

BETWEEN SHOREHAM AND DOWNE:  
SEEKING THE KEY TO NATURAL BEAUTY

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People divide roughly, it seems to me, into two kinds, or rather a continuum is stretched between two extremes. There are people people and things people. I undoubtedly fall on the side of the things. From the earliest childhood I can remember I was content to be making objects, looking at things, playing in silence with no one near. Yet I don't think I was an asocial child. I certainly enjoyed games with others, slap stick, practical jokes, and the making up and enacting of stories which, of course, always involved people or else the objects or animals that were people surrogates. But in the games with others somehow it turned out that I was usually the one out of step and the slowest to pick up the rules, I the most apt to miss my move because day dreaming of something else. Likewise in the stories I made up I laid great emphasis on what I considered an exciting landscape setting, less on the human relations and complexities. My story line was often just a long march of exploration in which my characters—often represented physically by inch-long twigs—would scale the cliff-like mossy roots of an overthrown tree or penetrate the bamboo jungles of the wild grass of a corner of the garden, heroically surviving dangers which were sometimes of a human nature but more often animal or inanimate. Miniaturized landscapes that I could imagine myself to be in and admire from a “tiny” point of view were a passion. (I remember excitement discovering an article on Japanese *bonsai* landscapes in my father's encyclopaedia: at once, of course, I tried *bonsai* cultivation myself but, with neither skill nor patience, all my treerings soon died.)

Corresponding to all this I suspect that fewer of my earliest memories than with most children are of people—of social incidents, friends, adults kindly or hateful, and the like—and more are of dramatic physical and especially visual experiences. As one example, I remember as a startling gift of nature my first sight of how oil spreads on a pool and makes it become alive with colours; how easy it was to cause this magnificent display again with a drop from the household can! I remember as a favourite environment the bare ploughland at the foot of our garden where amid

screaming lapwings I would wander hunting for colourful flint stones and fossils, and how in that same field in summer I learned, for example, that potatoes came from plants with beautiful flowers and later bearing fruits mysteriously resembling small green tomatoes - yet unlike tomatoes poisonous, my mother said, In the same field again after rain I remember how at the lower end, water coursing in the furrows laid out flat deltaic fans of pale silt beautifully marked. Firm underfoot to a first step, if trampled a little, these fans, losing their braided patterns and turning to mud, would suck my bare feet down as if with a living appetite. The shape or colour of a new flower, even a known one seen again, could make me weak with joy. I would stare, long drinking the colours, longing to visit it as a bee, to be somehow joined with it. I realized that such intense feelings were incommunicable to others and generally unshared, even by my siblings. Hence most of the time I kept them to myself, ignoring or making light of them when with company. Of course I didn't think of them then as love, not knowing the adult emotion, but what I am describing are in fact almost exactly the feeling of romantic love and I think it is probably true in us things people that there occurs some aberration of a natural sequence that has been evolved for a purpose of bonding person to person. In us this sequence has grown awry somehow and gained untypical intensity directed towards inhuman objects. Yet the same misdirection, which is so often disastrous socially, leading to whole fields of skills unlearned and therefore later badly applied, can be very helpful in the making of scientist, an engineer, or the like. Thus it is probably not wholly maladaptive. I believe it is in essence an aberration of this kind that makes me a successful scientist.

Love leads to endeavour (often unsuccessful) to understand, predict, and control a loved object. Successful prediction of course is what a scientist always aims for, but unlike with the typical lover he has another objective too which is to generalize and not to be too concerned about any single instance. The people people for their part learn others, both as individuals and in the mass, with intensity equal to the way we learn things. They accomplish their general understanding via an averaging that is not unlike that of the scientist but differs from it in stopping short of principled understanding. People people tend to be satisfied by rules-of-thumb about their fellows, and have little interest to find, indeed distrust as rather inhuman, any system of clear and simple, interlocking principles that might predict human action. Perhaps when the object of interest is humanity, to hope for a simple and principled understanding will

always be illusory. If anyone claims to predict me, I at once try to devise behavior that will confound him: I dislike the idea that I am predictable.

Nevertheless, that some generalization about “normal” human behavior is possible is probably admitted even by the most fanatical anti-hereditarian and, oddly enough, it may be things people who are more able to find the laws. Standing back we may be better placed to notice and understand patterns that other just accept. In this way, at least indirectly, my work may have contributed to generalization even about humans. I am told that politicians say that they have little interest in the new discipline of human sociobiology; whether it right or wrong they say they don't need it since they learned all that it can tell about people long ago—in the market place, in the lawyer's office, or wherever. This is probably true. Through constant interaction they know already how to appeal to people. Probably they have learned much better the manners, the words, and even the lies that sway the mood of a crowd—or indeed sway the warmth of any particular person to judge by the scandals that seem so often to surround politicians. But at the same time they can probably give no explanation for their skill or not any deep one. Politicians are probably the least likely among all the professions to be things people, especially today.

In contrast to this, leaving aside for a moment the scientist, consider necessary attributes for an engineer—a profession which, encouraged by my father who was one, I was also once inclined to. If an engineer is to be creative he must as far as possible concentrate an inward vision on what he means to make and must anticipate in his mind all the difficulties that his design is likely to encounter. In short he must test his construction mentally so far as possible before he even starts to put it together. It is hard to imagine that the intense introspection needed for all this can go on in a busy place with people continually interrupting him. Spatial thought is probably relatively very demanding of neuronal space and activity in the brain just as our 3-D graphics programs are demanding of memory and CPU time in a microcomputer. For scientific modelers the case is doubtless much the same and I am certainly one of these. For such a person it is hard to imagine that even a passive flow of music or poetry into thinker's ears can fail to disturb his concentration. On the other hand, as with the naturalist in presence of the insect, plant or stone, the concentration the engineer brings to bear is also proportional to his involvement in the thing he envisions, his love of it. In some minds this may be so intense that outside stimuli can be shut away. The adaptiveness in the evolutionary

scheme of the engineer/inventor's concentration is obvious enough—such people can build houses, make clothes and live in places that would otherwise be uninhabitable to an erstwhile tropical hairless ape—but even the concentration of the naturalist if moderate in degree probably also becomes understandable when we look back to the importance which hunting, gathering and cultivation have had in our human past. It is probably the things person who eventually, for all the time he seems to waste on “useless” sides of the observation of nature, will read the tapestry of ecology correctly, know how to find in its complexity what matters to human life—what plants grow where and when or can be made to, where the wild quarry of the hunt is likely to move, and so on.

On the basis of these thoughts it seems clear to me that things people constitute, when not so extremely oriented as to be pathological (as with autisms), an integral and adaptively maintained part of the human pattern of variation. Human groups which lack things people may be uncreative, and, even on the social side, may be too Machiavellian for their own good. On the other hand human groups that have things people to the exclusion of all socialites may simply fail to hang together, fail to direct ideas and inventions into cooperative enterprises and useful channels. The weakness of both extremes implies a pressure towards some degree of a mixture—a polymorphism.

So altogether I would like to think. I am saying all this, I guess, to give some justification for a particular lover of things, one lazy dreamer, stone-turner, bird's—nester, flower—picker, butterfly hunter who wandered about my home county, Kent, as a boy.

On the hilltop of the North Downs where I grew up, 200 meters above the level of the not-distant Thames Estuary and English Channel, I experienced, I am sure, a wonderful world for a boy so inclined. My mother and father had bought a house with a small-holding of about five hectares in a part of the first real countryside outside the suburbs to the southeast of London. My father commuted into the capital but did so not quite every day. Following his own bent as an engineer and inventor he had converted a large shed that came with the house, designed for battery chickens, into a workshop. There he built models, tried his engineering experiments, designed tools, and mended absolutely everything that ever broke down in our set of increasingly antique possessions. Hoping that his boys would follow his footsteps as an engineer, he

strongly encouraged us to use all the tools and materials of the workshop for our own purposes. As I will explain in a minute, as regards a career my mother's inclination to natural history eventually won over my father's engineering; nevertheless I much enjoyed making things and I became quite proficient with his tools. Besides cages for rearing butterflies for which I was becoming rapidly impassioned, I built many elaborate and battery-powered mechanical models—cranes, cable cars and the like, setting these to perform in the miniaturised outdoor landscape settings I have already mentioned. But the outdoors itself was the trouble. Just outside the shed where I worked landscapes of all kinds called to me whether I had models to put in them or not. There lay my mother's marvelous garden with its edges trailing into the unfenced fields and woods. How easy to throw down one's tools! What child addicted to living patterns could fail to be drawn out on any fine day by all the gliding and humming and crawling marvels that came my mother's flowers, drawn by the flowers themselves, by the birds in her apple trees, the miniature orchards of her current bushes? Who could not wish to stroll beyond eventually into the even more endless marvels of the woods where, as an added incentive, no sudden call to dig potatoes or wash the car could follow, and where a book might be carried almost unnoticed in one's shirt, to be read in peace in some quiet sunlit place? The outside world was an irresistible competitor with the engineer's workshop, and in the long run it lured me away.

Beyond simply drinking the wonder of a new natural pattern or activity that I discovered I always wanted to understand better what I was seeing. How did the patterns come about? Why should the green fruits in the potato fields be similar to tomatoes? Why did rain water in the furrows leave the delicate braided patterns which I saw on the slit? It was just water, wasn't it, if so why not go evenly over the flat soil like the water went from my bath? Why, in short, should there be patterns upon patterns everywhere I looked—what made them?

I soon found that books had keys to many of the mysteries. A picture in a small book on geology, showing fossils akin to those I had already found in our field, and the stated fact that these fossils proved that our two hundred-meter hilltop had once been under the sea—a marvel whose near incredibility has hardly left me to this day—made me for a time want to be a geologist. I think this ambition was just after my social wish to grow up to be a knight in armor whilst it was a wish to be an astronomer that was shortly to follow (our field within in its dark surround of woods was a good

though very cold observatory for the stars and my father possessed a small telescope that he had won as an engineering prize). But after the astronomer a still more profound impulse was soon to push me even farther away from the knight in armor which had been perhaps the only trace of an inclination have a “people” ideal in my life.

When training as a doctor in New Zealand my mother, unusually both as intending doctor and as intending mother, seems to have paid close attention in her courses to a brief outline of evolution and natural selection. Much sooner than it comes to most children, if it ever comes, she had passed on to me the general idea of Darwinism. I remember what she told me even now as a revelation. Suddenly I could see why the potato fruit and the tomato were so alike, and alike too to the fruits of the bittersweet, the native weed of our hedges. These plants were in the same group, they were a real family! Darwin had proved that a certain surname, Solanum, which Linnaeus had given them, jokingly and for convenience presumably, really meant something: they were indeed cousins—and had been cousins even when as far apart as the snowy Andes and our humble field, as with bittersweet versus the others! Clear to me at a stroke now was why parents loved their children, why people were afraid to die, even such small matters as why it so hurt to stub one's toe and why such a painful and useless appendage as a toe nail might still exist—too recently it had been our useful claw. All this and much else I slowly put together. I had not developed the idea for more than a few such cases before I knew what I wanted to do most in my life and since making that decision I have hardly wavered. Whatever my profession was to be, most of all I wanted to understand all that the idea of evolution could tell me. It was to be a torch with which to peer into the mechanism of a gigantic machine more ingenious than any of my father's a key to unlock to pedigree of like's single enormous family.

I realized that I had made as yet only the faintest beginning: given time the idea might illuminate everything—myself, for example and even the things I thought. At the very least it should serve to interpret all of those visual patterns that fascinated me that were not inanimate. At that time I had hardly heard of a university. My parents referred to “geologist” and “astronomer” as professions one might possibly aspire to but had never once mentioned “evolutionist.” Why should they indeed, evolution being to this day a pursuit so useless as to have no existence in the world of professional expertise. As to the geologists and astronomers, I imagined they worked in offices in towns just as my father did. Having no idea that to become an evolutionist as such could

be an option, I continued to think of other professions but thought always of how I might side-track the work involved towards evolution. I hoped to find ever more marvelous correspondences in unexpected organs of animals and plants. Above all I wanted to understand for what purposes the transformations had been brought about. Professions of school teaching, bee keeping, carpentering, and novel writing (I was good at stories at school) passed through my mind. I rejected engineering rather definitely. Perhaps my father being so good at it was also a factor, and perhaps there was a bit of Freudian perversity and competitiveness towards him combined. Mainly, however, I think I sensed that engineering would be too absorbing: one might daydream of evolution in the intervals of handling bees or planning planks, but one could not when working on any best design of a thing. I knew well how even at night a design would never leave me until it was completed—and then immediately, if I was in the profession, there would be another. Similar thoughts applied to geology and astronomy: they were at once too close to my dream and too absorbing and creative in themselves. They would hence distract from my main aim.

I have said that I was not asocial and as a matter of fact ideas about human life and questions of right and wrong did interest me extremely in a somewhat abstract way—this is an interest I now vaguely trace back to my knight-in-armor phase. I was an avid reader of novels and always eager to judge and compare characters. Usually I was persuaded to what seemed the author's own view of his creations, but sometimes not. I came to realize eventually that the best authors just gave you characters as such-humans-hardly even pretending to have decisions of their own about them. Wanting to understand the moral issues affecting human life does not, of course, make me a people person: people people need just need people to interact with, not necessarily the understanding of them; They tend to be conformist and are seldom more than superficially critical of any ethos of their time. The best authors and artists, however, while virtually having to be of the people orientation, give us not only life as it but also hold up before us, if only by an implication, a vision of a utopia in which human life could be better. Sometimes this vision is quite radical.

A British painter, engraver and poet whose work was unusually utopian and who affected me greatly during my childhood was William Blake. I was strongly drawn by the mysticism of his paintings and his poetry, as also by the mysterious polytheistic world that he seemed to inhabit. In later life this admiration dwindled. Doubts came

about his panglossian moral philosophy and with this a realization that his initially convincing robust nudes actually ripple with muscles that are almost as non-anatomical and impossible as angles' wings. Surely an artist that could be satisfied with such slap-dash and unreal anatomy would be content with a slap-dash and poorly thought out utopia too: I came to contrast Blake with my growing admiration for some of his own masters whose style he had followed but, in this sense, debased. Michelangelo's nudes too could be exaggerated but at least in essence they would "work" and at its best Michelangelo's naturalism could be utterly convincing. In short he could really draw and sculpt and Blake couldn't. However, concerning Blake's sincerity and originality, as well as concerning his eccentricity, likewise appealing to me, there could be no doubt.

Then later in my mid twenties when already engaged on research I learned that Blake had had a disciple painter named Samuel Palmer, and that this man had worked on a famous series of paintings and drawings in a village that was a mere mile or so from my childhood home. Discovery of the peculiar art that Samuel Palmer had executed during a brief seven year period when he had lived in Shoreham, our neighbour village and almost only during that period, came as revelation and a shock to me. Here was an artist who seemed to have redeemed, to an extraordinary extent, what Blake had lost—and yet kept also much of what he had gained! More than this, there in his paintings were our Kentish churches between the hills and among their trees, there my own ancient hollow oaks of Lullingstone Park where I had been accustomed to bird-nest for jackdaws and owls, there the steep grey, fields scabbed with ant hills and the bare chalk showing under fence and stile; and all of this grossly heightened, steepened, twisted into a kind of religious phantasy, a vision of an ideal rural peace in England of the early 1800s. Enormous harvest moons rose behind the woods and hills that I knew; ears of wheat sized like pine-apples swayed behind the head a man reading his Bible in a field; near at hand a tree held out its nest and eggs and bird, and hawthorn and apple trees were bowed under their weight of flowers or fruit. All this was Palmer's world and it was also my own. My own ecstasy in that beautiful countryside could be felt in his pen strokes.

In these works the intense vision of Blake had been hybridised with the reality that I knew intimately, where I too had felt myself to be seeing Eden remade before my eyes. But just as the bliss of the irresponsibility of childhood had by this time ended for me, so Samuel Palmer's vision of those seven years had had to end for him. It was as if

it took all seven years for the fact to dawn on him that despite its appearances, Shoreham of 1830 was very far from being a paradise for those who lived in it. Its people, it seems he knew only from a distance. Even more than his scenery, his rustic figures were highly idealised, their poses often in fact borrowed from other known paintings. In spite of his strong utopian leaning I have ended thinking that Palmer was not really a people person, in this again being more like me. Out there in the real Shoreham, peasants were starving for want of even of bread and how could there be starvation in the famous “Valley Thick with Corn” that he painted? The countryside in the reality included riots and hopeless drunkenness. The glorious fat wheat ricks that he celebrated were being set aflame. It was time when countrymen were hanged for stealing one sheep to feed their family and others exiled in chains to Australia for snaring one pheasant. As suddenly as it began Palmer's visionary period ended. He married respectably and transformed throughout a long remaining career into a competent but somewhat uninspired English landscape painter, not much to be distinguished in style from all the rest who were contributing to the decoration of the walls of the drawing rooms of respectable Victorian England. It was in one of these in London, a drear bed-living room where normally I laboured on the theory of kin selection, that, turning on my knees the pages of the newly discovered book illustrating his paintings and about his life, I was to cry myself for his disillusion. His reaction to landscape and his social vision had been mine too exactly: I too had love Blake and had come in the end to see his social vision to be hopeless, as far from feasible as his false muscles are from composing limbs that would work, or for that matter, far as true justice is from the wistful chivalry of knights and *samurai*.

I am not a superstitious person, do not believe in ghosts in any way that allows them an independent existence. It may make some sense to talk of the “spirit” of a place, but as to a spirit that of itself chooses to talk to or influence a place's inhabitants or visitors, all that is nonsense. I cannot have been influenced by Samuel Palmer in my childhood because I had never heard of him, nor had my parents. Yet my reaction to his pictures shows that I certainly was influenced by the scenes he saw and painted, and in the same way. I have come to think of this influence as formative of, or at least somehow representing, the utopian side of my nascent interest in evolution.

In this light it is certainly an odd thing in my background that if you stand on Badgers Mount, or better still if you stand on the adjacent even higher ground of Well

Hill, of which Badgers Mount is really just a shoulder, and if you then turn your back to Lullingstone Park and the Shoreham Valley with their rolling farmlands and sharp hills and woods, and thus facing exactly the opposite way towards the northwest, you find yourself looking across a further grooved tableland of the North Downs hill towards where, slightly farther of than Shoreham, there is a village called Downe. Here Charles Darwin the evolutionist lived and wrote down all his ideas. He too, as it happens, was all his life an intense lover of the scenery around him, whether in farthest Chile where he traveled on here in Kent. And he wrote and died there within my view from that hill. He chose to end the famous book which launched his theory with a description of a roadside “tangled bank,” describing how in his imagination its ecology might have been shaped through the processes he had deduced. In this case by the time I first read this passage in about my fourteenth year (having chosen the book for a school prize) I already knew that Darwin had been our fairly close neighbour. I had been on a walk with my mother and the other children to his house. Reading the passage, I realized how I was privileged to know exactly the banks that he was describing. They were those of the deep incised roads crossing the chalk ridges towards his home, worn out of the hill by the passage of hooves and wheels and feet over centuries. They were there on the Shoreham side too. Darwin had obviously been moved by them like Palmer but in a differently creative way. Darwin and Downe came to stand in my own mind for the less emotional, less humane side of my nature, the pure science in which the problems of man and the possibilities of utopia need figure relatively little, a view of life where I would just wish to understand and not at all to improve. In contrast Palmer and Shoreham stood for my social and utopian side.

Would I have grown up with the same interests as I did if I had live as a child in, say, Chicago, far away from haunts of Darwin and Palmer? Actually I do expect so. Chicago and Illinois have in fact reared excellent evolutionist. Closer to home, though, if raised simply farther from Shoreham, on the other side of Downe, say in Croydon or Epsom, where there is nothing much except a race-course, very much a people people's thing, to enthuse about, would I still have avoided to be a more pragmatic, more worldly, less emotional scientist? Again I expect so: had misfortune made me a Croydonian I believe my genes would still have made me much the same and I would now be hanging a basically similar life upon other hooks—on Jane Austen, it might have been, and the beauties of Box Hill. To believe otherwise, indeed, would make my receiving this prize

as unfair as if it had been awarded by astrology or drawing a number. Nevertheless I think these historical and geographical associations of my boyhood can help, if you wish, to explain how I am made.

As a young man, like most, I was certainly interested both in utopias and in ideas of social reform. But from starting with somewhat naive ideas about eugenics that soon arose out of my evolutionary interest, I slowly came to realize that there were major unsolved problems about the organization of life that, until solved, must almost preclude eugenic prescriptions. I saw this not just in terms of the usual reasons given in those times for decrying eugenics—such as that we didn't yet know enough in detail about genetic disease or about what would be really genetically progressive and anyway it was all Nazi-Germanic and horrible. It was a much more sweeping difficulty that I saw: despite Darwin and the revelations of his greatest book we didn't yet understand how the whole scheme of life had got itself involved, firstly, in creating these species all around us—the cats versus dogs—and secondly, in storing within them huge amounts of recombinable variation. Until we understood what variation, sex and genetics were all about, how could we begin to say whether one variety was more desirable than another, or even say that a seemingly gross abnormality was bad? There was a warning on this that I already knew. One might think that the gross distortion and inadequate function caused to human blood cells caused by the presence of the “sickling” gene of West Africa was a trait that just had to be bad: however, given the presence of deadly malaria in any area, to which disease only the sicklers were resistant, this was not the case. Might this prove to be only the tip of an iceberg of similar examples? More important for a pure evolutionist, would a more general understanding of sex and genetic variability prove possible along the line this example suggested?

Another thing I wanted to understand as a preliminary to thinking about might be “best” for humanity as seen by my limited people-regarding side, was the source of the passions that seem inevitably involved in any mere discussion of such issues as eugenics and population control. Was the reason for these passions that the issues were indeed among the deepest, most important humans ever needed to think about, as my evolutionary paradigm would suggest, and was it that precisely because of that huge importance, their discussion could not easily be made a part of normal human intercourse, perhaps not even admitted to normal consciousness? Perhaps the vast new assets of *Homo sapiens*, language and rationality, so magnificently useful for all

contingent issues, prove themselves inappropriate in a problem that is so fundamental. The pressure of our genes to proliferate may be like the motion of a heaving ship or of a tennis ball which if made the object of conscious thought only becomes the harder to allow for. But perhaps it is not that rationality is inappropriate, rather that only with pain and under social censure that rationality on a subject like this can be expressed. It is of course hard to imagine any more offensive and arrogant purpose language could be put to than saying to another person what the evolutionary rationale suggests one should sometimes think: "You are having too many children: stop, permit me and my family to produce them instead. We will make a better world than you will." Ghosts of implications of this kind inevitably haunt even the most general discussions of population control, leave alone do they they haunt discussions of eugenics. It remains, then, that it ought to be possible, just as Galton suggested, both to take the sting out from natural selection and to bring to birth out of humanity a happier and less wastefully selfish and crime-prone species by eugenics; and yet it remains very difficult even to see any justifiable and acceptable policy, leave alone to begin to implement one in a humane way. Natural selection in fact seems extremely likely to continue its sway into the foreseeable future.

As the niche expansion that has been allowed by technology reaches its limits, we already begin to see both in small in the bitterly embattled local populations that were formerly peaceful and in large in the resurgence of infectious disease that an increasingly dense, mobile and world-dominant population brings to itself, some of the forms the full resumption of natural selection is going to take. Nowadays every way one looks from Well Hill one cannot escape the lights and the roofs of the new suburbs and towns that did not exist in Palmer's and Darwin's time. Their presence, of course, calls up from afar yet another great British savant, that gloomy prophet who stands behind Darwin as Blake behind Palmer (and he too behind Palmer at least as at the time of his disillusion). This prophet is Malthus.

In spite of the widening shadow of overpopulation now hanging close over all the habitable lands of the earth—and one has only to go to slums in anciently civilized habitable lands like India to see what life under the final shadow is like—in spite of this darkness, I still have hopes that Samuel Palmer's initial vision was not so entirely hopeless as he himself seems to have come to think. Indeed I retain even some hope that still gleams from his mentor Blake's most perfect poem where he wrote he would not

rest from mental fight “Till we have built Jerusalem / In England's green & pleasant land.” I said I did not believe in ghosts in a real sense but as to the continued existence of such artists as Palmer and Blake through their work there can be no argument. I feel as if I myself still strive with both their ghosts as I try to see a way that part of their vision can be redeemed without the crippling illogic and false interpretation of life that they originally had. For my own peace of mind I have to try to hybridize such artists, reconcile them some way, with ghosts of my other side, with Darwin and Malthus. I have never considered building utopias to be my strength: I realized long ago that one needs to be more of a people person to be good at that. However, rather surprisingly, I do feel I have made some progress towards effecting a reconciliation among my old heroes as well as between them and myself.

The first steps in my research career and what I was actually struggling to achieve when I happened upon the book that revealed Palmer, would, I believe, either have dismayed or angered the young man—dismayed in so far as he understood, angered where he did not. In the great sociobiology debate which E. O. Wilson opened through his brave book I feel fairly sure that the ghost of Blake lines up with the opposition: I easily imagine him raging and lamenting with *Science for the People*. Palmer probably would have joined that side at least at first. It is indeed a gloomy prognosis for human society and for altruism if nothing can be found to underpin our cooperation except for nepotism. Only the worst of Nazi utopians could wish to believe nepotism is all the hope there is for humanity. Fortunately there also now exist other well defined and workable concepts in this field of the study of social evolution. One began under the term “reciprocal altruism” and is now better called simply “reciprocation.” I have had only a very small part in this concept, far less than the other pioneers such as Trivers and Axelrod, or Richerdson and Boyd: nevertheless I did a little and I think Blake and Palmer will appreciate that. The topic is more “humane” but unfortunately it doesn't involve anything that can be called real altruism: the concept comes down to no more than farsighted self-interest. However, there is another new field bearing indirectly on social behaviour to which I feel have been contributing more and this for me at least has turned out more dramatic and unexpected. It comes from an approach to the problem of species and sex. Together with other authors I have shown a way the sickling disease case that I mentioned earlier may indeed lead into a much wider set of cases, a set which may touch on almost every aspect of human life. The

theme gives a reason both for the existence of sexuality itself and for why we are as almost infinitely varied as we are. (as well as being as prone to gamble with mates and with genetics as we are, and as resistant to the evolutionary seductions of nepotism as we are). The theme is simply, again, disease.

The idea comes in two main versions. One sees the relevant disease problem as only due to genes that have somehow mutated and gone wrong—genetics here provides both the disease and then, by sex, its cure. The other version accepts the existence the same constant load of bad mutation as the first but at the same time implicates an additional, even more important source of ill health, against which variability and the operation of sex must try to protect. This comes to a species actively from the outside—by pathogen infection. The second is the view I support. According to it the variability of sexual species, including presence of forms like those anaemic sicklers (which when malaria is absent might seem merely mutations of the worst sort, straightforward agents of the first theory), is intrinsic, a group character that cannot be eliminated without risk of later population extinction. The notion this version has of a stored disease—control technology applies to species even across the boundaries of their local races. More specifically the idea tells that if you want your offspring to be innately immune to malaria, say, then your best chance is to marry a West African: he is the type most likely to have evolved anti-malaria genes because the disease's prevalence in West Africa has been recently greatest. Indeed we now know that there are such genes are there for the taking that are nothing like as drastic or as makeshift as the gene of the sickling trait is. If on the other hand you put more emphasis on your offspring's need to be immune to tuberculosis, then you must go to marry an Eastern European: this group has been through the world's most recent severe TB epidemic and as result a mate from that region will give raised chance that your offspring has a gene to resist it. Based on such thoughts a two-generation program of arranged marriages might get your grandchild both such genes together and a kind of freedom of both continents. But perhaps you should hurry and I advise to find first the now identifiable malaria-resisting emir into whose harem you must enter yourself or persuade your daughter. May be as his genetic prize gets to be known there will be a rush for him! The main message, however, is don't just lazily breed with your cousin. There you are almost sure to get neither new nor resurgent lucky genes, and in fact nothing much but what you already have. In this only partly joking picture I epitomize a situation that exists within all

outbreeding animal and plant populations, and exists not just for pairs but for many more elaborate combinations of resistances. What I write about the pair in the human case will doubtless seem wild and exaggerate to many, perhaps repugnant: but it is based on facts, not speculation.

Clearly such view of what can be attained through our sexuality and gene recombination looks to a level of necessary diversity in the genome that was not contemplated in the early days of evolution theory and genetics. And obviously too white it by no means says that eugenics is impossible, it warns that the subject needs much circumspection and that in general it is not a good idea to reduce any overall span of variation that humans have. This is so as long as it is desired to retain a naturally healthy physique as the basis of the human species.

Most interestingly in the context of eugenics, however, both the externally driven infectious-disease version sex theory that I support, and that more internally-driven (and at present better accepted) pure mutation-elimination version, lead to a similar conclusion, that a high level of selective death of zygotes has been a normal and necessary part of the maintenance of the health of species. The only escape from this for our own is either a level of genetic engineering and cellular intervention that is at present not remotely in sight, or a series of technological fixes after of before birth for both all the old diseases of humanity and the new ones that will increasingly appear and accumulate. The problem is not only with the major new infectious diseases or the major gene defects. There will also be needed physiological fixes for all the small bad mutations are constantly being added to the human gene pool. The natural system of life was to arrange deaths after some sort of testing through competition. Generally in a species with parental care these deaths will evolve to occur as early in life as their effects can be made to appear. Such deaths eliminate multiply bad and/or currently inappropriate genotypes. The multiply disadvantaged genotypes are constantly being created by recombination along with other “clean” genotypes that are likely to survive in their place. The idea that the elimination of the former class is natural and even eugenically necessary, of course, runs much against our humane instincts and it is doubtless partly for this reason that genetics is sometimes referred to as “the gloomy science.” In the face of such a bleak outlook of constant deterioration, our instincts are almost guaranteed to be pre-set to tell us: “Even if that may true in general, of course it doesn't always apply—and surely anyone can see it doesn't apply in my wonderful

family.” But according to the old system, which the new one of medical tinkering is very far as yet from being able to replace and perhaps, even in principle, never will replace (and certainly won't before the Malthusian crunch begins to make medical progress much more difficult), death must cull from almost every family. No family is so intrinsically healthy against all infections or so shielded from mutations that it is not being carried steadily down hill, in need not at all of the “Rassenhygiene” of our mistakes of the past but, as the least, of just a natural wild culling of badly endowed foetuses and neonates. To my mind in its complete opposition to the natural system of death that has undoubtedly served to raise us up to what we are, the Roman Catholic Church and like-minded organizations could hardly be more wrong or more cruel to the species they profess to believe the most special on earth than by trying to prevent the death of every fertilized zygote. As can be seen I am here more on the side of Christian Science and Jehovah's Witnesses with their doctrines of no medical intervention at all, although for the more self-aware stages of human life I still have to part from them. Even in the stories of Christianity, Jesus, it may be noticed, was never said to cure or bring back from the dead a sick infant, while the Old Testament has examples of exposure of infants described without censure. No one can look on such matters without distress but to me the incomprehension, the lack of fear of the human neonate, seem like a divine providence for humane infanticide or at least for a letting of “nature to take its course.”

It is over issues like these, then, that my ghostly fight goes on. Here, not particularly hopeful or even wanting to convince people generally in a world that normally reacts with horror to the very mention of such thoughts as I am raising above, I wrestle with dead neighbours of my youth instead, with Blake and Palmer and even with Darwin. Darwin I think is already largely on my side, firstly because of both his trained understanding and intrepid truthfulness, both stronger than my own, and secondly because he knows the intense anguish of losing his daughter Annie to disease when she was far into childhood. He contrasts this with the sorrow of deaths of some three others of his offspring as infants. One, incidentally, he knew to be handicapped, and Darwin certainly also knew dread both of crippling ill health and of hereditary disease. I fancy I have further to go with the other two but Samuel Plamer has grown slightly sympathetic to my view. A stubborn eccentric in many ways even after the conversion of his art into saleable respectability, I like to read, for example, how at all

times, even the most bourgeois and proper, he was inclined to dive a hand into the huge pockets of a workman's jacket and produce nuts which he cracked with powerful teeth. That is me teasing my dentist wife exactly—and as it happens sometimes with nuts I may have pulled down from branches of the very hazels that trained Palmer's teeth a century ago! Crunching nuts in the woods of the High Hill above Shoreham that my childhood house looked out on, his ghost regards me quizzically and he listens: he too lost children at ages of three and nineteen to disease and perhaps he believes less strongly than he once did in the religious dogma. I know the second death, that of his eldest son, was for him, like Annie's to Darwin, a terrible sorrow. Could this have been foreseen and preempted in utero, or even after birth, what would he have chosen, I ask him. As for Blake, I still only see one faint point of hope. One poem that is for me the second most perfect of all that he wrote, or even perhaps the very best, “Oh rose, thou art sick! The invisible worm....,” shows that he too may have glimpsed a problem of this kind and seen how it can be in the gift of art to transform its sadness.

It may be gathered from what I have written that the straightforward visual beauty of natural patterns became somewhat lost sight of in the research I ultimately entered on and for which I have become best known, a laying bare of the roots of sociality. I have not in fact made any discovery concerning how the patterns of animal shape and coloration or even the patterns of ecology come about. Though I followed some embryo ideas enunciated by Darwin even in this, my excursions, so to speak, have turned out to be more on the Shoreham side of my life than I intended, less on the side of Downe, so that at times my work has almost entered a people person's domain—even though by such persons themselves the ideas tend to be much resented, as I have imagined them to be by Blake. But what lures one into the garden of Science doesn't necessarily define where one goes when one is there. The problem that I felt inspired to attempt first was in fact more or less being solved at the time I was thinking of it in my last year at school although it required some thirty years before I was to know this. This was the definition of what are now called the fractal patterns of nature and it was done more than by any other by Benoit Mandelbrot. Through him I think I understand now much better that beauty of order-in-confusion that still so delights and torments me whether purely visually in the fern leaf or tree shape or braided sand, or in part temporally as in the eddies of the river, or in boiling clouds. I understand now that natural selection guides and often reduces these “easily” attained fractal patterns into

the more “difficult” actually less natural ones, as Mandelbrot saw. Contrast the fern-leaf pattern with that of the fruiting Lunaria plant where a non-fractal pattern (an almost perfect circular flat disk) is produced for each fruit. It is the circle and the stiffly arranged seeds within it makes the Lunaria “higher” plant in contrast to the more fractal fern alongside with its myriad sori. However, that is hardly the point: I have always liked finding answers without having to go through the long agony of working them out for oneself. But whether I understood the patterns or not I still believe that the pattern addictions of my childhood that drew me in, addictions richly supplied out of what might be described as a vast psychedelic drug enterprise of nature that surrounded my home—drugs supplied out of every flower, each changing leaf—was not wasted on me as a scientist. For beauty is beauty always and in my opinion nothing is so likely to determine the depth of a scientist's contribution as the aesthetic standards that somehow are set to work in him. Human arts like human science can never be more than a pale reflection of beauty that is taken from nature, from outside of the human workshop. At their worst both activities come to present admired uglinesses and run-away fashions in which all objects are second hand and their appreciation more concerned with human style than with the reality behind them. While I certainly exaggerate above for explanatory purposes by putting such emphasis on certain illustrious neighbors of my boyhood, I do not think I exaggerate at all in saying that the richness of the world I had as a boy and the varied beauty in it! I was helped to appreciate has determined my course and my success all through my life.