in ethnic

businesses tends to be by setting up new ventures rather than expanding existing ones; that training investment is about 25% of that in corresponding majority community businesses, and that small size and problems in raising funding are common, and once again it's an unpromising scenario for the future.

Unless steps are taken to reverse the trend, the UK economy is living off its reserves and eating the seed corn.

- **The limitations of self-help** One of the characteristics of the UK ethnic communities that is sometimes praised is that they have strong internal support systems. Diaspora links, extended families, a commitment to the elderly and the frail, and a culture that is disposed to support entrepreneurship all combine to provide support systems that not only work but also benefit the state by taking some of the duty of care off its shoulders.

However, this is a strength that has limitations. Community support systems can be extremely vulnerable. As we have already seen, they draw on communities whose resources are finite, and they rarely receive adequate funding from the state for their work – which in any case is often done behind the scenes and informally.

A mosque or other community centre can give only limited support and is not often in a position to make the kind of long-term welfare plans that achieve major results. When they reach the end of their finite resources there is often nothing to replace such agencies.

The role of Government must include the strengthening and resourcing of local support systems, including community projects, community development, faith projects, ethnic media and much more. If this action is not taken, we are once more looking at an alarming prognosis.

- **Economic decline** Yet another fault line is implicit in the fact that economic growth in the ethnic communities is almost always created by the community than by government intervention. It looks very good in some ways and speaks a great deal for the capacity of the community to direct itself and create economic growth. But looked at

over the long-term the economic graph is downward, even though often masked by temporary growth.

The reason, once again, is the finite nature of ethnic community resources, committed to existing channels and with little chance of creating new ones once those are exhausted. Ethnic business communities are sometimes like coal mines: a bonanza year with huge profits merely masks the fact that this is a year when the capital stock has been reduced more than it usually is.

There is a pressing need for government to ensure that ethnic communities and their economies are brought into the overall plan, and that any suspicion that the communities are managing very well without government intervention must be rapidly corrected.

- **The Loss of Assets** Last but by no means least, the fact that many in the ethnic communities leave the UK points to a drain of assets much more severe than a mere brain drain (though a brain drain is happening: the UK has an unfortunate tendency to educate talented members of the ethnic minorities to a high professional level, and then happily see them go abroad to find work). But much more is lost – certainly culturally, artistically, and socially, but also in terms of familiarity with the mother country and linguistic expertise.

That expertise, properly recognised and used, could be one of the biggest assets available to UK majority business, which currently invests millions in translators, foreign advisors, cultural consultants on overseas trade trips and much more: an investment that could be slashed if those looking for such resources knew what was available in any British city.

Where to go from here

We suggest that nothing less than a complete change of perspective and policy is needed – by government and by business, on a national and a local level, in terms of organisational and personal relationships.

Change of perspective

For much too long, the ethnic communities have been seen as fringe elements surrounding a core 'British' mainstream community. We need to bring about a

change of perspective so that modern UK society is perceived as it really is: a mixed society, in which many ethnic strands intertwine: where the national character is shaped by its ethnic mix, and where a thriving prosperous business community can only be created by drawing on the whole range of talents and expertise possessed by the whole range of communities.

For too long, also, the ethnic communities have been seen as a problem instead of an asset: a burden to the state, requiring help and subsidy. On the contrary, as we have argued, they are an asset: though realising that asset will require some far-reaching changes of policy as well as perspective.

Change of policy

A lot is said in modern Britain about 'diversity' and how to cultivate it. Diversity is sometimes inadequately recognised, however, in government policy, where a 'one-size-fits-all' approach is favoured, so that the problems of the London Borough of Hackney receive very similar prescriptions to those of inner city Liverpool or Leicester. Communities are not the same, even when those communities share a common ethnicity.

It's imperative, too, that the appearance of success in many ethnic communities should not distract legislators and agencies from dealing with the barriers to growth that exist in so many communities: lack of access to training, to education, to business support, to the banking networks and much more. 'Positive discrimination' is rightly looked at sceptically these days. But everybody should be empowered to stand level at the starting line. At present, some never get there at all.

The agenda for creating a truly diverse society and national business culture is a large one, and sometimes a daunting one. But time is not on our side. It would be nothing less than a national tragedy if time were now to be wasted by attempts to cobble together a new strategy by tacking bits and pieces on to existing policy. A new way of looking at things is needed, and in bringing that about, the ethnic communities themselves have a key role to play.

(for more information visit:

www.thebritishandhowtodealwiththem.com)

THE UBIQUITY OF BLUE

An analytical survey of the contributing elements and processes involved in concocting watercolour painting

Professor Peter Welton

Emeritus Professor of Fine Art, De Montfort University

Lecture delivered on November 18 2002

It is perhaps inevitable that most art criticism and comment focuses on the product. It is after all, the tangible manifestation of artistic endeavour and pleasure (or pain!) may be derived by the observer from engagement with it. Such responses are of course very familiar to the artist and indeed are endemic to creative activity. But it is the more esoteric values associated with meaning which are frequently teased out of a painting which artists find surprising and often puzzling. Attributing meaning to squiggles and splodges of paint is central to aesthetic appreciation but much of this is due to the observer's need to make 'sense' of such stimuli in order to achieve some satisfactory closure of the experience of seeing. Rarely does the artist set out to achieve such a response and it is this curious perceptual game which is most intriguing about making paintings. It wouldn't be going too far to suggest that the artist who did set out to do this would inevitably fail; the imagery employed would be too obvious and the challenge to the observer would be diminished. No pleasure could derive from a process of untangling where the result was not only unsurprising but also predictable. This, incidentally, is the common error of the hobby painter who strives to achieve an imagined 'reality' in painting.

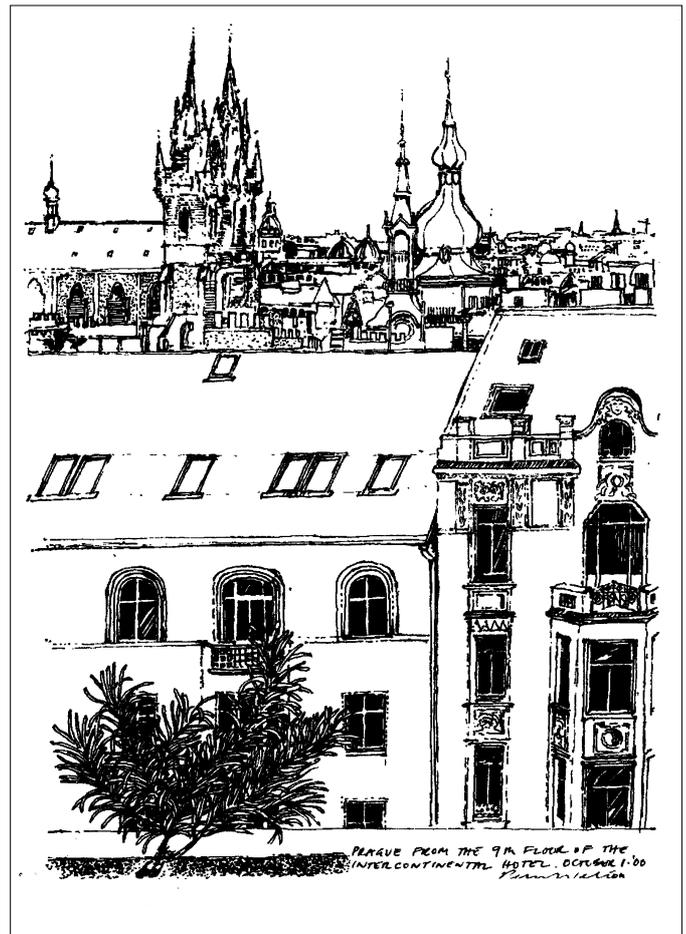
It would seem to follow then that the work of art is a partly completed contract between the artist and the observer. That success in this strange activity depends on the artist and the observer sharing common cultural values and experiences to make the transaction worthwhile. The artist can only employ devices with which he is familiar in making his paintings and the observer is equally constrained by his experience. But when these two are in tune with each other, then good art can result. It has been said that if we could talk to a fly we would have absolutely nothing to say to each other...our experiences would be incompatible and there would be no common basis for dialogue.

So, how does the artist go about making pictures where this fine balance can be struck? What are the constraints which prevent him from achieving Nirvana with ease and elegance? Perhaps it should be said here that my basic concern as an artist is to pursue this goal of communication and perhaps, also, I should have prefaced this whole piece by saying these are my views about watercolour painting and not some universal view. As far as I know there may well be no other artists who share this approach.

Let us consider then the materials involved in making a watercolour painting - the elements of the process.

It is worth saying that the mark of a good watercolour painting is one in which the only surface texture detectable is that of the paper itself. There should be no paint presence on the surface of the paper. By comparison much of the pleasure to be had from oil painting is in examining the way the paint has been applied. If you were to run your fingers over the surface of a Rembrandt self-portrait you could feel the way the painting has been made. (They don't like you doing this in the National Gallery by the way). A watercolour painting, however, offers you no pleasure in that direction... and for a very good reason. The gum which binds the pigment of watercolour paint is a very weak dilution and therefore incapable of allowing the paint to form into a robust solid mass on the surface of the paper.... it can easily be removed with a fingernail. It follows from this that the artist must attempt to get the paint inside the paper. In other words to stain the paper as opposed to applying paint to the surface.

And the implications of that become apparent as the relentless logic of this process reveals itself.



Watercolour paper consists of cotton fibres held together with yet another special gum and it takes a considerable amount of water to saturate the paper to the point where the gum is softened sufficiently to allow the cotton fibres to separate and accept the tiny grains of pigment into the actual body of the paper. Now good quality watercolour paper has another interesting characteristic. When paint is applied to it, no matter how wet the mix is (the slurry), it prevents all lateral movement - the blotting paper effect -and the patch of paint the artist has applied stays precisely where he put it.

So, because the paint is mixed with an enormous amount of water the painting surface (the ground) must be kept horizontal throughout the whole process. And the consequence of that, a fortuitous consequence by the way, is that when the paint is bone dry an elegant and clean patch of paint has been produced which has around it a micro-wall of pigment which has three functions. First it has considerable aesthetic appeal in that this tiny line elegantly and precisely describes the shape of the patch. It unerringly follows every minute variation of the outline in a way that the artist could never match

with a brush or a pen. Second it acts as a barrier against any new wet paint being applied and encroaching on the dry patch, and this is a great help in achieving adjacency with colour, an attribute in achieving viable and vibrant relationships between colours. And thirdly this tiny line, being darker in tone than the rest of the colour with which it is associated adds a small but significant contribution to the overall accumulation of dark tones in the painting. And that factor is vital in painting because the success or failure of a picture is linked to the distribution of tonal values from almost white to almost black. Compared to the importance of tone in a painting colour hardly matters at all.

Notwithstanding that perhaps surprising view it is necessary to now look at the paint itself...the colours that are used to make paintings. On my studio table I have 50 or 60 different colours, either in little pans or in tubes. These can produce a true palette of thousands and thousands of colours as I mix them together. And the chances of precisely replicating a mixed colour are remote. So remote as to not be worth the effort of trying. So I must accept the fact that every time I mix a colour there's a chance I have never seen that colour before and probably never will again.... although something very like it will be around.

In applying the paint to the paper I have to bear in mind one or two truths about watercolour painting. Because of the need to put the paint on very wet and of a very thin mix it follows that if I put a pale colour on top of an already dry dark colour I probably won't be able to see it. Not a very inspiring prospect. So I have to make sure all the pale colours go down first in order for them to be revealed later when I paint around them. Then I proceed to apply paint to the paper using five different methods of application - single colour; two or more colours mixed before applying; the evocatively named wet into wet method; the wonderful negative painting method beloved by John Cotman and finally the dramatic transformational method of glazing

I am always conscious of the fact that every mark I make will not be precisely as I intended it... it will be too big or too small, in the wrong place, the wrong colour, or tone. I am also aware that I must not attempt to correct these errors whilst the paint is wet or I will certainly damage the surface of the wet paper. I know I must not use a pencil to draft a painting before I start.

Graphite is an alien presence in a watercolour painting although I draw extensively away from the painting.

I draw succour from the realisation that I can make adjustments in the painting as I go by changing the very subject of the picture, sometimes minutely, sometimes in a major way and that the least location-specific colour blue is invaluablely ubiquitous in this quest. The best I can hope for is a result which might be described as an accommodation of errors. And when its all over, often 4 or 5 weeks later, I will hope somebody will be sufficiently challenged to tease some meaning from it!

RUBENS' ALLEGORIES OF PEACE AND WAR

Professor Richard Verdi

Professor of Fine Art and Director of the Barber Institute of Fine Art, University of Birmingham

Lecture delivered on December 2 2002

Professor Verdi, a specialist in 17th century art, gave an extremely interesting talk on Peter Paul Rubens (1577-1640) paintings concerned with Peace and War illustrated by slides including the huge canvas painted in London for King Charles I in 1629-30, Peace and War (Minerva Protects Pax from Mars) now in the National Gallery, London.

He pointed out that Rubens was involved in diplomatic aims and hoped to arrange peace in the Low Countries. Rubens was a convinced pacifist, not a quality which most people associate with this important artist.

Professor Verdi took us through and identified the origins of the imagery Rubens used to emphasise the blessings of peace which he passionately enjoyed, in which he believed and which he painted with breathtaking virtuosity.



He rounded off his talk by showing a slide of Picasso's Guernica, linking Rubens the pacifist with a 20th century artist similarly disposed.

Real Genetic Engineering Studying Bacterial Flagellar Motors

Dr Liz Sockett

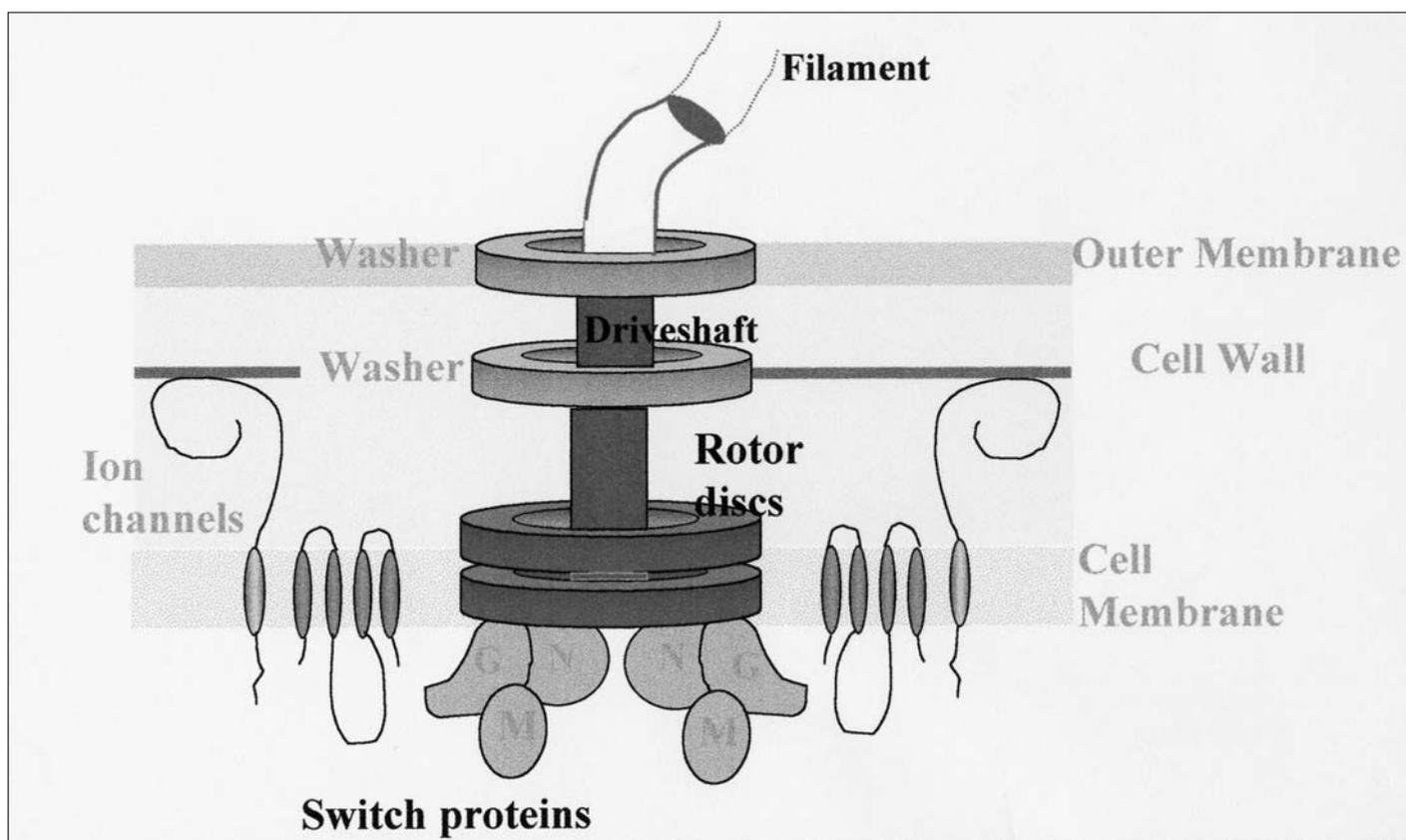
Institute of Genetics, Queen's Medical Centre, University of Nottingham

Lecture delivered on Jan 13 2003

Nanoscience and nano-engineering are much in the news lately as physicists, chemists, journalists and even royalty, debate the benefits and perceived risks of engineering microscopic machines for technological applications. While it is certainly true that all new technologies must be, and are, subject to strict safety evaluations; at present the nano-technologies themselves are mainly confined to making very simple microscopic rotors and tube work meshes in physical science laboratories.

As a biochemical geneticist who researches micro-organisms, I am amused to think that while these worthy people discuss the pros and cons of such simple, man-made, nano-structures; deep within everyone of their intestines are swimming, friendly, bacteria powered by a most sophisticated natural

rotary nano-engine, the bacterial flagellar motor. This motor is 35 nanometers in diameter at its base (that's about one millionth of an inch), it is entirely composed of proteins and it is part of the membrane of a living bacterial cell. The motor consists of a pair of rotary discs connected to a drive shaft and this



Bacterial flagellar nano-motor (drawn by flagellar researcher Karen Smith)

passes through a washer to the outside of the bacterial cell where it connects to a long helical protein propeller called the flagellar filament. Amazingly the motor can rotate at 100 revolutions per second, and this drives the bacteria forward at a scale speed exceeding that of any cheetah! The fuel for motor rotation comes from the hydrogen ions in H₂O water. The ions enter through channels that encircle the motor in the membrane. As they do so they cause temporary shape changes of some of the proteins of the motor. These have the effect of pressing upon and releasing the motor discs so they rotate. Some analogies for the mechanism are either water pushing on the bars of a waterwheel or a circle of people pushing a roundabout in a playground.

So this natural flagellar nano-machine far outstrips the efficiency and complexity of any man-made nano-efforts to date or likely in the near distance. It has some 25 different protein components, it can engage forward and reverse gears, and it can be switched by sensory inputs to change direction to allow bacteria to swim towards food sources. Its organisation and efficiency is breathtaking and to see the speed with which bacteria swim on a microscope slide still impresses me after nearly twenty years

watching them. Antonie van Leeuwenhoek first realised in the 1600s that the tiny particles he saw down his early microscopes were in fact living "animalcules" because they each had their own "proper motion" just as other living creatures. It is sobering to realise that in the 333 years since their discovery we have still not fully determined the function of all of the parts of the engine!

So why and how do we study flagellar motors? Well obviously, understanding such an elegant natural motor will inform the work of nano-technologists who want to design structures to carry out specific functions on a sub-cellular level. (Many of these nano-tech ideas relate to making microcircuits on chips or to growing tiny fibres to repair areas of the human body). There is also an element of curiosity that drives scientists, including ourselves, to find out exactly what the mechanism of rotation is. Hydrogen ions are a plentiful supply of fuel as water is ubiquitous on earth, so understanding hydrogen ion-driven motors is useful.

In addition there is a link between bacterial swimming and human disease. Several pathogenic gut bacteria including *Salmonella* and *Vibrio*

cholerae, and *Pseudomonas* species which infect the lungs of cystic fibrosis patients; use swimming as an important part of the infection process. They locate sites in the body to attack and colonise by swimming down onto them. It is interesting that mutant, cholera bacteria, without flagella, can be drunk by human volunteers, without them getting sick. In young CF patients many swimming *Pseudomonas* bacteria are seen in their lung mucous as they begin to get infected, but later in life when their lungs are sadly fully colonised, the bacteria switch off their flagella and stop swimming as there are no new colonisation sites to find. Learning how to control the synthesis and the action of flagella is important in the treatment of these infections.

Other swimming bacteria with flagella may be important as treatments of the future. One extra-small bacterium that my group works on is *Bdellovibrio bacteriovorus*. This bacterium is a predator of other bacteria in nature! It swims up to them, attaches to them, and bores into them using flagellar swimming.

Then it lives within them, sealing itself in and consuming the cellular material of its prey. From this it builds usually 5 or 6 more *Bdellovibrio* which make new flagella and then burst out of the dead prey to infect more bacteria. This predator has no effects on animals or humans but is good at killing bacterial pathogens like *Salmonella* and

Pseudomonas. When it destroys all the pathogens, it itself will die as it requires living prey to survive. It is the fastest known swimming bacterium and actually has an entry in the Guinness book of records for that feat! We are researching how *Bdellovibrio* controls its flagellar engine to locate and enter its prey. In future it may be possible to use it instead of antibiotic creams on infected wounds.

How does Genetics help us to study flagellar nano-motors? Well quite simply with genetic engineering in bacteria, one can act as a mechanic and remove a single engine part at a time, by knocking out the gene that encodes that particular protein. Then one grows up the bacteria and observes their swimming, seeing if they can move at all, if they can engage forward and reverse gears, if they can brake. In this way one can build up a picture of the function of each nano-motor protein part. One can also substitute motor parts from related but different bacteria by replacing genes. We have had some success working in collaboration with Dr Michio Homma's group on the nano-engines of bacteria from fresh and salt water. The former engines are powered by hydrogen ions and the latter by sodium ions. We took the fuel channel genes from each bacterium and fused them together to make chimeras, swapping one part of one gene for the same part of the other at points along their length. We replaced these in place of the normal gene in the bacteria. On testing which ions drove the

GOD: A LITERARY AND PICTORIAL HISTORY

Professor Gordon Campbell

Department of English, University of Leicester

Lecture delivered on January 27 2003

The history of God is a sensitive subject. Were I to speak about the gods of classical antiquity that animate the poems of Homer and Virgil, listeners would consider the subject in a detached frame of mind. The gods of Christianity and of its sister religions, Judaism and Islam, however, are another matter altogether, because we cannot achieve a significant degree of emotional detachment from these gods. That is not, of course, to say that they exist, because we have open to us a variety of responses to the contention that these gods, or one of them, exists. We may be believers, either because we have never considered the alternatives, or because we are convinced by the force of the cosmological, teleological or (less likely) ontological arguments for the existence of a god. Since the eighteenth century, at least in France, it has also been possible to be a disbeliever, an atheist who denies the existence of a transcendent god. Since the nineteenth century, initially in England, it has been possible to take the view that the existence of god is unprovable, unknowable, and so style oneself an agnostic. None of these positions would make sense with respect to our attitude to the gods of classical antiquity, because no-one now believes in their existence and we are not emotionally attached to them. In the case of, say, the Christian god, we are emotionally attached, and so are obliged to take a position of belief, disbelief or unbelief.

These three positions have not always been available, and in many places are still not available. I travel frequently in the Islamic world, and there, if I may risk a generalisation, god is a fact. Allah exists, and a certainty that that is the case is present in the mind of people who are in most respects wholly secular; there are no traditions of atheism or agnosticism within the Islamic tradition. Before the eighteenth century, the same could be said of the Christian tradition: belief in the existence of the Christian god seems to have been universal. It is true that preachers inveighed against those fools who have said in their hearts that there is no god, but no examples of atheists (except for a few in fifteenth-century Italy) have been found. There was, however, plenty of blasphemy about, but it is a mistake to link blasphemy with disbelief. Chaucer's *Pardoner's Tale*, for example, which describes how two robbers conspire to kill a third and split the booty between them, seems to be animated by a late medieval blasphemy in which God the Father and God the Holy Spirit get together and decide to send God the Son to his death on the cross, which would enable the riches of heaven to be split two ways rather than three. This is certainly blasphemous, but it would be foolish to think of it as indicative of disbelief.

The improbable combination of blasphemy and belief can also be discerned in some Renaissance writing. Rabelais's *Pantagruel*, for example, mocks a Christian doctrine, now dormant, known as the *conceptio per aurem*, the conception of the Madonna through the ear. This particular

route was appropriate both as a means to preserve the virginity of Mary and also as a fitting point of entry for the Word of God, because words enter through the ear; in one important extension of the tradition, Jesus was also born through the ear of his mother. The doctrine has its origins in a misreading of the Greek text of Luke 1.28, which in the AV is rendered 'and the angel came in onto her and said "Hail, highly favoured, the Lord is with thee"'. Greek and English are both rich languages, and both capable of ambiguity which is not always intentional, so when the angel is said to enter Mary, there is an ambiguity both in Greek *eisrchomai* and English 'came in onto her'. This misreading eventually found its way into the theological traditions of both the eastern and western churches, and in due course found its way into art and literature. In art, there are many depictions of the dove that represents the Holy Spirit flying towards the ear of the Virgin with a scroll of words in its beak.

The image was in some measure secularised in the Renaissance, but still retained its power. Shakespeare's *Cleopatra* instructs a messenger to 'ram thou thy faithful tidings in my ears/ That long time have been barren'. In *Hamlet*, you will recall, the death of Hamlet's father is presented in a dumbshow: the King enters with the Queen and lies down on a bank of flowers. Gertrude exits and Claudius enters; he removes the king's crown and 'pours poison in the sleeper's ears'. The unmistakable evocation of the *conceptio per aurem* is meant to show that the killing of the king is not only murder, but blasphemy. A

generation later, Milton's Adam complains to the newly-fallen Eve 'O Eve, in evil hour thou didst give ear/ To that false worm' (*Paradise Lost* 9. 1067-68). At his birth Rabelais's *Gargantua* 'sortit par l'aureille senestre'; birth from the left ear is a demonic parody of the conception and birth of Jesus, which was of course through the right ear. We lived in a right-eared world.

This is one tiny example of a rich vein of blasphemy in Rabelais, and in the twentieth century passages like this provoked a long debate between those who thought that Rabelais must have been an atheist and so a French Enlightenment figure *avant la lettre* and those who thought that such a reading was an anachronistic account of the mentalité of sixteenth-century Europe. The balance of evidence would suggest that he was indeed a believer, but that belief was not incompatible with blasphemy.

The god in which we believe or disbelieve is unchanging, immutable, and yet the image of that god is constantly changing. The notion that gods are described in terms of the ideals of the believer is an ancient one. There was, for example, a pre-Socratic philosopher (of the sixth century BC) called Xenophanes of Colophon, a fragment of whose verse is preserved in the writings of Clement of Alexandria; Xenophanes sought to subvert the idea of an anthropomorphically-constructed god by arguing that if horses and cows had gods, and if they could draw, they would draw gods who looked like horses and cows.

In the course of the two Christian

millennia, the church has moved progressively away from anthropomorphic descriptions of god. A parallel development can be seen in the Jewish tradition. In the Hebrew text of the Old Testament, the god is routinely described as having human attributes such as a face, hands and feet. In the Samaritan version of the Old Testament, which is later, many of these anthropomorphisms are excised. Let me give you an example. The Hebrew text of Genesis 18.8 baldly states of Abraham and God that 'they did eat'. In some later versions, such as the Syriac of the Peshitta and the Aramaic of the Targum, this reading is preserved. In the first-century Palestinian Targum (which was discovered in 1956), however, the phrase runs 'they were seen as if they did eat', and in the Midrash Rabba, it says 'they pretended to eat'. The notion of a god who could eat had become something of an embarrassment.

The notion of an Old Testament God who lived like his opposite numbers in Greece on the top of a mountain is one with which believers are uncomfortable, and so passages that describe this god are said to be accommodated to the understanding of the Jewish people in that period. In other words, one can either argue from a position of belief that God is unchanging and that his character is revealed progressively, or one can argue from a position of disbelief that God's character develops over time.

The matter is further complicated by the fact that there was no more a consensus about the nature of God in the past than there is in the present. In England, for example,

one might at any given point draw a distinction between the god of the Roman Catholics, the god of the Church of England (which itself contains many parties) and the god of the non-conformists. In the seventeenth century, the God of the Catholics was still intervening in nature to effect miracles, whereas Protestants insisted that the age of visible miracles had ended with the apostolic church. The Church of England is hard to pin down in the seventeenth century, because at the beginning of the century it was a Calvinist church, whereupon it became an Arminian church under Archbishop Laud, a Presbyterian church under the Commonwealth and Protectorate and, after 1660, when the puritans became non-conformists, a state church that represented the views of some but not all of the people.

Conceptions of God clearly differed amongst these groups, and we should not lazily identify any of those conceptions with our own. We know, for example, that the Baptists of Kent and Sussex professed belief in a god who existed in the shape of a man, and the radical Lodowick Muggleton famously remarked that God was about six feet tall. Such views are not restricted to uneducated radicals, as will become apparent as we consider the God of Milton's *Paradise Lost*, where his fullest appearance is the council in heaven in Book III.

Councils of the gods are a standard feature of the epics of classical antiquity. The classical topos was absorbed into Christian literature, and for centuries the three members of the Christian godhead assembled in the literature and

drama of the Middle Ages. There is, for example, a fifteenth-century Parliament of Heaven play from Coventry in which Father, Son and Holy Spirit come together to discuss the Fall. In Milton's representation of the divine council, however, there is no Holy Spirit; it is simply a meeting of God the Father and God the Son. I shall return to the anti-Trinitarianism implied by this omission, but for the time being should like to concentrate on the character of God. He is a seventeenth-century Puritan god, and so very different from his modern counterparts. In his insistence that the purpose of all creatures is to praise him, he sounds to our ears like a heavyweight boxer insisting that he is the greatest; we would much prefer the angels to proclaim God as the greatest and for God to respond by saying 'aw, shucks, you shouldn't say things like that'; the reason is that we think modesty a virtue and a social grace, whereas our seventeenth-century predecessors thought false modesty a sin.

In Book III God the Father sees Satan flying towards the newly-created world to corrupt Adam and Eve, and points him out to God the Son. God knows the future, and becomes deeply upset because humankind is going to fall. It is the Son's task to placate the Father and to set him on the right course of action. The Father says of Adam 'Ingrate, he had of me/ All he could have; I made him just and right,? Sufficient to have stood though free to fall'. But should the entire human race be condemned? The Son says 'That be from thee far,/ That be far from thee, Father, who art judge of all things made, and judgest only right'. For the

seventeenth-century reader, that phrase would ring a bell. It evoked Genesis 18, the story of Sodom and Gomorrah. When the god decides to destroy Sodom and Gomorrah Abraham asks 'Wilt thou destroy the righteous with the wicked? Peradventure there be 50 righteous within the city: wilt thou also destroy and not spare the place for the 50 righteous that are therein? That be far from thee'. It's the same phrase in a very similar context, when God is about to zap a large number of people. In the Genesis story the god concedes the point, and Abraham keeps bargaining. If 50, why not 45? Then 40, 30, 20 and 10, which is the god's bottom line. And then, says Genesis, 'the Lord went his way'. Far from being remote and serene and omnipresent, this is a god who can be outwitted by a clever human and can then walk away. The extraordinary thing is not that there should be such an account in 800 BC, when gods lived on mountaintops, but that Milton should transport the phrase to the seventeenth century. As Milton observed elsewhere, in one of his divorce tracts 'Abraham even to the face of God himself seemed to doubt of divine justice'. The phrase 'face of God' is in turn revealing. The translators of the AV avoided the anthropomorphism of the Lord's face, and says of Abraham that he 'stood yet before the Lord'. Milton remembered the Hebrew *liphne*, and so translated 'face of God'. In common with many other Puritans, Milton thought of God as distinctly human, and was entirely relaxed about God having a face.

Milton's image of a wrathful and slow-witted god who can be calmed by the persuasive powers

of his son strikes a modern reader as verging on blasphemy, and yet it is part of an important strain of seventeenth-century Puritan thought. Knowledge, in the view of many Puritans, was an impediment to salvation. In his late middle age, Milton came to believe that education was inimical to faith, and argued that attending university was only useful if you were going to combat papists for a living. John Bunyan, on being accused by a magistrate of claiming a privileged understanding of the Bible even though he had no knowledge of Hebrew and Greek, replied that anyone who had received the sort of enriched education that included Hebrew and Greek would not fit through the eye of the needle and so would be excluded from the kingdom of heaven.

But what did God look like? Milton never says, because, as a Protestant, he was suspicious of visual representations of the divine. Such iconoclasm is not peculiar to English Puritanism. Much of northern Europe became Protestant in the sixteenth century. Religious art in northern Europe died, and artists turned to secular subjects such as portraits and landscapes, both of which were acceptable because they celebrated God's creation without representing God. Beyond Europe, we know that Judaism is iconoclastic (remember the reaction of the god to the golden calf) and that Suni Islam is iconoclastic; Shi'a Islam is not wholly opposed to representation, which is why Iranian carpets represent figures.

In the Orthodox and Catholic churches, however, there are few

inhibitions about representation, although the Council of Trent regulated Catholic art from the mid-sixteenth century onwards. The images of God are male, because the Christian god is male. Think, for example, about the word 'God', which is a Germanic term: it is God in Dutch, Gud in Danish and Swedish, Gott in German. Before the conversion of the Germanic tribes to Christianity, the word was grammatically neuter, as in Gothic, where it is Guth. When after the conversion to Christianity the term God came to be applied to the deity of the Christian faith, it became a masculine noun; indeed, even in the two languages in which the neuter form was preserved (Gothic and Old Icelandic), its grammatical construction became masculine. The god of Christianity is resolutely male. But what else can we say? The image in our minds is of the Ancient of Days, an elderly bearded chap in a gown. Such was not always the case, because for a long time God the Father was depicted as one of a set of identical triplets, Father, Son and Holy Spirit, and the age of those triplets was young. Indeed, it was 33, the age of Jesus at his death and the age, according to Thomas Aquinas, of everyone in heaven, where we shall all assume the physical form that we had or would have had at age 33. It is at a later period that God the Father becomes older than his son and the Holy Spirit comes to be represented as a dove.

The Trinity, I should point out, is not a fixed feature of the Christian conception of the God. Many radicals, including Milton, did not believe in the Trinity. The difficulty, as Milton realised, was that the Trinity is not a Biblical doctrine,

and the word trinity is post-Biblical. It hung for centuries on the exhortation of Jesus to his disciples to go forth, teaching all nations and baptising them in the name of the Father, Son and Holy Spirit (Matthew 28.19). The fact that 'in the name' (Greek *eis to onoma*) is singular rather than plural hinted, so it was said, at a triune god. This was not a sufficiently robust proof text, so gradually another evolved. It began as a comment on I John 5.8 ('and there are three that bear witness on earth, the spirit, the water and the blood; and these three agree in one'). The marginal comment, written by an early medieval Christian, ran 'for there are three that bear record in heaven, the Father, the Word and the Holy Ghost; and these three are one'. In the twelfth century this Latin comment was translated into Greek and inserted into Greek texts of the Bible. It is the only serious proof text for the Trinity, and it is, not to put too fine a point on it, a medieval forgery. If you are curious about it, you should know that theologians refer to it as the Johannine Comma.

In addition to the representation of God in literature and the visual arts, we must also consider his dramatic history. In the mystery plays of late medieval Europe, God appears as a character on stage. The English mystery plays were suppressed with the Reformation, and so God disappeared from the English stage except in Catholic strongholds. God was not to reappear on the Anglophone stage until 1930, when he starred in a now-forgotten play by Marc Connelly called *Green Pastures*, which was made into a film the following year; the God of *Green*

Pastures is a black man whose beneficence is represented by his doling out of ten-cent cigars.

Let me conclude by returning to Book VIII of *Paradise Lost*, in which God comes to visit Adam in Eden. Adam has been naming the animals two by two, and raises the issue of his own solitude with the god of the garden: In solitude, / What happiness, who can enjoy alone? The god replies with a smile that Adam can play with the animals. Adam replies that he seeks rational delight, wherein the brute Cannot be human consort; they rejoice Each with their kind, lion with lioness; So fitly thou in pairs thou hast combined. The god pretends not to understand, and says What thinkst thou then of me, and this my state, Seem I to thee sufficiently possessed Of happiness, or not? Who am alone From all eternity, for none I know Second to me or like, equal much less.

The debate goes on, and finally the god admits that he knew all along what Adam wanted, and so presented him with Eve. It was Eve, of course, who was deemed to have caused Adam's downfall, so the gift suggests something of the cruelty of the laughter of Milton's god. Where did the notion of cruel laughter come from? One could evoke classical precedents (the laughter of the Homeric gods at the disability of Hephaestus) or Biblical precedents (the god of the second Psalm, who laughs his enemies to derision), but there may be a salutary source for this cruel laughter closer to home. In 1645, at the age of 37, Milton published his collected poems. The publisher commissioned a portrait from an artist called William Marshall.

Milton saw a proof of this unflattering portrait, and asked the Greekless Marshall to engrave a few lines of Greek below the portrait. Marshall engraved the words, not knowing what they meant. The Greek might be translated 'look up, my friends, and you will see what is supposed to be a portrait of me; it is in fact an image of the incompetence of the worthless artist who drew the picture'. Gods are what we make them, and the cruel laughter of Milton's God has its origins in the cruel laughter of Milton.

FROM PLATE GLASS TO DIGITAL

Mr Steve England

Chief Librarian, Leicester Mercury

and Dr Michael Crowe

Retired General Practitioner

Lecture delivered by Mr England on Feb 10 2003

My job entails managing the newspaper archives, alerting newsdesk to breaking news stories and compiling entertainment listings. The collection of photographs go back as far as 1970 and others going back even later, covering major events.

Dr Michael Crowe has given me a lot of support over the past year, for which I'm very grateful. He is on hand to offer further help this evening.

First of all, I'm going to show you part of a video on the history of Leicester. It shows one of the ways in which the old photos in the Mercury Library can be used to good effect.

Content of the talk – we'll take a look at the history of photography, the process of printing pictures, a short history of the newspaper in Leicester and the use of pictures to illustrate news items and thereby contributing to the history of the city - we will also take a glimpse into the future.

It is often said that - A picture is worth a thousand words. Frederick Barnard used it in his book *Printer's Ink* in 1921 – he was retelling a Chinese proverb. But there is a little known second part to the proverb ... I'll tell you about that at the end.

At the last count, I found 10 firsts in the talk.

What is a photograph? It's a single image, which can present a concept. The camera can record a moment in time, an object or person, preserving the image in both negative and positive representation. Development of photography has seen the introduction of the digital camera, but the principle is still the same, except that the preservation is in digital format, which makes it easier to send by telephone or satellite – but you can still have a physical positive representation.

The very first projection of an

image on a screen was made by a German priest. In 1646, Athanasius Kircher used a candle or oil lamp to project hand-painted images onto a white screen.

Joseph Nicéphore Niépce developed the world's first photographic image in 1827. He called his process heliography. His first successful image *View from His Window at Le Gras*, took over eight hours to complete the exposure.

In contrast to this first image, I thought I would show you the colour picture that won the Roy Thomas Colour Award for the second year for our Mercury printers. It's the City game, at the end of last year, away at Fratton Park, Portsmouth, that was played in conditions that were just a bit wet!

This was the box camera Niépce used and again Niépce at work taking pictures.

When he was unsuccessful in finding a way to shorten the exposure time, he became partners with Jacques Louis Daguerre in 1829. However, their partnership was short-lived as Niépce died four years later, aged 68.

Then came the almost simultaneous announcements by Jacques Daguerre in France and William Fox Talbot in England of their processes by which the images formed in the camera could become a permanent record.

In 1837, Daguerre captured light and dark on copper plate and reproduced them.

Portraiture became the bread and butter for many photographers. At first, the long exposures necessary with daguerreotypes made portrait taking a painful process for the sitter. Early prints show the subject using head restraints to allow for the long exposures.

Many archaeological expeditions included photographers throughout the mid-1800s. Landscape photography, as demonstrated by these early practitioners, has evolved into, among other things, the ubiquitous postcard and calendar art.

Wood engraving had reached a high standard in newspaper illustration during the 1860s (examples adorn one wall of the Mercury foyer). The photographic halftone plate, invented in 1861, replaced them.

James Maxwell, the British physicist, made the first colour photograph in 1861, using a three-colour process, of a tartan ribbon bow.

By the turn of the century, the developments in photography were responding to needs expressed by the photographers, ranging from the dry plate to artificial lighting to smaller cameras and the possibilities of capturing colour and motion. George Eastman's introduction of the roll film with sensitised emulsion and Kodak camera in 1888 had a definite impact on the growth and development of the photographic industry, creating a consumer market responding to the fascination of 'snapshots.'

For photographers interested in the documentary aspects, and those beginning to explore artistic expression, the technological changes highlighted new possibilities for using photography. With the invention of the halftone photoengraving process, the place of photography in the world became assured.

In 1886 the process for halftone engraving developed by U.S. inventor Frederick Eugene Ives

used small raised dots of varying sizes. Ives pioneered colour photography 5 years earlier by making the first trichromatic halftone process printing plates. He also invented a process for gravure printing that will employ minute pits etched into a metal plate, and although rotogravure will replace his photogravure, the Ives halftone process was to endure in photoengraving.

This provided the ability to reproduce photographs while printing text in a relatively inexpensive manner; essentially, it created advertising and photojournalism, the chronological sequencing of the picture story, and a new role for portraiture.

In 1894 Thomas Edison and W K L Dickson were credited with introducing the first film camera.

The Polaroid Land instant camera was based on a process which American physicist Edwin H. Land developed in 1947.

Digital image editing, enhancement or even manipulation is now possible using Photoshop. How annoying is it to have taking a brilliant portrait picture, only to find the subject has 'red eye'! No problem – you can even change the normal colour of his or her eyes!

The process of printing text and pictures in a newspaper is called Platemaking: The process of exposing and developing the photochemical plate used to transfer the image on an offset press to newsprint paper.

Earlier processes used glass and I have some examples here for you to look at.

A new development is plateless

digital printing. Using this system, press operators can eliminate several steps in offset printing, one of the most popular ways of printing newspapers. Offset printing is based on the fact that oil and water don't mix. Typically, the process begins when a negative of a page is placed on an aluminum plate, which is flooded with light, etched, put on press cylinders and inked. Because oil-based ink sticks to oily image areas and water repels ink from non-image areas, letters and pictures can be formed on the printing plates.

The digital technology replaces printing plates with a thin coating of what the firm CreoScitex called gelatinous "goo." When the beam of the company's Squarespot thermal laser imaging system strikes it, dark and light areas are created, forming an image of a page. The remainder of the process uses the usual offset method. At the end of the press run, the goo is wiped off and a fresh batch is applied for the next run.

The company is working with press manufacturers to develop laser imaging systems that can be mounted onto all varieties of offset printing presses.

British Pathe News – that bastion for recording news item for showing on picture house screens between 1896 to 1970 – has now made available all of its news footage to the public on the web. It costs to download a particular newsreel, but free for preview stills.

You may have come across the term pixels in a digital picture. Well, they are tiny rectangular elements in the rectilinear grid of the computer screen that is either "painted" on or off to form an

image or character.

Each individual block you see represents one pixel. Each is created by using binary code which tells exactly how much light fell on that area.

If a pixel is black-and-white, it can be encoded with only 1 bit of information. If the pixel must represent a larger range of colours or shades of grey, the pixel must be encoded with more bits of information as follows: 2 bits for four colours or shades of grey, 4 bits for sixteen colours or shades of grey, and so on. An image of 2 colours is called a bitmap; an image of more than 2 colours is called a pixel map.

This example is a computer icon with original dimensions of 32 X 32 pixels. The larger image shows the icon zoomed to 500% so you can clearly see the individual pixels.

Let's jump back a bit in time and have a look at the development of photo-journalism at the Leicester Mercury (or Daily Mercury, as it was previously called).

The Daly Courant is said to be the world's first newspaper, dated 1702.

The Mercury was not the first newspaper to appear in the city. That honour goes to the Leicester and Nottingham Journal, a truly regional newspaper, which began in 1753.

The Mercury itself was born on January 31, 1874, at 3 St Martin's. This picture is really photographer's license. It's a Columbian Press. The Mercury was printed on a Wharfedale press, a two-feeder single cylinder news machine, popularly called 'flyers'. This was replaced just three

months later with a Victory web machine.

The Mercury outgrew its premises and moved to Albion Street in 1890. It was to be the home of the evening paper and its associated weeklies for nearly 80 years.

It was also the site where the company took on board the developments in photo-journalism. Till now, the pages of the paper were a bit bland, with columns of text, only broken up by spaces and larger typefaces for headlines.

The first photograph appeared in an advert in 1907, some 80 years after the first photographic image ever.

The first news photo covered the unveiling of the Leicester and Leicestershire South African War Memorial on July 1, 1909. It was taken by photographer R Leonhardt, from his offices at 7 Horsefair Street.

In 1912, copies of the Mercury's sister paper, the Daily Post, were flown to Loughborough.

During the First World War, casualty lists began to appear in September 1914. Photographs of survivors from battles and sinkings began to appear, soon to be replaced by images of the dead.

We can now follow the progress in photo-journalism in the way it records momentous events in the city and county.

King George V visits town on June 10, 1919.

Leicester was formally made a city on June 14, 1919. No use of pictures in this instance, you'll notice.

1919 and 1920 saw the Green Bicycle murder case. The accused, Ronald Light, was a master at Dean

Close School in Cheltenham. On March 6, 1920, he was brought to Leicester by train – a reporter and a photographer were dispatched to take a look at the alleged murderer. The trial took place on June 12, 1920 at the Castle. Glass plates I have brought today show scenes inside the court room. The verdict was Not Guilty.

The Memorial Arch in Victoria Park was unveiled on July 4, 1925.

The General Strike took place on May 4, 1926.

No, this is not a fashion parade in the 1960s - in April 1928, these young ladies were told to leave a tram in the city, because they were considered to be 'scantily-dressed.'

Two pictures depicting the city centre scenes with trams.

Mercury photographer, James Mapham, who became Montgomery's official photographer.

His most famous picture of the D-Day beaches.

May 7, 1945, Germany surrenders – joyful scenes.

Nov 1949 – the last trams in the city.

June 2, 1953 – Queen's Coronation.

Street parties in celebration – this one was in Belgrave.

Building council house estates in the city in the 1950s – Eyres Monsell.

June, 1964 – Joe Orton interview.

1920s Charles Street.

After Charles Street was widened, the Lord Mayor of London, here for the Pageant, officially opened it in June 1932.

1964 – City planner Konrad

Smigielski's Charles Street
monorail plan.

1964 – Is this Leicester of 1995?

Sept 1968 – automatic two-tier car
parking in Leicester. This is a Pathe
News picture – you can tell why
they are free.

July 21, 1969, front page – moon
landing. Spot the deliberate
mistake! There's talk today that it
was all a fraud!

Nov 1976 – Showaddywaddy. On
April 30, they are performing at the
De Montfort Hall as part of their
30th anniversary tour.

July 12, 1981 – Riots Sunday
special edition.

January 9, 1989 – EMA Kegworth
crash – special edition.

Feb 21, 1990 – IRA bomb.

Nov 14, 1990 – first use of colour
– Prince Charles' 42nd birthday.

Sept 1996 and 1998 – the County
win the Championship. This signed
shirt is now worth £1,000, I'm
reliably informed.

April 16, 1997 – City win Coca-
Cola Cup after a replay with
Middlesbrough at Hillsborough.
Steve Walsh was Man of the Match
and Steve Claridge the scorer of
the winning goal. This earned the
team a spot in the UEFA Cup.

April 1997 – Tigers win Pilkington
Cup. John Wells and Dean
Richards raise the Cup – the
score? Tigers 9 Sale 3

Nov 1998 – the Sporting Statue
was erected near the Clock Tower
in recognition of the sporting
achievements of our three teams.
As a result of collaboration
between the Mercury and the City
Council.

In April, 1998, the Leicester
Mercury website

'thisisleicestershire' was launched
to the world. Now it had become
possible to display pictures and
even sell pictures online. Moving
pictures were also possible. Simon
Crane arranged at one time to have
a webcam looking out over the city
to be broadcast over the web.

Photos at the Mercury are stored in
cabinets – the microfilm reader-
printer is needed to view the file of
the paper – not very good for
pictures, though.

The whole system of processing
and archiving pictures became
automated in 1996, firstly with
Photogrid, now with Tark.

Agency pictures are also fed
straight into the system – so, just
minutes after a major event takes
place anywhere in the world,
pictures start arriving on our
screens.

Picture desk staff and sub-editors
gather round a computer to choose
a particular picture.

The new Millennium – this paper
for January 1st actually appeared
in the next day's edition.

On March 1, 2000, the Mercury
was re-launched with a new look.

2000 – Bluearmy.co.uk website
award.

9/11 – the horrific attack on the
New York World Trade Centre
towers. The next day's paper
covers the reaction to the disaster.

The Queen Mother died last year
and the Mercury covers the
funeral.

What will the future pages of the
Mercury look like?

Use of video? It is thought that
video-link headsets may be used
by reporters for updating the
website.

2124 will be the paper's 250th
anniversary.

Mercury may well become an
electronic 'Flexiware' computer
screen, where world-wide
information can be accessed at the
touch of a button.

The idea was expounded in 1999
by the Express, but they were
looking at the future of television.
Perhaps this is where the two
media will be meeting.

I wanted to end my talk with a
dramatic picture. This particular
picture was used on the front cover
of our publication Leicester Til We
Die, recording Leicester City's last
season at Filbert Street. It's the start
of the first game of the season
against Bolton and it's in black and
white. Ominous that we should be
using black and white when we
are in a world of colour, but this
picture just shows how effective
the use of black and white can be.

The Chinese proverb? A picture is
worth a thousand words, but a
word paints a million different
pictures.

NEW USES FOR OLD ESTUARIES: RECONSTRUCTING THE HOLOCENE HUMBER

Dr. Julian Andrews

School of environmental Sciences, University of East Anglia.

Lecture Delivered on February 24 2003

This presentation demonstrated the effectiveness of estuaries at synthesising and storing organic matter and metabolising nutrient elements on 10,000 year (Holocene) time-scales, with particular reference to the way the storage and metabolism has changed as humans have modified the coastal zone. The study focused on the Humber estuary of eastern England. Here, as in most other large European estuaries, environmental changes over the last 6000-2000 years have been mostly natural. This contrasts strongly with the last 300 years when human activities including reclamation, industrial, commercial and agricultural development have been extensive. New palaeoenvironmental and geochemical data highlight the contrast between the natural and human-impacted estuary and suggest how future management of temperate estuaries in developed countries might impact organic matter storage, and carbon and nutrient metabolism in the estuarine and wider coastal zone.

The modern Humber estuary is a well-mixed macrotidal system and the water is very turbid. Tidal flats fringe large parts of the outer estuary but may be narrow (<100m wide) or absent where seawalls or commercial development are extensive. In parts of the outer estuary, mudflats give way landward to saltmarsh, typically in front of clay embanked sea walls. The mudflat to saltmarsh transition is marked by the presence of *Spartina anglica* which makes a broad lower saltmarsh zone. Landward of the lower saltmarsh, higher and drier marshes are colonised by *Puccinellia* and *Halimione*. The natural succession of marine to terrestrial environments usually ends with mature saltmarsh, the succession having been truncated by the construction of seawalls and by reclamation. This truncated succession from saltmarsh to reclaimed agricultural land is wholly artificial, resulting from 300 years of reclamation. Before extensive human involvement the natural succession was probably from much wider tracts of saltmarsh, to progressively less saline fen and carr environments.

Samples from Holocene Humber sediment cores allowed us to identify seven widespread environments with statistically significant geochemical data sets: (1) oak/hazel fenwood (OHF), (2) alder carr (AC) (3) river channel muds or sands (Rcm/s), (4) high saltmarsh (HSM), (5) low saltmarsh

(LSM), (6) intertidal mudflat (ITMF) and, (7) a sandy facies (S). Of these only three (LSM, ITMF and S) survive as significant areas in the modern estuary. Elemental and stable carbon isotope data showed that these Holocene sediment types have diagnostic geochemical signatures reflecting the up-core transition from terrestrial peats through saltmarshes to more open marine mudflat environments as regional sea-level rose.

Chronology and average sedimentation rates were partly constrained by radiocarbon dates, and palaeomagnetic techniques helped define discrete sediment packages and discontinuities (time gaps). Although the Humber Holocene sediment record is not continuous, long-term sedimentation rates (about 1mm per year) show that sediment accretion kept pace with regional sea-level rise between 6000 and 2000 years before present (BP). This sedimentation rate, combined with core evidence to allow a geographic reconstruction of the palaeo-Humber (3000-2000 years BP), was used to calculate storage values for organic carbon and nitrogen in the various environments of the palaeo-Humber and to compare these to modern values.

Comparison of the organic carbon and nitrogen sedimentation and storage terms for the palaeo-Humber with modern values highlights the impacts

of reclamation and commercial / urban development in the estuary in the last 300 years. OHF and AC peats that were the largest organic carbon and nitrogen stores in the palaeo estuary are now absent (reclaimed) while saltmarshes are no longer widespread. Conservative calculations show a net decrease in annual organic carbon deposition from about 200 000 tonnes in the palaeo-estuary to no more than 2 500 tonnes today, a 99% reduction in potential organic carbon storage capacity. In effect the natural estuary was very efficient at using atmospheric CO₂ to make wetland plant organic matter and bury it, whereas today that process hardly happens at all. The comparisons for nutrient elements like nitrogen are equally impressive, with the palaeo-estuary burying about 10, 000 tonnes of nitrogen per year, compared to just 300 tonnes today, a reduction of more than 95%. Again the implication is that removal of saltmarsh and associated brackish - freshwater wetland by reclamation allows huge amounts of dissolved nitrogen to bypass former (Holocene) storage areas to impacting the North Sea. This is particularly undesirable for nutrient elements like nitrogen and phosphorous that fuel primary productivity causing blooms of algae that create unsightly foams and can impact the health of fish and other marine life.

In attempts to combat tidal flooding of lowland coastal areas it is now common in Shoreline Management Plans to see proposals for 'managed retreat' or 'managed realignment' of sea defences. This typically involves letting existing defences fail to allow the coastline to recede to a new line of defence, while at the same time encouraging rebuilding of natural saltmarshes, often on areas of formerly reclaimed saltmarsh. While new saltmarsh creation by managed realignment is designed principally to dissipate the energy of the flooding sea, the recreation of marsh on formerly reclaimed land will also have an impact on the deposition and bacterial-metabolism of organic carbon and nitrogen. Managed realignment should therefore reverse some of the effects of reclamation in a small way. In the Humber estuary it is likely that modest managed realignment will happen in the coming years. Creation of one square kilometre of new mudflat and saltmarsh should allow annual storage of an extra 50 tonnes or so of organic carbon, and about 2-3 tonnes of nitrogen. Although the cost effectiveness of most realignment schemes is based on flood defence and,

secondarily habitat creation, these small, but not insignificant increases in chemical storage capacity, may be the 'added value' that make a realignment scheme viable.

We already live in times when the European Union is pressurizing member states to reduce nutrient inputs to the North Sea. It is possible that in a few years time local authorities may have to account for their local area carbon budget (carbon credits) to reduce emissions of CO₂ to the atmosphere. Our study of the Humber shows that judicious decisions concerning coastal zone management can help in both of these areas. Geologists have a central role here by showing how the natural systems worked: in this case, literally — finding new uses for old estuaries.

Acknowledgements

This work is a collaborative effort and I thank particularly Tim Jickells, Duncan Parkes and Greg Samways for allowing me to use some of their data.

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CHAOS AND COMPLEXITY IN THE GAME OF LIFE

Dr Derek Raine

Lecture delivered on March 10 200

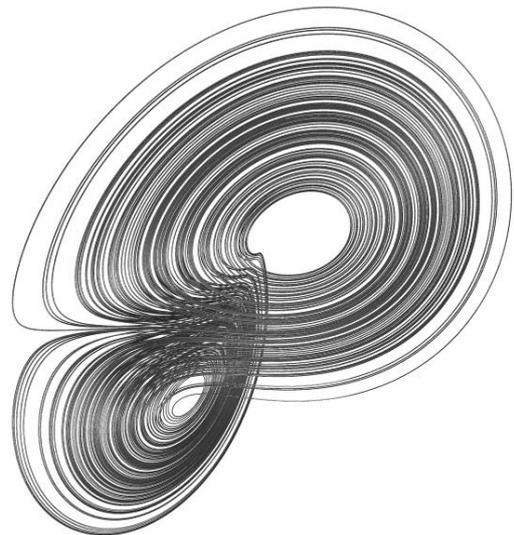
We are beginning to understand that a lot of the apparent complexity of physical systems arises from the operation of fundamentally simple rules. The apparently random disorder of chaos, for example, can arise in quite simple physical systems that can be analysed. This insight can be extended to social and economic systems where agents interacting locally according to a set of simple prescriptions, and without knowledge of the global picture, can create highly complex temporal and spatial behaviours. In this talk I shall provide a number of examples and illustrations.

We are supposed to think that science provides simple explanations for complicated phenomena – the reductionist analytical process. Unfortunately, many non-scientists think of science as producing impenetrably complicated explanations for simple phenomena. While the truth is that the success of science to date has been its ability to produce simple explanations of simple phenomena, from whence it derives its explanatory power. The emergence of science in this modern form can be traced back to Galileo in the latter part of the sixteenth and early seventeenth centuries.

Until Galileo's time the universe was divided into two parts. There were the heavens in which everything was ordered according to natural law, as exemplified by the motions of the planets. And there was the Earth, in which laws did not apply, or did so only approximately. When Aristotle watched a falling stone he saw an initial motion too complex to analyse, followed by a fall at constant speed. By rolling objects down an inclined plane Galileo was able to lessen the affect of gravity and slow the motion to the point where it could be analysed correctly as one of constant acceleration. By stripping away the incidental complexity of real falling stones one is left with a simplified ideal motion that proceeds according to an exact and simple mathematical law. In this way, the Earth becomes subject to the same law-like analysis as the heavens. Galileo said that the book of nature was written in mathematics. So this talk is fundamentally about mathematics, but presented in the form of pictures.

In our own time we have discovered that Galileo's description hides a deeper truth. In the phenomenon of chaos we have found that under certain

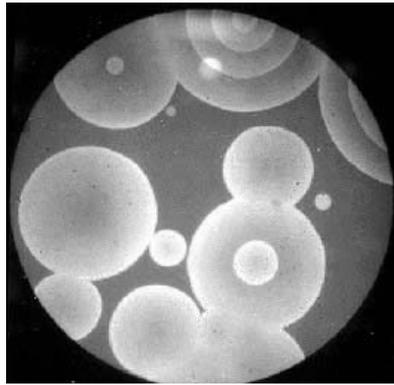
circumstances simple laws do not lead to simple behaviour. The first to give us a quantitative model of such behaviour was the American meteorologist Ed Lorenz. In the early nineteen sixties Lorenz was investigating mathematical descriptions of weather systems, which he hoped would be sufficient to capture reality while remaining simple enough to analyse. He found that these simple deterministic systems would sometimes produce results that appeared to be random, to the extent that prediction became impossible. We now recognize this as chaos.



A picture of the chaotic system of Lorenz showing the apparently random wandering of the system through its possible states.

Another example can be found in chemical reactions, the best know of which is the Belousov-Zhabotinski reaction in which the reduction of a bromate compound by malonic acid in a stirred flask

gives a solution that randomly turns from colourless to red and back again. The figure shows the spatial patterns that can spontaneously emerge from a homogeneous mixture. The pattern is essentially unpredictable.



Spatial distribution in the B-Z reaction arising from an

This unpredictability has entered common mythology as the butterfly effect, illustrated in the film *Sliding Doors* with Gwyneth Paltrow. The story involves a character who is seen to lead two quite different lives depending on the small time difference between getting on a train just before the doors close and just missing it. The smallest time difference leads to divergent futures, just as the flapping of a butterfly's wing can make the difference between a hurricane and a calm day in Lorenz's model of the weather.

Thus we are tempted to give up on predicting the slings and arrows of everyday life and simply move the pre-Galilean division to one between the hard physical sciences and the soft social sciences, between the rigorously testable, and the woolly and uncertain.

But in fact, the difficulties of chaotic systems provide a clue to an approach to the problem. We shall see that some of the apparent complexities of social systems can be derived from very simple underlying rules of behaviour of the individual participants. Let us look at some examples of complex systems that it may be possible to understand in this way.

Let us start with a simple experiment on ants. We have a colony of ants kept some way away from two sources of food by a barrier with a single opening. The food piles are equidistant from the opening. Ants emerging from the opening must decide from which pile to obtain their food. They then return with it to the colony. The food piles are replenished and maintained equal at all times. What do we observe?

Obviously not exactly equal numbers of ants visiting each pile at all times, but possibly roughly equal numbers with some small random fluctuations. No. Sometimes the majority of the ants visit one pile for an extended period of time, sometimes the other; sometimes there are large and rapid fluctuations. The system appears highly unpredictable. The traditional accounts of ant behaviour, that those emerging first choose at random between the food sources and then lay down trails for other ants to follow is powerless to explain the unpredictability of the fluctuations. We shall see later that this does not mean the ant behaviour cannot be explained!

Another example is the level of crime. There are various theories for what determines this. One popular theory is that crime follows the laws of economics: potential criminals do (implicitly) a cost-benefit analysis of the rewards versus the likely penalties. One might then argue that an important element of the calculation would be the level of unemployment – the potential rewards available without resorting to crime. But comparing the levels of crime now, and in the 1930s, with the

corresponding employment levels seems to contradict this. Another input into the equation might be the harshness of sentencing policy, which would affect the calculation of the costs of crime to the perpetrator. Again, this is unlikely, because the current record numbers of prison inmates appears to correspond to a relatively high level of crime. Worse still, different levels of crime appear to correspond to the same sentencing regimes, so the problem appears to involve many variables in a highly complicated way.

Two more examples. We should all like to know if the stock market is predictable. Standard economic theory would say that the prices of shares are

determined by the likely future earnings. We cannot of course know what these are going to be precisely, but we do not expect them to change by large amounts hour by hour or even week by week. The stock market should therefore be pretty stable with some small variations and general drift. In fact it seems to be subject to any number of fluctuations, both large and small. The figure shows the performance of the New York stock market over the last century or so. In fact it might as well have been over the last month or so or the last day or so (provided we change the vertical scale as well as the horizontal one). The fluctuations are what we call self-similar, so that any section in sufficient detail looks like any other on average. As an aside for the pessimistic reader, note that it took almost forty years for the market to recover from the great crash of 1929.

And finally, earthquakes. There is a little town of Parkfield about 200 km south of San Francisco off the San Andraes fault in California. They have experienced earthquakes of magnitudes around 5.5 on the Richter scale in the years 1857, 1881, 1901, 1922, 1934, 1966. What is the next year in this sequence? The average interval is around 22 years. In the 1980s some geologists predicted with confidence that there would therefore be another large earthquake in or around 1988. None occurred, large or small. In fact, none has occurred to date. The incidence of earthquakes appears inherently unpredictable.

The examples we've looked at so far involve series in time. Before I try to explain what is happening, I want to look at an example of organisation in space. This is a case where complex structures appear to emerge from nowhere, and it involves 19th century Manchester as related to us by Friedrich Engels (in a book on the Conditions of the Working Class in England). Manchester was the engine of the industrial revolution and its 'foul drain' as de Toqueville put it, a 'filthy sewer from which flows pure gold'. But Engels describes how it was possible for the middle classes to walk from one end of the city to the other without becoming aware of the poverty nestling side-by-side with affluence. Manchester grew by a factor of about 3 every generation for a hundred years, far too fast for its development to be controlled by its public servants. Yet in separating and hiding its atrocities it appeared more organised than any city in history.

In order to try to make sense of some of this complexity of social, economic and physical systems I will turn to a simple game. It is called the game of life and it was invented by the Cambridge mathematician John Conway. The rules are quite simple. The game is played out on a large grid of squares. Each square can be either white (alive) or black (dead). At each tick of a clock each square changes its colour according to the state of its eight immediate neighbours to the left, right, above and below and on the diagonals. If a square is black it needs three white neighbours to bring it to life (two parents and a midwife so to speak). Otherwise it remains dead. If a square is alive it can either die of loneliness if it has one or fewer living neighbours or of overcrowding if it has more than three. Otherwise it remains alive. Start by assigning squares to be alive or dead at will and see what happens as the clock ticks. What happens is entirely unpredictable except by actually running the evolution. There are patterns that become fixed, some that cycle round through loops of any length, some that die out entirely. The number of different patterns that result from these rules is absolutely enormous. The complexity is in fact as large as possible: the initial configuration can be constructed in such a way that the grid behaves like (i.e. simulates) a digital computer carrying out any computation.

This is our clue to understanding complexity. Some systems are just complicated. Take the flame of a burning candle as it flutters in the air. That complicated pattern is the result of the random interaction of a very large number of molecules in the flame and in the surrounding air. But it's not just too complicated to predict – it's too complicated to be worth predicting. We just do not want to know its exact shape at all times. Other systems are not like this at all. These are the so-called complex systems where the complexity arises from the action of very simple laws. These we do want to know about.

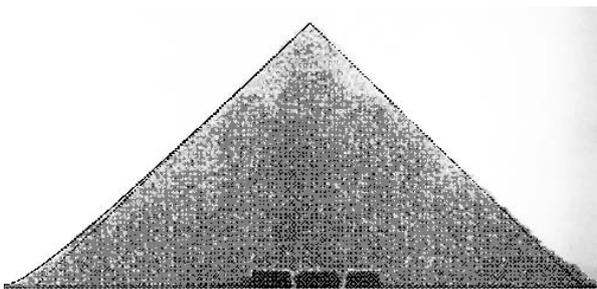
Let us see how this applies to some of our examples. First the ants. Remember the large fluctuations in their foraging behaviour between two equal food sources? Can we invent a simple rule that will explain this behaviour? The following solution is due to Alan Kirman. Each ant as it emerges from the colony can be assumed to have three choices: it can either do what it did last time; or it can be persuaded by a returning ant to visit the other source or it can

randomly decide to switch food piles. This simple set of rules fully explains the type of behaviour we see. Of course, it cannot explain in detail the way in which the ant trails change in time – when exactly a large fluctuation will occur – but it explains precisely the manner of the variation.

Let us see if we can extend this. Members of society differ in their susceptibility to criminality. Some might never be persuaded to crime; others might be more likely to be influenced while the rest of society will consist of the active criminals, although not beyond redemption. How persuadable people are to change will depend on their frequency of interaction with other groups, hence on the numbers in those groups. Using this as a basis one can explore the effects of, say, economic deprivation on crime rates. There is too much freedom in the models to claim them as correct, but the results are to say the least interesting: it turns out to be quite possible for different rates of offending to correspond to the same levels of poverty, or the same penal regimes, or conversely for the same levels of offending to correspond to different rates of imprisonment. What seems to matter most is the influence of members of the society on each other: people are led to crime by other criminals.

In order to say anything about earthquakes we have to turn to a different description of complexity, and to see exactly what we must start from a simple but apparently unrelated picture of a pile of sand. Imagine making a sand pile on a table by slowly adding grains at random positions to the table. As more and more sand is added the pile grows bigger, but not without limit.

Eventually, additional sand grains will not necessarily increase the pile, but will sometimes cause sand to spill over onto the floor. These avalanches of sand keep the pile from growing beyond a critical slope,



A sand pile at its critical slope

which is not imposed from the outside, but is a property of the sand pile itself. We say that the sand pile has self-organised to this critical state.

The distribution of words in an English text

Imagine that we collect the spillages in this critical state and count the grains. An interesting picture emerges concerning the number of occasions on which we will count avalanches of any given size. Essentially the really large avalanches are much rarer than the smaller ones, but not as rare as one would expect to find in a random distribution. Rather than describe it mathematically I'll tell you another circumstance in which we find the same type of distribution.

Imagine you count up the numbers of times different words appear in this text and rank them. There will be a few words, like 'penal' that occur only once which will therefore have a very low rank. There are others, like 'words' that occur more frequently and will have a middling rank. And still others, like 'and' that occur very frequently and have a correspondingly high rank. A plot of frequency against rank will give a distribution much like the plot of frequency against size for the sand avalanches. The organisation present in a meaningful text appears to exhibit this property of self-organised criticality.

There are lots of other examples. One very interesting one is the size distribution of extinctions of species. There have been several very large extinctions of species in the past, the best known being that associated with the demise of the dinosaurs. There is also a continuous record of smaller extinctions involving fewer species but occurring more frequently – just as if evolution is perched on this

critical point. The extinction of the dinosaurs is usually attributed to a specific event, the asteroid that landed off the Mexican coast. For one-off events there is no possibility of telling if they have one-off causes. But it is just as likely that removal of the dinosaurs was simply a rather rare manifestation of the way evolution normally works.

Frequency of earthquakes

Another example of this type of behaviour brings us back to earthquakes. We tend to hear about the few very large ones, but these are just the exceptions. The release of energy along the plate boundaries of the continental crusts occurs in large and small events just like the avalanches of sand. There may well be no hope of predicting the timings and locations of particular earthquakes, but that is not to say that we cannot derive from their distribution some general ideas of their nature.

In our final example we find an explanation of this type of distribution that we have associated with sand piles in terms of the behaviour of agents. The fluctuations in the stock market are distributed in size just like the avalanches in sand piles and the magnitudes of earthquakes. Large ones are rare, but not so rare that they do not happen and small ones happen all the time in an apparently meaningless fashion that is not explicable by the standard economic arguments. We can get an explanation however from another simple model.

According to this, investors in stocks are of two types: the fundamentalists, who have some economic rationale upon which to base their decisions to buy or sell, and the chartists, who base their decisions on the statistics of what the market is doing. Fundamentalists and chartists can then respond to stock movements in one of three ways. They can continue to follow their precepts, or they can be

influenced to switch, or they can switch randomly. A chartist might switch if, for example, the stock levels rise apparently too far out of line with market fundamentals. The behaviour of these different types of agents can explain the size and distribution of fluctuations in equity prices. The same applies to the values of currencies, or for that matter, house prices.

I want to close this section by ensuring that I have not over-egged the pudding. I am not saying that complex systems are now understood, in particular that we understand crime and stocks and shares, or, worse still, social and economic systems in general. In relation to our understanding of complexity we are closer to the age of Galileo than to the splitting of the atom. I am saying that there is progress to be made, and that this is an area of science of great interest and importance.

So I want to end with a few words on the potential effects on science education. It seems to me that the classical division of science into physics, chemistry and biology is inappropriate to a modern mass education in science, addressed as it is to the potential scientific elite. The problems of physics, for example, are not immediately relevant to the beginning student, certainly not very interesting and not subject to meaningful debate. Attempts to make these matters relevant by alluding to technological applications and their impact on society not only misses the target, because the science itself is either too difficult or is irrelevant and does not therefore become interesting because it is vaguely related to some other discussion, but brings in a certain anti-scientific aura.

The interesting problems and applications of scientific ideas are to be found in interdisciplinary contexts – biophysics, environment science and so on – and in particular in complex systems where these quite simple models that we have been looking at can be explored at all levels. To my mind, an education in science would begin with these ideas and only later move into specialisms relevant to the potential professional scientist.

I am pleased to say that at the University of Leicester we are attempting to implement our part of this vision. The faculty of science and of biological sciences have joined forces to offer a new undergraduate programme, which we call i-Science

(i for interdisciplinary or integrated) which will be based entirely around interdisciplinary problems in science, which I hope will attract the next generation of leaders in science management, media and education and researches in complex systems to carry these ideas forwards

Further reading:

Mark Buchanan Ubiquity Weidenfeld & Nicholson 2000

Steve Johnson Emergence Penguin 2001

Paul Ormerod Butterfly Economics Faber 1998

MORE FEAR THAN TALENT - THOSE THAT GOT AWAY....

Mr Kenneth Grange, C.B.E.

Founder, Pentagram Design

*The Harry Hardy Peach Lecture Delivered in the Rattray lecture Theatre,
University of Leicester on March 12*

The evening was opened by Dr David Bethel, President of the Lit and Phil who paid tribute to the achievements of Harry Hardy Peach, one of the 20th Century's leading figures in the field of design and on whom some biographical notes were published in the previous issue of the Transactions.

Mr Grange opened his address by recalling his last visit to Leicester in the 1960s when he was designing for the important Leicester based company, Imperial Typewriters, no longer in existence.

He explained that he had spent nine years as an architectural assistant and had been brought up on a diet of modernism. He reflected that his enthusiastic approach to work could be explained by his working class background. The consequent fear of unemployment was his stimulus. Referring to Harry Peach, he said that Dryad was the natural focus for all designers of his generation. He recalled Julian Binns, son of John, a director of Dryad, some of whose current Directors were present at the lecture.

The title of this lecture arose from an exhibition of Mr Grange's work, held at the Boilerhouse. He had retired from Pentagram two years ago and whilst clearing out his archive he realised how much he had hoarded through the years. He had never learned to draw and therefore only ever made models. He had kept all these models and thus his archive material just grew. One of his partners suggested that there was sufficient material for an exhibition and so the idea took shape.

Kodak was one of his main clients and through it Pentagram was started. His design for the Kodak Instamatic camera which was Kodak's best seller ever. His connection with Kodak taught him all he needed to know about manufacturing and such firms were wealthy and therefore generous. Kodak's approach to

design was a good example of what was taking place in industrial design at the time. In the 1960s anything his generation designed would sell because the 2nd World War had stopped progress in the field of design. British manufacturers were leaders in modernism and no other company other than Braun could match the designs of Kodak. In the 1960s the design for a Bosch washing machine was very primitive.

Mr Grange reflected on how the world position of designers from

the U.K. has changed today. The lesson he has drawn from this is that one can never be secure in life. We have, he commented, 'lost sight of owning the pride of innovation'. He gave an account of some of the main items he has designed. They included;

The radio for Murphy which today would be regarded as very stylish.

The Kenwood Chef which he designed in three days and produced an impressive half model which was immediately accepted. He advised Kenwood that post modernism was the way forward and it was becoming an important influence but this did not always result in producing items which sold well.

The Wilkinson 'Retractor' razor which is still in production.

There followed an account of items he designed which had not been successful and had not adopted by manufacturers. Amongst these were:

A design for the Eurostar train which looked like his earlier successful design of the HST. However, the Europeans didn't want a British-looking train.

The PM toaster of which only 100 of 30,000 was sold.

The 'Net chair' for British Rail. It met the criteria for light weight, comfort, and ventilation. However it could easily be vandalised with a Stanley knife.

The lecture was liberally illustrated with amusing anecdotes and recollections. Mr Grange summed up what in his opinion was the reason for the success of Pentagram. There was a belief

amongst the partners that ideas and experience should be shared. The five original partners encouraged one another to take free jobs based on the philosophy that you took these because you wanted to. In order to attract young designers into the firm, they abandoned the idea of having to buy into the practice and the firm has grown enormously on this philosophy with the 'non-selling' of good will.

The vote of thanks to Mr Grange was given by Professor Robert Burgess, the Vice

Chancellor of the University of Leicester. Professor Burgess who observed that the Peach Lecture was a further demonstration of the continuing close ties between the

University and the Leicester Literary and Philosophical Society.

THE MILLENNIUM ATLAS: COMINGS AND GOINGS AMONG BRITISH BUTTERFLIES

Richard Fox,

Surveys Manager, Butterfly Conservation

Lecture delivered on March 24 2003

In 1995, Butterfly Conservation launched a new nationwide survey of butterflies. Within five years, Butterflies for the New Millennium (BNM), as the project was known, had become the largest and most comprehensive survey of butterflies ever undertaken in Britain and Ireland.

However, this was not the first survey of our butterflies. The first account of British butterflies was written in the same year as the Great Fire of London and the popular appeal of this small group of insects has gone from strength to strength ever since. Nowadays, there are scientific benefits of butterfly recording because butterflies are good indicators of subtle changes in our environment and could be used to assess the health of our countryside and urban areas.

Between 1995 and 1999, scores of conservation organisations and some ten thousand volunteers and members of the public took part in the BNM survey. This army of volunteers generated 1.6 million sightings and the most accurate picture ever of the state of Britain's butterflies. The findings were published in The Millennium Atlas of Butterflies in Britain and Ireland.

Specialists and generalists

The main comparison drawn in the new atlas is between the BNM survey and that of a previous national survey (1970-82) and the most important finding is that many butterfly species declined during the final decades of the twentieth century.

Most of the declining species are ones that ecologists would term habitat specialists. They are the butterflies of unimproved meadows, heaths, chalk downs and ancient woodland. These species can only survive where habitat and climatic conditions are exactly to their liking. Many of them are also dependent on human activity and thrived for centuries under traditional forms of agriculture and forestry. The Adonis Blue is an example of a habitat specialist species. Its larvae feed only on Horseshoe Vetch, a plant of unimproved chalk and limestone grasslands. Thus, larval

diet immediately limits the distribution of the Adonis Blue, as much of Britain does not have suitable geology and even where it does, much chalk and limestone grassland has been replaced by other land uses. However, the situation is more complicated than this. The butterfly is also very sensitive to climate, and can survive normally only on the warmest, south-facing slopes where the turf is grazed very short allowing the ground to bake in the sun.

About half of our 56 resident butterflies are considered to be habitat specialists. The rest, the common, widespread butterflies, are called wider countryside species. These are generalist species whose larvae eat a wide range of plants (as is the case with the Green-veined White) or eat plants that are themselves common and widespread (such as the nettle-feeding Peacock butterfly). In addition to the dietary tastes of

their larvae, generalist butterflies tend to be far more mobile and far less climatically sensitive than the specialists.

The Millennium Atlas shows a clear difference between the fortunes of these two groups of butterflies over the past 20-30 years, with most habitat specialists declining, while the distributions of many wider countryside species have expanded or remained stable.

The High Brown Fritillary, for example, is a specialist butterfly that was once widespread in woodlands across England and Wales. It thrived where the traditional practice of coppicing created a regular supply of sunny clearings with the warm, sheltered conditions essential for both the larvae and their foodplants, violets. In recent decades, the High Brown Fritillary has undergone the most severe decline of any species and has been lost from 77% of the 10 km national grid squares in which

it was recorded in the 1970s. It is now restricted to only 50 sites.

Other specialist butterflies have suffered similarly spectacular declines. The distributions of the Wood White, Pearl-bordered Fritillary and Marsh Fritillary have all decreased by more than 50% since the 1970s.

Only one habitat specialist, the White Admiral, has undergone a substantial national range expansion over the same period. This species, which favours shady woodland, had declined in the 19th century but began to recover in the 1930s and 1940s. This re-expansion has continued to the present day and this species should become more common in Leicestershire over the coming years, especially if broad-leaved woodland habitats are encouraged.

In contrast, the distributions of many wider countryside species have expanded or remained stable. The Essex Skipper has shown the greatest percentage increase in range: 139 % since the 1970s. This butterfly colonised much of Leicestershire during the 1990s and is now continuing to spread northwards and westwards into neighbouring counties. The first ever Nottinghamshire record of the species was made in 1995 and, that for Derbyshire as recently as 1999.

All is not completely rosy though amongst the wider countryside species. There is strong evidence that some of our common species (e.g. the Small Copper and Small Heath) have declined locally, although their distributions have changed little at the national level. The Wall is the only wider countryside species to show a

substantial decline in its national distribution since the 1970s. Whilst it is still a widespread butterfly in Leicestershire, the Wall has disappeared from a large and well-recorded part of southern England.

The longer view

Historical records dating back over 200 years, show that five species that have become extinct during the period (the Black-veined White, Large Copper, Mazarine Blue, Large Blue and Large Tortoiseshell), a quarter of our butterflies have suffered severe declines (>50% decrease in distribution) and a further quarter have undergone substantial declines (>20% decrease).

Why are butterflies declining?

Three main factors have led to the declines of our butterflies. The widespread destruction of habitats is foremost amongst these. For example, 80 % chalk and limestone grassland has been lost in Britain since the 1940s. Even the network of hedgerows, which provides breeding habitat for many wider countryside species, has been severely reduced.

The second major factor is changing land management, particularly the decline of traditional forms of forestry and agriculture. For example, many threatened butterflies are dependent on low levels of grazing, but cannot tolerate extremes. European subsidies and crises such as BSE and Foot and Mouth disease have led to just such extremes. As a result, some semi-natural grasslands have been abandoned by farmers, leading to an immediate loss of the short turf

conditions needed by specialist butterflies such as the Large Blue. At the other extreme, overgrazing has adversely affected some butterfly habitats, particularly in upland areas.

Many woodland specialist butterflies have suffered declines, as their habitats have become more shaded and overgrown following the abandonment of coppicing in most broad-leaved woodlands.

The third major cause of butterfly declines is the fragmentation of remaining habitat. This places surviving butterfly populations at further risk of extinction due to chance events (e.g. fire or disease) or inbreeding.

Global warming

The main factor causing wider countryside species to expand their distributions is climate change. Average summer temperatures have increased by 1°C in the past 25 years, a substantial increase for climatically-sensitive insects such as butterflies. Most of the expanding species use habitats that are still relatively common, such as hedgerows, roadside verges and woodland edges. They are also relatively mobile butterflies and have been able to move through the landscape, tracking climatic change and capitalising on recent favourable weather.

The Millennium Atlas and conservation

The butterfly records collected for the Millennium Atlas form an unprecedented data set with many potential applications to support nature conservation. Of particular importance is the opportunity to reassess the Government's

priorities for the conservation, listed in the UK Biodiversity Action Plan (BAP). The severity of declines recorded in the Millennium Atlas suggests that some BAP species, such as the Brown Hairstreak, require increased priority, while other rapidly declining species, including the Dingy Skipper and Dark Green Fritillary, should now be included in the plan for the first time.

At the basic level, the Millennium Atlas data set contains the precise locations of butterfly populations. This is vital in local nature conservation, feeding into local government policies (such as Local Biodiversity Action Plans), informing the planning process and allowing direct conservation action through, for example, habitat management and site designation.

Scientific research

The data set also provides a powerful tool for a wide range of research and data are already being used in research to predict the responses of our wildlife to climate change. With the warming climate, we would expect butterflies to move to higher altitudes and to higher latitudes and the Millennium Atlas provides clear evidence for both. Northern butterfly species, such as the Large Heath have tended to go extinct at low-lying sites and colonise higher sites while, as already mentioned, considerable northward range expansions have been recorded for some southern species. With the Millennium Atlas data, we have been able to show that these range expansions are due to climate warming and, importantly, that even common and mobile butterfly



species (such as the Speckled Wood) are failing to keep track of climate change. The reason for this inability to keep pace is that even the widespread habitats used by these butterflies have been much reduced and fragmented by human activity. This worrying result explains why the majority of our butterflies, which are less mobile and have more specific habitat requirements, have failed to capitalise on the warmer climate by expanding their ranges.

These findings have implications for the long-term conservation of the British butterfly fauna. Many populations of habitat specialists already appear to be isolated on remaining patches of suitable habitat, and will be unable to track shifting patterns of climate and vegetation. The fact that habitat fragmentation is also limiting the responses of wider countryside species to climate change is of great concern.

The future for our butterflies

Many butterfly species have declined and will continue to do so unless we take action to address the causes of these declines.

Action is needed on many fronts, but agricultural policy is seen as a key one for butterflies and other wildlife. Farmers play a vital role in maintaining our landscape and wildlife but we must change the policies that have led agriculture to be the most serious threat to our butterflies over recent decades. Initially the focus of this has been through agri-environment schemes, which provide financial support for farming that enhances or maintains wildlife.

The butterfly survey has also highlighted the importance of brownfield sites for declining species (e.g. Dingy Skipper and Grizzled Skipper). Brownfield sites, such as disused railway lines, spoil tips, abandoned industrial sites and old quarries are often targeted for redevelopment without full recognition of their wildlife value. Such sites are also threatened by well-intentioned but ecologically disastrous landscaping. Local groups can play an important role in identifying and protecting brownfield sites that support diverse wildlife communities.

One of the biggest challenges is

the need to move away from the old fashioned view of conservation as something that only happens on nature reserves and to develop a new landscape-scale approach to conservation. Nature reserves, whilst remaining important as carefully managed refuges for highly endangered species, cannot and should not be sole focus of wildlife conservation. We need to conserve and restore habitat networks across the landscape if we are to halt the declines of butterflies and to allow species to move in response to the changing climate.

In conclusion

The distributions of butterflies in Britain have undergone major change during the last two centuries, with particularly heavy losses over the last 50 years. The Millennium Atlas has provided an unprecedented amount of information on how distributions

have changed and a valuable new database that can be used to support conservation. It also provides a detailed baseline against which future change and the success of Government policy can be measured.

There is little doubt that butterflies will continue to change in the future. Butterfly Conservation will continue recording and monitoring schemes so that up-to-date information is always available to inform local and national policy and practise. Anyone can help! Recording butterflies is easy and a rewarding way to spend a few hours on a spring or summer day, so please get involved. More information about the BNM recording project is available at www.butterfly-conservation.org in the 'conservation' section or by contacting the Leicestershire co-ordinator Adrian Russell (adrian@wainscot.demon.co.uk or 0116 241 5101).

British butterflies constitute a very small group – there are ten times as many butterfly species in continental Europe and nearly 500 times as many other invertebrate species in Britain. Nevertheless it is almost certainly the best studied insect fauna in the world and the Millennium Atlas shows how butterflies can be used as flagship species to raise the profile of insect conservation and to highlight the important role that volunteers play in increasing scientific knowledge.

Further reading

Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G. & Jeffcoate, S., 2001. The Millennium Atlas of Butterflies in Britain and Ireland. Oxford University Press, Oxford.

www.butterfly-conservation.org/species

Recurrent Patterns of Bird Territories in Welford Road Cemetery, Leicester Between 1972 and 1985

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Abstract

Using the method employed for a study of Home Park (Middlesex) it was shown that, for each of 11 species of birds located in the Welford Road Cemetery, Leicester between 1972 and 1984 there was a constant annual pattern of territories. These were defined as 'traditional'. Those few 'interloper' territories which did not fit into the pattern were occupied usually for one year only, and were termed 'inserted' if they impinged on the pattern, or "remote" if they did not. It was found that insert territories occurred when species' densities were high. Remote could occur at any time and were probably displaced or 1st year pairs. Traditional territories were further broken down into two classes, depending on the number of years a territory was occupied. To discover any habitat preferences, the class with the higher occupancy percentage was compared to habitats, but no conclusions could be drawn.

Introduction

McNeil (1995) analysed the common bird census returns from a study site in Home park (Middlesex) by plotting the central points of each species' annual territories, for each year the work was carried out, on to species maps. He found that these points defined 'perennial' territories. He concluded that these were 'traditional sites' which were occupied for a number of years. In some years they may be abandoned or included into a neighbouring territory, but then could be re-occupied in another year.

Because of the feeding activities of deer, Home Park has no scrub layer. Welford Road cemetery (Leicester), which was concurrently censused for 15 consecutive years, has a managed scrub layer. Using data from this site, a second analysis was undertaken to discover if the presence of a scrub layer affected the results obtained from Home Park.

Location

A description of the site and the varied management of the field layer within its boundaries is given in McNeil (1994). It is roughly rectangular with the long axis running east to west, and slopes downwards towards the north. From north to east it is bounded by the railway, Welford Road, and University Road; the eastern boundary was originally allotments; then a bowling club; then a university car park; and is now occupied by the university medical block.

Methods

The common bird census of the British Trust for Ornithology required at least eight visits to a selected site, evenly spaced out (ideally at 10 day intervals) during the spring and early summer. All the species encountered were mapped, together with indicators showing any breeding activity (singing, nests, mating, carrying nesting material, etc.), on separate visit

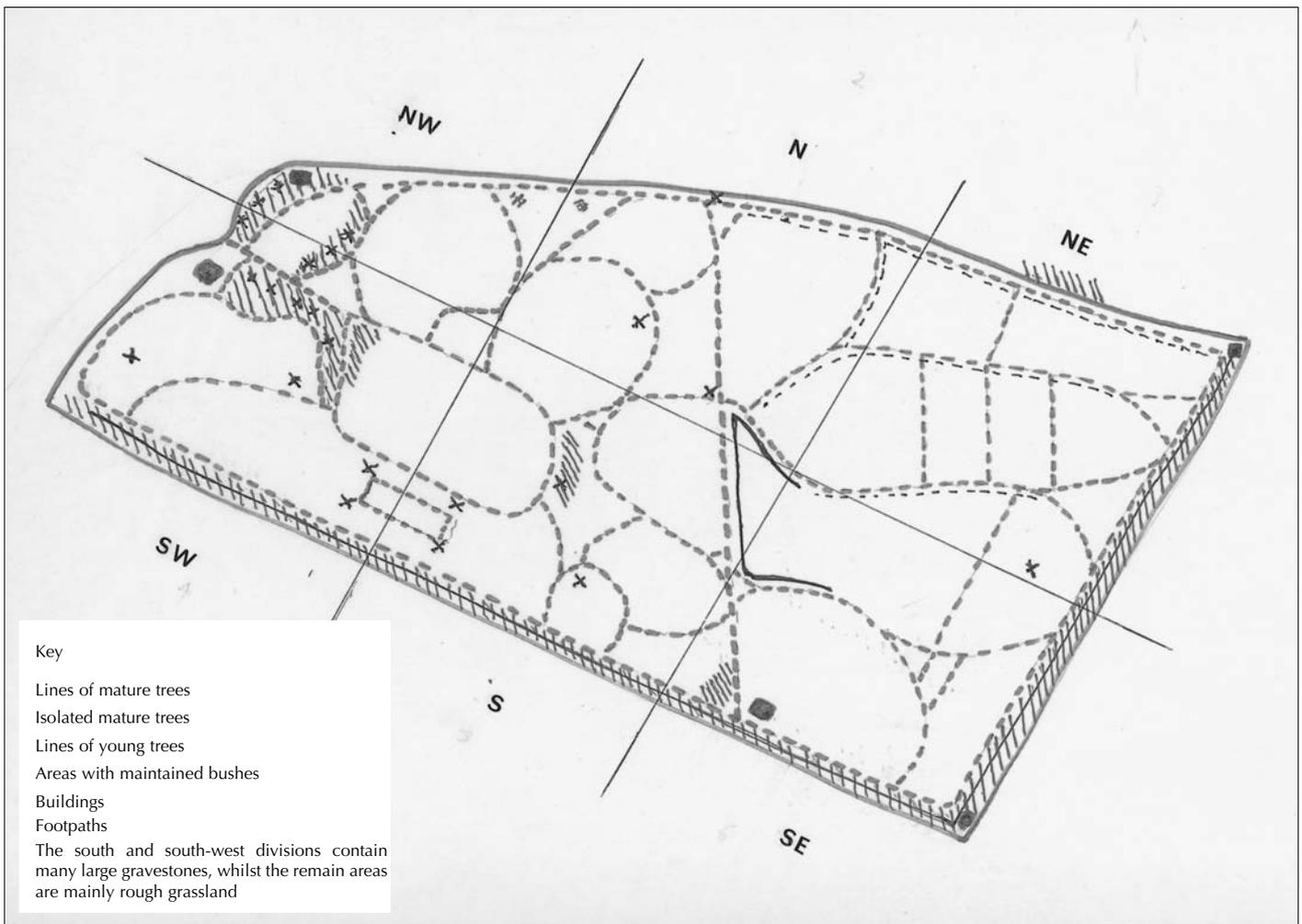


Figure 1 - Welford Road Cemetery, showing principal areas of vegetation and arbitrary divisions used in the analysis

maps. At the end of the season records for each species were extracted from the visit maps and plotted onto species maps; these were then analysed by the BTO staff. This analysis involved identifying groups of records which would appear to relate to the same pair of birds recorded at different times (Marchant 1983). The method does not accurately record territory size; however, in territorial species the nearer the centre of a territory is approached, the higher is the probability of encountering the 'owner', and conversely the lower the chance of meeting an intruder. For this study, therefore, the centre of a territory was taken as within that area where the "owners" were most often recorded.

At the time this work was carried out records of Wood Pigeons, Starlings and House Sparrows were not analysed by the B.T.O. staff, so no records were kept of these species.

For this study all the species maps relating to Welford Road cemetery were borrowed from the Trust, so all the annual territories are those they recognised, and are thus not the subjective creations of the author. Using approximate centres of each of the annual territories for each species, it was found that perennial groupings could be outlined, exactly as in the annual studies. The mean number of annual records per perennial territory was computed, and used with chi-squared tests to classify the annual occupancy of each perennial territory as significantly below the mean ('interloper'), mean ('average'), or high ('traditional').

An interloper territory was further defined as an 'insert' if it occurred adjacent to or within a traditional or mean territory. If it were 'remote' it did not. In some species where the entire cemetery was covered by traditional and mean territories there could be no remote territories. _

These analyses require a relatively stable, territorial population. For semi-colonial species the centres of their annual groupings and numbers were used to determine if there were any bias towards any part of the cemetery. For the purposes of comparing territories with habitats, the cemetery map was divided into six regions (NW, N, NE, SW, S, SE), the traditional bird territories listed for these regions together with the main vegetation types and the presence/absence of buildings.

Results

Table 1 shows the results of the full classification of perennial territories for 11 species by the methods described above.

Species	Interloper Insert	Interloper Remote	Average	Traditional
Collared dove	0	0	1	1
Dunnock	2	1	1	6
Robin	4	*	7	3
Blackbird	5	*	10	13
Mistle thrush	0	0	0	1
Song thrush	6	*	3	8
Spotted fly	2	1	2	3
Blue tit	2	1	4	3
Great tit	0	1	4	3
Coal tit	**	2	0	1
Carrion crow	0	0	1	1

Table 1 Classifications of the Territories of Individual Species

*entire cemetery was covered by territories; by definition, it is not possible for a remote territory to exist. ** only one territory, so neither interloper could be an insert territory.

Another eight species could not be analysed for interloper territories for the following reasons:

Habitat disturbance – wren (see McNeil (1994))

Increasing – redpoll, stock dove

Decreasing – chaffinch

Too few annual records – tree sparrow, goldcrest, willow, warbler, blackcap

These are omitted from table 1.

Insert territories could be examined for density effects for six species. In each case insert territories occurred when the number of occupied territories was the high; only in the blackbird and song thrush were some territories recorded when populations were only moderate. In contrast, remote territories for the spotted flycatcher and the great tit did not show strict adherence to this condition, though those for the blue tit and dunnock did.

Three species - goldfinch, greenfinch and linnet - are semi-colonial. The distribution of colonies showed that the goldfinch has an eastern bias, whilst the other two have western ones.

Table 2 lists, for all species which held territories in the cemetery, the distribution of traditional territories in each of the six areas into which the cemetery was divided, whilst table 3 lists the types of habitat found in these areas.

	NW	N	NE	SW	S	SE
Stock dove		x				
Collard dove					x	
Wren	x		x	x	x	x
Dunnock	x		x	x	x	x
Robin			x			x
Blackbird	x	x	x	x	x	x
Mistle thrush	one	very	large	ter-	ri	tory
Song thrush		x	x	x	x	x
Willow warbler			x			
Black cap			x		x	
Goldcrest					x	
Spotted fly		x	x		x	
Blue tit	x		x	x		x
Great tit	x	x		x	x	
Coal tit					x	
Carrion crow	x	x		x	x	
Tree sparrow					x	
Chaffinch			x		x	x
*(Greenfinch)	x	x	x	x	x	
*(Goldfinch)	x	x	x	x	x	
*(Linnet)	x	x		x	x	x
Redpoll			x		x	
Totals	9	9	13	10	16	9

Table 2 - Bird species with traditional territories occurring in each of the six divisions

*Those species in brackets are colonial, and only the distribution of colonies is shown.

Habitat Type	NW	N	NE	SW	S	SE
Line Mature trees			x	x	x	x
Isolated mature trees	x	x		x	x	x
Line young trees			x			
Bushes	x		x	x	x	x
Rough grass	x	x	x			x
Many gravestones				x	x	
Buildings	x		x	x		x

Table 3 Principal Habitat types in the six divisions

Of those divisions which support the least variety of bird, the north division has only two main types of habitat, whilst the north-west included the smallest physical area. Only in the latter area were House Sparrows detected breeding.

The data do not support the hypothesis that the variety of habitat types is the only criterion on which the number of species were based. Other factors must be involved. For coal tit and goldcrest the presence of fir trees in the south division is an important factor, whilst, also in the south division, the presence of areas of close-mown grass may influence some species.

A closer analysis by species did not reveal any recurrent associations with habitat types. There appeared to be an association between wrens and blackbirds with lines of mature trees, bushes and open rough grassland, but other results were purely co-incident, as between great titmice and the presence of many gravestones, or the absence of buildings and the chaffinch.

One of the findings from the work on Home park was that young trees there supported no bird populations at all. It is perhaps of interest to note, therefore, an apparent association between both robins and redpolls (and perhaps the willow warbler) with young trees in this study. No definite conclusions could be drawn, however.

Conclusions

This study shows that the findings in Home park, where the shrub layer was systematically destroyed by the activities of deer, could be extended to an area where the shrub layer existed but was closely controlled by the activities of man. Whilst in both locations the distribution of trees planted by man also plays an important role in the distribution of birds, this was a on a much longer time-scale than this study and could safely be ignored.

McNeil (1994) has already shown that the maintenance of rough grassland does not influence the populations of species found in Welford road cemetery, and these species were much the same as those found in Home park. The present study, using a wider range of habitat types than was available in Home park, failed to associate any one species with any habitat type, and could not even show that the

variety of types had any direct bearing on the variety of bird species contained.

It may be concluded, therefore, that (barring hurricanes) the pattern of bird territories will remain the same over several years in these two sites. Further work will be required to show if this conclusion will apply to cases where the shrub layer is not systematically managed, or over what period of time a pattern will persist.

Acknowledgements

I wish to thank Mr R Thewlis of the British Trust for Ornithology for reading this paper, and for his helpful comments.

References

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McNeil D.A.C. 1995 Breeding Bird Populations in Hampton Court Park, London Bird Report 60 pp 177 - 181

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THE PRESIDENT'S ANNUAL REPORT

Presented at the Annual General Meeting on 28th April 2003

The 2002-3, the 168th season of the Society, has come to a close after a stimulating and varied programme of talks and two important additions to its role.

During the year, I have given a great deal of thought to the purpose and role of the Society in this 21st century. In 1835 when it was founded, there was no TV, no wireless, no telephone network and few trains. The means of communication physically and mentally were few: There were only three universities in England - Oxford, Cambridge and the fledgeling Durham (1832), although in Scotland there were four universities serving a population a fifth of the size of England. But there was a thirst for knowledge in England with the industrial revolution changing the employment patterns, there was an urgent need for fora which satisfied this thirst for knowledge and discussion of ideas. The Leicester and other Literary and Philosophical Societies helped to fill the gap and developed a format of proceedings which have served their constituencies well in the years of their existence.

With all manner of communication so readily available, free Open University lectures on BBC 2 for example and, if one chooses carefully, extremely good historical and scientific programmes on various TV channels, has the Lit and Phil a role today?

However, TV programmes do not create a memorable social occasion and the Society's programme does, offering a forum where the like-minded can meet, listen, reflect and ask questions and discuss over coffee afterwards the topics offered. Looking at the programme of lectures presented over the last 10 years, there has been a theme this has been meeting C.P.Snow's Two Cultures - bringing the arts to the scientists and the sciences to those educated in the arts. That seems to me to be a very worth-while role.

This session we have maintained this traditional mix - with Professor Draper's Pastoral, Professor Verdi's Rubens Allegories of Peace and War, and Professor Peter Welton's talk on his own painting along with Dr. Liz Sockett's Real Genetic Experience, Chaos and Complexity by Dr. Derek Raine and Dr. Juilian Andrews' talk on Sediments of the Humber Estuary, Richard Fox's British Butte~ies and Ram Gidoomal's insight on how the main ethnic communities in the U.K. conduct their business. Professor Gordon Campbell's witty talk on how God has been presented in literature and pictorial imagery, and Steve England's talk on the development of the camera and its journalistic uses, gave us a varied, well-thought out programme.

Some of you attended the really splendid talk given to the schoolchildren by Dr. Lawrence on Exploring the Earth. I watched the young people watching and listening with rapt attention.

We have been fortunate to hear these talks and are grateful to the speakers.

I mentioned two additional roles undertaken this year. The Henry Swain Bennett Research Fund was

re-activated and three post-graduate students of the Department of Chemistry, University of Leicester each received £100 to assist them in their studies.

Mr Wayne Eltringham is studying Asymmetric Hydrogenation using supercritical fluids **Miss Nicola Emma Durling** who is studying Solvent Effects on Reaction Dynamics in Superficial HFC Fluids, and **Mr Raul Calder Morales** who is studying Heterocyclic Compounds in the invention of new drugs for the pharmaceutical industry. When they have completed their PhD theses, an abstract will be published in the Society's Transactions.

The second additional role was the organisation and administration of the Harry Hardy Peach Memorial Lecture for which we now responsible in association with the University of Leicester. Dr Kenneth Grange CBE, RDI talked about his work as an industrial designer to a varied audience including students of ergonomics from Loughborough University. I record my particular thanks to Mrs Alwyn Dean and Mrs Hilary Lewis for arranging the event.

Without the active support of the Officers and Council none of our activities would come about. I

thank the Council for their support and the Officers for the time and effort they give on our behalf:

The Honorary Secretary, Dr. Davinder Sandhu who, on taking the role of Acting Dean of Medicine has reluctantly resigned. He will remain on Council and we wish him a trouble-free time as Acting-Dean.

The Hon.Membership Secretary Mrs P. L.Silver who quietly and efficiently ensures that our membership list is up-to-date and served.

The Hon.Progranune Secretaries, Dr.Geoffrey and Mrs Hilary Lewis who spend an enormous amount of time assembling our lecture programme and looking after our speakers.

The Hon. Treasurer, Mr B.D.Beeson who not only keeps our accounts in order but, like all good treasurers, keeps a wary eye on our investments and is always ready to advise Council on how best to achieve their aims within resources available.

Our Independent Assessors, Messrs K Smithson and D Barker ensure that we meet legal requirements.

The Hon.Editor of Transactions, Professor M.Aftab Khan, performs a fairly thankless task chasing our speakers for an abstract of their talks and assesmbling them with patience.

Our bodies and souls are kept together with post-lecture coffee and biscuits supplied and organised so effectively by Mrs.Beeson. To all these we offer out most sincere thanks.

Fortunately, five of our lectures are sponsored. This ensures that your subscriptions are kept low. The sponsors are: The Leicester Mercury, The De Montfort University, The University of Leicester Book-shop, The Royal Society of Chemistry and the British Association for the Advancement of Science. We are grateful to them.

Finally, thank you the membership for your loyal support. May I ask each one of you to introduce a new member for next session, thereby keeping the Society alive and well and bringing its offerings to a wider audience.

Programme for the 2001-2003 Season

Except where indicated, all lectures were held in the Art Gallery of the City Museum, Leicester, on Mondays at 7.30 p.m.

October 7, 2002

AN APPROACH TO VOCATIONAL EDUCATION

President's Address
Open meeting followed by a social gathering
The Lord Mayor was present.

October 21, 2002

THE PASTORAL

Professor R.P.Draper
Professor Emeritus , University of Aberdeen

November 4, 2002

DOING BUSINESS WITH BRITAIN'S ETHNIC COMMUNITIES

Mr Ram Gidoomal,C.B.E.
Chairman Winning Communications Partnership

November 18, 2002

THE UBIQUITY OF BLUE

Professor Peter Welton Emeritus Professor of Fine Art, DeMontfort University
(Sponsored by DeMontfort University)

December 2, 2002

RUBENS'S ALLEGORIES OF PEACE AND WAR

Professor Richard Verdi
Professor of Fine Art and Director of the Barber Institute of Fine Arts

December 18, 2002 (Wednesday)

LECTURE FOR SCHOOLS EXPLORING THE EARTH: a view of the world from space

Dr S.Lawrence, Space Research Centre
University of Leicester

Held in Rattray Lecture Theatre, University of Leicester. Admission by ticket only.
(Sponsored by The Leicester Mercury)

January 13, 2003

**'REAL' GENETIC ENGINEERING:
Using genetics to examine the natural nano-
scale engines of bacterial flagella**
Dr Liz Sockett
Institute of Genetics
Queen's Medical Centre, Nottingham
(Sponsored by the Royal Society of Chemistry)

January 27, 2003

GOD: a literary and pictorial history
Professor Gordon Campbell
Dept of English, University of Leicester
(Sponsored by Leicester University Bookshop)

February 10, 2003

FROM PLATE GLASS TO DIGITAL
Mr Steve England, Chief Librarian, Leicester
Mercury and Dr Michael Crowe, Retired
General Practitioner
(Sponsored by the Leicester Mercury)

February 24, 2003

**NEW USES FOR OLD ESTUARIES:
RECONSTRUCTING THE HOLOCENE HUMBER**
Dr. Julian Andrews,
School of Environmental Sciences, University of
East Anglia.
(Joint Lecture with the Geology Section)

March 10, 2003

**ANTS AND BUTTERFLIES IN THE GAME OF
LIFE**
Dr Derek Raine
Dept of Physics, University of Leicester
(Sponsored by the British Association for the
Advancement of Science)

March 12, 2003 (Wednesday 5.30p.m.)

**HARRY HARDY PEACH LECTURE
(Open to members of the public)**
Held in association with the University of
Leicester
MORE FEAR THAN TALENT
Mr Kenneth Grange, C.B.E.
Industrial Designer & founder of Pentagram
Design
**Held in the Kenneth Edwards Building,
University of Leicester (5.30pm)**

March 24, 2003

**The Millennium Atlas: comings and goings
among British butterflies**
Richard Fox, Surveys Manager, Butterfly
Conservation
(Joint Lecture with the Natural History Section)

April 28, 2003

ANNUAL GENERAL MEETING (7.00p.m. start)
Followed by a recital by Sara Norris, mezzo-
soprano and Moira Finch, pianist

ANNUAL REPORT OF THE GEOLOGY SECTION

Officers 2002/2003

Honorary Life President: Dr Bob King
Honorary Life Vice-President: Dr Trevor Ford O.B.E
Chairman: Andrew Swift
Vice-Chairman: Mark Evans
Secretary: Joanne Norris
Treasurer: Doug Lazenbury
Field Secretary: Dennis Gamble
Acting Publicity Officer: Mark Evans
'Charnia' Editor: Graham Stocks
Student Representative: Kay Hawkins

Committee

Dr Roy Clements
Dr Mark Purnell
Professor Andy Saunders
Keith Smithson

Co-opted:

Margaret East
Dennis McVey
Paul Monk

2002–2003 was another very successful year for the
Section which, encouragingly, saw a steady increase

in membership numbers to 137. The officers and committee showed their commitment to the cause by regular attendance at committee meetings and by willingly undertaking duties which have kept the wheels turning smoothly. Both winter and summer programmes ran very successfully, and the standards we are setting must be the envy of many other groups.

The summer programme saw us ranging the country as usual. In a departure from normal procedure, we began the season in mid-May with the weekend field trip, which was based in Lyme Regis for excursions to the Dorset Coast, led by the Chairman, Andrew Swift. It was a marvellous weekend, and more excellent geology was seen in our other trips. The next one on June 23rd saw us re-visiting one of our favourite haunts at Blockley Quarry, led by Mike Howe and Pete Blake. The evening excursion of July 24th was rather unusual, and involved a geological ramble around Welford Road cemetery led by Helen Boynton, looking at the geology of the monumental masonry. This one attracted a large turnout and much interest was shown. On August 3rd we visited another of our old haunts, Southam (Long Itchington) Quarry near Rugby, a locality which never disappoints, and on this occasion the visit attracted an attendance of 27, a record for a one day trip in recent years. Andrew Swift again led that one. In early September we had a special treat, when Roger Mason, who first reported Charnian fossils from Charnwood as a schoolboy in 1957, returned to Leicester from China to lead (with Helen Boynton) a commemorative field trip to the scenes of his world famous finds of 45 years earlier. This one was run in conjunction with the British Association Festival of Science week based at the University; the Section was fully involved and received much favourable comment. And finally, our last visit of the season was to Warwick Museum and Edge Hill Quarry with Jon Radley from the Warwickshire Museum, on a beautiful late September day.

The winter programme ran without a hitch although we had to do a double shuffle to get a speaker for the Parent Body talk on February 24th, when we lost not one, but two, previously arranged speakers. In the end we were fortunate to get the services of Julian Andrews from the University of East Anglia, who gave an excellent talk. Attendances at indoor meetings were very encouraging, and up yet again on previous years. The Saturday School made a very

welcome return to the programme this year on March 1st at Vaughan College, and the topic of hominids and climate proved extremely popular, with applicants for tickets being turned away after we'd sold the permitted 80+ tickets. The Christmas meeting was enjoyed by all, but perhaps the most satisfying event of the winter programme was a very popular Member's Evening on February 12th, when we got our best attendance for many years.

Other important landmarks during the year were the long-anticipated launch of the Section C website, Charnia, in December. Great credit must go to Dennis McVey for his exhaustive efforts in putting together a very impressive site. The e-mail circulation list continued to grow in size and importance and has now assumed a major role in the dissemination of information and reminders to members. These days our newsletter Charnia is almost unrecognisable from its earlier photocopied incarnation, and is a credit to the Section.

Finally, there were two special occasions for the Section in this session. First, a happy one, which was the 80th birthday on March 18th 2003 of Bob King, our Life President, who was so influential in laying the foundations of the successful Section we have today. We wish Bob many more birthdays. The other was rather sadder for the Section, and that was the retirement of Doug Lazenbury from the Treasurer's post he has occupied with distinction for over 10 years, a retirement which took effect at the AGM on March 26th.

Summer Programme 2002

Friday May 17th - Sunday May 19th

Jurassic localities on the Dorset Coast. Based in Lyme Regis.

Leader: Andrew Swift

Sunday June 23rd

Lower Jurassic of Blockley Quarry, near Moreton-in-Marsh

Leaders: Dr Mike Howe and Pete Blake

Wednesday July 24th (evening)

The monumental masonry of Welford Road Cemetery

Leader: Dr Helen Boynton

Saturday August 3rd

Upper Triassic and Lower Jurassic of Southam (Long Itchington) Quarry, near Rugby

Leader: Andrew Swift

Sunday September 8th (in conjunction with the British Association)

The Precambrian fossils of Charnwood

Leaders: Professor Roger Mason and Dr Helen Boynton

Saturday September 28th

Warwick Museum and Edge Hill Quarry

Leader: Dr Jon Radley

Winter Programme 2002 – 2003

2002

Wednesday October 9th

Derek Pullan (Department of Physics & Astronomy, University of Leicester) - 'In-situ analysis of the Martian surface with Beagle 2'

Wednesday October 23rd

Professor David Keen (Centre for Quaternary Science, School of Natural & Environmental Science, University of Coventry) - 'The Quaternary of the Midlands: how many glaciations and where did the rivers go? Some revisions of traditional views'

Wednesday November 6th

Dr Bill Murphy (School of Earth Sciences, University of Leeds) - 'Earthquake-triggered landslides'

Wednesday November 20th

Dr Paul Smith (Unit of Earth Sciences, University of Birmingham) - 'Microvertebrates and macroevolution - unravelling the origin and early evolution of vertebrates'

Wednesday December 4th

Professor Mike Lovell (Department of Geology, University of Leicester) - 'Petrophysics in the freezer: physical properties and behaviour of gas hydrates'

Wednesday December 18th

Christmas meeting, held at the New Walk Museum, Leicester

2003

Wednesday January 15th

Dr Peter Long (ex-Department of Biology, University of Leicester) - 'When did the wrinkles come? Pre-Ice Age life in and around the southern North Sea'

Wednesday January 29th

Dr Rob Ixer (Unit of Earth Sciences, University of Birmingham) - 'Bronze Age mining under the (ore) microscope'

Wednesday February 12th

Members evening, held at the New Walk Museum, Leicester

Monday February 24th

Parent Body Lecture, held at New Walk Museum, Leicester. Dr Julian Andrews (University of East Anglia) - 'New uses for old estuaries: recreating the Holocene Humber'

Wednesday February 26th

Professor Ian Smalley (Leicester and Trent universities) - 'Loess for geologists; looking at the early history of a controversial material'

Saturday March 1st (whole day)

Saturday School, Vaughan College, Leicester. 9.30 am - 5.00 pm. 'Climate and hominid evolution'. Speakers included Professor Chris Stringer, Professor Leslie Aiello and Professor Peter Andrews.

Wednesday March 12th

Dr Alan Wright (Ashbourne, Derbyshire) - 'Problems in dating the English and Welsh Late Precambrian'

Wednesday March 26th

AGM and Chairman's address - Andrew Swift (Department of Geology, University of Leicester) - 'Geological highlights of the Midlands, I – Bantycok Quarry, Newark'

HOMINID EVOLUTION AND CLIMATE

The climatic constraints on the success or failure of hominid lineages

Report by Dr Andrew Swift on the

Saturday School symposium held at Vaughan College on March 1 2003

On March 1st 2003 the latest in the long running series of collaborations between the Geology Section of the Leicester Literary & Philosophical Society and the Department of Lifelong Learning took place at Vaughan College, in the shape of a Saturday School symposium which focussed on the impact of climate and climate change on the evolution of human lineages.

Surely there are few more fascinating and fundamental questions as those which we humans ask ourselves about our past - what factors influenced our evolution? How did our prehistoric ancestors and other hominid species respond to the world they found themselves in? What happened in the early stages of our evolution to make the human being what it is today? Perhaps we also ask such questions about our neanderthal cousins. Such mysteries seem to be at the core of our humanity and this meeting addressed many of these questions. Five of the leading experts in the field of hominid studies, Professor Chris Stringer, Professor Leslie Aiello, Professor Peter Andrews, Dr Mark Maslin and Dr Douglas Brandon-Jones, were assembled together in Leicester for the symposium, which was convened and organised by the Chairman of the Geology

Section of the LLPS, Andrew Swift, who is based in the Geology Department at the University. The logistics at Vaughan College were capably undertaken by Diane May and her team. The meeting was enormously successful and attracted a sell out audience of around 90, which was drawn not just from the members of the Geology Section of the LLPS but also from academia, the people of Leicester and many experts and interested students from other parts of the country.

The expert speakers, who were drawn from several UK institutions, did not disappoint the audience and topics discussed ranged from the role of earth movements and mountain building in changing local climate to drive evolution, to the influence of glaciation on human migration, via the reasons for Neanderthal decline and extinction in Europe. Other speakers considered how we can use the composition of the other mammal remains found with hominid fossils to interpret the environment favoured by our distant relatives. The debate went on amongst the delegates during breaks for refreshments and lunch, and the discussion which concluded the day could probably have gone on for very much longer.

Annual Report of the Natural History Section

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Hon. Treasurer	Miss R M Ewen
Hon. Secretary	Mrs G Ball
Hon. Minutes Sec.	Mrs D Thompson
Hon. Programme Sec.	Miss J E Dawson
Hon. Editor	Mrs D Thompson

Committee

Dr A Bevington	Mr A Brooks
Miss D Phillips	Mrs E Penn-Smith
Mr P Tyler	Mrs A Pinnock
Mrs S Walton	Mrs J Harris

There have been two well attended committee meetings this year. A questionnaire about the section devised by Dorothy Phillips was distributed and 26 members responded. The committee will consider the findings.

Members of the Summer Programme Committee were Maggie Frankum, Doreen Thompson, Pat Heighway, Alison Gregory, Jenny Harris, Alan Bevington, Richard Iliffe and Gill Ball. Enough money was raised by the sale of second hand books to members to buy a copy of 'The Millennium Butterfly Atlas of Britain and Ireland' for presentation to the Museum. The need for a sound system for members to hear the speakers more clearly was discussed. A

portable system suitable for the Council Room was found. It would cost about £400. Two funds can be applied for to cover some of the cost. The matter is under further discussion.

Alan Bevington has devised a Web Page and is in the process of setting it up. Letters were sent of the Museum regarding the necessity of the use of the Council Room for our meetings. Thanks are due to Jan for the winter programme and organisation, Doreen for the minutes and newsletter, and Pat and Alison for the coffee.

Lecture Programme 2002

January 9th

Rutland Water enters the Millennium - and how!
Tim Appleton

January 23rd

The Burning of Borneo and Beyond
Dr Sue Page

February 6th

Bee Keeping
Brian Cramp

February 20th

Managing Ulverscroft Nature Reserve
Steve Woodward

March 4th

Joint Meeting with the Parent Body
'From Rainforest to the Eden Project
Sir Ghilleen Prance

March 6th

Museum Exhibition
Nick Gordon

March 20th

A.G.M, Followed by Watervoles in Leics. &
Rutland .
Louise MacAlevey.

October 16th

Member's Slide and Exhibition Evening

October 30th

What we found we didn't know about the Flora
of Assynt
Ian Evans

November 13th

The Red Mason Bee
Dr Chris O'Toole

November 27th

Thirtieth Sowter Memorial 'Conserving Grassland
Fungi
Dr Peter Long

December 11th

Birds of Conservation Concern in the E Midlands
Colin Wilkinson

Summer Outdoor Programme

May 4th

Old Sulehay Forest, Northants.
Nick Owen

May 18th

Short Wood & Glapthorne Cow Pastures
Dr Alan Bevington

May 26th

Buzzing about in a Wildlife Garden Maggie
Frankum

June 23rd

Wymondham Rough
Christopher Glen

July 6th

Asfordby Hill
Peter Gamble

July 28th

Full Day excursion to Castor Hanglands
Chris Gardiner

August 18th

Ashby Canal
Steve Grover

August 31st

Moth Trapping at Groby Pool & Rifle Range
Ivan Pedley

September 14th

Fineshade Wood, Northants
Doreen Thompson

October 20th

Fungus Foray - Launde Park Wood Richard Iliffe

The Average attendance for these meetings was 34

Mrs D Thompson Minutes Secretary
Mrs G Ball Secretary

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The Vice Chancellor of De Montfort University

One representative of the Geology Section

One representative of the Natural History Section

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