Excerpt from

Feeling for Stones

Chapter Eight
Moving On

I would like to live long enough to see a time when we begin to live symbiotically with the natural world. But one lifetime – the remainder of my lifetime – will not be long enough. As Dr. Fuller wrote in 1662, *"All things are not found out in one age…"*[1] and we have a long way to go. Our task is more daunting because of the acceleration of human activity in the past fifty years. Thanks to improvements in health, agriculture and industrial production – all of our proudest accomplishments, in fact – mankind has become an invasive species, monopolising the waters and nutrients of the planet. As the diversity of life diminishes with each human success, the resilience of the whole system declines and crisis become inescapable.

The American ecologist, C.S. Holling, tells the story of C.B. Huffaker's classic 1954 experiment in population dynamics undertaken at the University of California, Berkeley. This experiment took place in a room divided into separate cells. In each cell, researchers placed a population of spider mites with their favourite food, an orange. They also placed a colony of spider mite predators in each cell. As researchers varied the number of oranges placed in different cells, they counted the populations of mites and predators to see how the populations changed as the amount of primary food was altered. Sometimes they ran the experiment with all the barriers between the cells in place. Sometimes they removed a few barriers but left others where they were; once they took all the barriers away, allowing both mites and predators to move freely anywhere in the room.

The results were startling. When all the barriers were up, some populations of mites and predators exploded with increased food while others died away when food was scarce. Overall, however, the number of mites and predators in the whole room was the same at the end of the experiment as it had been at the beginning. This was interesting all on its own, but the most disturbing result came after all the barriers had been removed and the food source varied in the same way. This time something else happened. First, both populations of mites and predators began to oscillate, rising and falling in relatively modest swings. As the experiment continued, those oscillations became more extreme, swinging more and more wildly until the populations of both mites and predators crashed completely and died out. The

researchers cautiously concluded that the barriers had created spatial variability which had created diversity and diversity had created resilience.[2]

I see this experiment as a metaphor for our world. The mosaic landscapes of medieval England, of the Sahel before the French arrived, of Mount Cameroon in Kuva's time, of New England under the Native Americans, and of Mtwara province before 1900 were like that experimental room with all its barriers in place. Today, many people speak enthusiastically of a 'borderless world.' They expect great wealth and economic growth as trade, money and labour leap over the mountains, deserts, rivers and seas that once formed the spatial boundaries of our world. Yet, the more borderless our world becomes, the greater the risks of a very big crash.

Already extremities of new kinds have begun to strike us. These will increase in my lifetime. There might be more diseases, more frequent floods or droughts, heat waves or extreme cold. We could see an increase in crop failures or epidemics among farm animals, or the more rapid extinction of species that are commonplace today. Or, we might find ourselves facing a greater explosion of unwanted plants and animals in our gardens and farms. The world we live in – human and wild – is too complex for precise predictions.

What matters instead are two things: what foundations might we lay down now and how might we learn to recover and carry on? New foundations and our own capacity to learn will help us invent the ecological societies we need as necessity and extremity come our way. Twice before human society has invented new social and economic systems, first around agriculture and then around industry. Now, in much less time, we need to invent ecological societies that support the diversity of life so that all life can support us in turn.

Neighbourly Experiments, Necessity and New Learning

But what might that invention involve? In pre-industrial England, new goals were identified and met as people with different knowledge and skills engaged with each other on practical projects to meet new immediate needs. This was the virtue of neighbourliness. In the 16th and 17th centuries, *"Good neighbourliness [was] perhaps first in the criteria by which … an individual … was measured."*[3] This neighbourliness allowed the tangible skills of craftsmen to express the new concepts of people who had studied mechanical philosophy and other novel ideas. They came together in the practical projects of everyday affairs – a new

windmill, a road, a new school or an alms house for the elderly.[4] As my grandfather kept the village accounts of Roxbury, Connecticut and my mother helped to pass the school bond issue, I absorbed the habits of neighbourliness in a practical way.

Today, similar neighbourly experiments exist around local ecological ambitions. In Zanzibar, the protection of the red colobus monkey in the Jozani Forest is developing new knowledge, new skills and new agreements. Around Lake Baringo in Kenya, people are learning to restore degraded land and create new agreements to protect it. Dwain Morse's clean water technologies – and his efforts to sell it in today's industrial system – are another important experiment, as are Campbell Gemmell's negotiations in Scotland. More casually, one day I found myself walking by the Bleeker Street Community Garden in New York City. I stopped to admire its tiny plots crowded with flowers, shrubs, trees and birdhouses and read its modest rules posted on the gate: *"invest in tools … attend meetings … clean up sidewalks … participate …"*. I have also visited the new London Wetlands, created on the site of former waterworks along the Thames. Here, for the first time in a long while, rare bitterns were seen in the summer of 2003. All these experiments, and others like it, are among the early foundations of the ecological age.

Neighbourliness on its own, however, did not invent the industrial system and will not invent the ecological age. The industrial revolution also required new knowledge of many kinds: new skills, new concepts and new ways of learning. The great foundation skill of industrialising peoples – in early England and today – has been the ability to read, write and calculate. Critically, these were not elite skills, but popular skills. They have enabled everyone to contribute to the invention of the industrial age and to its maintenance and expansion today. These popular skills also supported a new conceptual framework: the rational and scientific world of mechanical philosophy, of logical reasoning, empirical observations and comparative analysis. For these new skills and new concepts to change a human system, however, a new kind of learning was needed in the pre-industrial age: *lectio et quaestio.* As people learned how to read and question, inventions grew out of new enquiries and debate.

All the skills of the industrial age are still useful today, but now there is a new conceptual framework shaping our ambitions: the concepts of dynamic systems, ecological relationships and the chaos of complexity. These concepts are forcing us to discover new ways of learning, including simulations, computer games and the open experience of climbing mountains or working in a village on practical needs. As our concepts are changing, so is our technology, forming another foundation for the ecological age. Such technology includes the

resource efficiency that lowers fuel consumption in all our machines, but it also includes the technologies of habitat restoration like that around Lake Barinigo or the London Wetlands. Such ecological technology exploits new understanding of the habits and habitats of particular species in particular ecosystems, such as the red colobus monkey in the Jozani Forest or the water birds seeking refuge in the London Wetlands. The technology of the industrial age is not replaced in the ecological age, but it seeks different goals, requires different popular skills and uses a conceptual framework of ecological relationships rather than the specialised understanding of isolated things.

Throughout, the style of learning through questions remains essential to systemic invention. In today's organisations and neighbourhoods, it is easy to accept the prevailing assumptions that underlie all decisions. *"I cannot change the system,"* is an excuse I have often heard. Yet it is precisely our own assumptions that we need to question for the system as a whole to change. That is why I believe our work in East Africa has been one of my most important assignments, as we have learned to question the basic assumptions underlying East African societies and lives.

Conquest and Survival, Extremity and Engagement

Such questioning requires the self-respect needed to challenge existing power and cannot be separated from the experience of conquest and survival. This is particularly important today because reservoirs of ecological knowledge survive among non-industrial people and it would be folly to throw that knowledge away. Many such people live in regions with great biodiversity and many are in societies that were still colonies less than fifty years ago. For all these reasons, the experience of conquest, survival and creative engagement remains vitally important today and links the histories of the three continents I know. The Anglo-Saxons were conquered in 1066, the Indians of New England were replaced by 1700, and by 1900, most Africans were under European rule. The damages of conquest, the slave trade and colonial rule are not easily outgrown. Like the *gris-gris* I found on the streets of Dakar, its mischief can linger for generations, poisoning everything that follows. However, the English story shows us that the mischief of conquest can be outgrown, allowing all our societies to experience the relief of throwing that poisoned *gris-gris* into the sea.

However, for anything fruitful to follow a conquest something of the conquered culture needs to survive. Rosamond Faith describes how a group of English peasants in Hampshire used 400 years of oral history of their rights to complain in 1364 that their current landlord was exacting services they had not been obliged to do under King Edgar in 972.[5] Kuva's defence of Mount Cameroon, the social control imposed by the fear of zombies and

the hunger to win the Mountain Race all show us a people fighting to maintain the magic of their own ways. The Makua clan history in Tanzania is another example of a pre-conquest culture adapting and surviving through the years. All traditions are wise for some part of the time, but if conquest kills off that wisdom, then there is nothing for anyone to learn. This is the tragic lesson of 17th century New England.

On its own, survival is not enough. For survival to shape the future, it needs to be backed by confidence and self-respect. When the Commons met in the Chapter House in 1375 and Wat Tyler and his peasants rebelled in 1381, existing powers were directly challenged to change. This challenge grew out of the extremity of the Black Death, but was only possible because men had the self-respect to meet the mighty on more equal terms. The Commons who challenged the king did so as *"men powerful and strenuous in arms."* Wat Tyler's list was the sign of a man whose literacy gave him the confidence to shake hands with the king as one horseman to another. However, confidence without the survival of one's own culture remains a conquest. When Joseph Nyunga chided members of the Tanzanian team for having allowed themselves to be brainwashed, he wanted them to have both the skills of the modern world and pride in Tanzanian knowledge – the knowledge he expressed in his carvings and which I heard again when I went to Mtwara. When the idea of the *Utu Net* came into the report of the Tanzanian team, an older African knowledge entered the educated language of the modern public realm.

As once conquered peoples gain a powerful voice and engage with those who have set the rules, the goals of society begin to change. The Anglo-Saxon tradition seems to have been less deferential and less centralised than the tradition of the Normans. As those traditions survived and the voice of people became stronger, local traditions entered political affairs, creating the democratic forms we know today. Today, the statistics that formed the 1984 double-S curve express the development goals of the modern industrial state. They monitor the improvement of health and education, the growth of financial wealth and the increased production and ownership of things. However, according to Laurenti Magesa, man's responsibility in African Religion is to secure the abundance of life in all its forms. This is a different goal from creating personal wealth and the growth of economic goods and trade, but no one really knows how to measure it. One day – soon perhaps – the abundance of life will be monitored everywhere in the world, along with the quantities of money and things. Only then will I start to believe that the experience of conquest in Africa has been outgrown.

New goals on their own, however, will not invent ecological societies, because new societies also require new rules. This is the lesson of the squares of London and of the mosaic rights of pre-industrial peoples. Both have shown that the rules which govern our use of the land shape our social and economic affairs in profoundly important ways. They are the

practical expression of society's implicit goals. Industrial society could not have developed without the invention of new property rights and rules. These altered our relationship with the resources of the land and our relationships with each other. In early England, the ability to rewrite the rules required great political and social skills honed on the experience of neighbourly projects. As new ideas were tested and debated, as experiments succeeded and failed, some individuals lost and others gained. With each gain and loss, social relationships were renegotiated, redefining mutual obligations as well as power and prestige. So where are today's negotiations? Once again, they exist in the practical experiments of new ambitions. They are in the Jozani Forest, the London Wetlands, and the Bleeker Street gardens. They can be found in the negotiations around Lake Baringo or inside the Central Scotland Forest.

The history of pre-industrial England, however, reminds us that neighbourly experiments are not enough. They need a connection to power. A strong formal connection existed in Parliament, where the leaders of local government were often those called to attend parliamentary session. These formal links were backed by the informal connections of neighbourliness as members of society crossed social boundaries to achieve common aims. This worked well in a small society where, in 1603, roughly four million people in England were represented by 462 members of the House of Commons.

But what are today's connections between neighbourly experiments and people in power? I would argue that in large societies these connections are extremely thin. In England there are now nearly fifty million people represented by 529 members of parliament, an average of 93,000 people per parliamentarian. What becomes of systemic invention when political distances are so great? How many neighbourly experiments can an individual know when he or she is representing 93,000 people? This also makes it much more difficult for large experiments in new agreements to be accepted. The Kyoto climate negotiations are one of the notable global experiments in new ecological agreements today. But those who negotiate are not personally connected to the neighbourhoods and organisations where any agreement must be expressed in practical terms. Without these personal connections, how easily can the system change?

Even with strong connections to power, systemic change might not occur. Often new voices need the accidental support of necessity and extremity to help them force powerful people to change. In the Chapter House in 1375, the king needed money from the Commons to go to war; their power of the purse forced the king to listen to the Commons' demands. During Wat Tyler's rebellion, the new value of the peasants' labour created the opportunity to challenge old ways. This only happened because of the extremity of the Black Death. In the

following centuries, sudden death and epidemics broke up rigid power as often as they took people who were valued and esteemed. It was thanks to the necessity for money and the extremity of disease that, in both 1375 and 1381, everyone had something at stake and something to trade.

What are the necessities and extremities we face today and how might they change the relationships of power that currently set the rules? Climate change is one of the challenge that will force existing rules to change. It also gives the non-industrialised societies of the world a source of new political power, as non-industrialised people can demand payment for maintaining forests that soak up green house gases, or for improving the habitats of threatened species. As climate shocks become more frequent, their power can only grow. These shifts in political strength come as the petroleum age is reaching its end. During the transition, the system will not begin to change when the oil runs out, but as petroleum products, one by one, become more expensive than renewable fuels. If the costs of climate change are reflected in the price of fossil fuels, the use of alternative fuels will rise more rapidly, reorganising society along the way.

Disease could be another great driver of change. Over the past fifty years, we persuaded ourselves that disease could be controlled, but with the spread of HIV/AIDS, the rise of antibiotic resistance and the appearance of new epidemics, disease, once again, is a *"loathly monster"* often outside of anyone's control. *"Plagues are as certain as death and taxes,"* according to Dr. Richard Krause.[6] In trying to understand the impact of HIV/AIDS in Southern Africa our team tried to imagine who would survive the epidemic, since they will define the future as much as the loss of those who die. We believe that the well-educated, well-paid and those who think long-term are more likely to survive. People living in cohesive societies, including traditional societies, are also among the survivors as are the grandparents now raising their grandchildren alone. These thoughts led me to speculate that perhaps, the long term thinkers who survive AIDS will more readily accept the time scales of an ecological age. Even more speculatively, I could imagine African grandparents passing on some of the older values of African Religion, with its connections to abundant life. Perhaps, AIDS in Africa will be one of the extremities that forces ecological principles back into everyday lives.

Ecological Living

So what might it mean to live ecologically? Among other things, it means accepting the autonomy of disease and recognising that plagues are a part of life and diversity. It could

also mean accepting shortage and hunger and re-learning the skills of compassion needed to respond. Rose Lyimo, one of the older members of the Tanzanian team, told me that mothers around Mount Kilimanjaro used to boil stones during a famine to persuade their children to sleep. As the stones bubbled on the fire, the mother would poke them from time to time, pretending they were potatoes: *"Ah!"* she would say, *"They are not quite done! Just wait a little longer …"* As they waited for their supper, the children would fall asleep, comforted by the promise of food. In my own family, I have watched my mother sleep more and more as her life fades away. One day I asked her whether she could feel it if I held her hand while she was sleeping. *"A bit,"* she said cautiously. *"Would it be comforting?"* I asked. *"Oh, yes,"* she replied.

This is all part of what it means to live ecologically: it means doing without and recognising that crises and death are normal. It also means – as with the AIDS epidemic in South Africa – that compassion is survival. The person you help today, may be the one who helps you tomorrow. That is why the women in Dakar shared their food with me. *"La vie est très longue et le monde est très petit,"* they said; life is long and the world is very small. Living ecologically also means understanding the disciplines of restraint, enjoying the bounties of abundance only when they are genuinely there – like the Indians' harvest of spawning fish in New England. A friend of my grandmother's once said she wanted to be rich enough to buy clothes in season and fruit and vegetables out of season. Now, as I learn to live ecologically, I find myself buying the fruits and vegetables of each local season, rather than rushing towards the exotics at any time of the year.

Living ecologically also means living in four dimensions: we cannot simply be bookish people, relating to the wider world through papers, films and screens. When reading, writing and arithmetic became the core skills of popular education, most people still lived on the land and already had a wide variety of practical skills. Today, industrial society has taken over the production of three-dimensional things, leaving most of us alone with the abstraction of our books and papers and electronic screens. This is not enough for learning to live ecologically; we also need the intelligence of our hands.[7] We need to touch the world we live in, to walk around with the uneven shape of the earth beneath our feet, we need to smell the decay of leaf mould and of new blossoms in the rain, we need to understand soil's grit in our fingers and be able to identify the songs of the birds.

When my brothers and I took our small green metal lunch boxes into the woods, we entered the school of our ecological education. We were training our hands and limbs to walk in the woods as our eyes and ears learned to observe. We wanted to know the woods as intimately as we knew the rooms of our grandparents' Country House. Today, those of us in

urban, industrialised societies need to learn again how to live in the natural world, while those in rural societies need to see their unwritten knowledge is given the same value as the books of the modern age. As I tend my window boxes and plant tubs in Central London, I put the soil under my fingers again, learning how different plants respond to different types of light water and soil. It is an active attempt to unite book learning with the unwritten intelligence of eyes, ears and hands, my own practical experiments in an ecological age.

Forty years ago, in Roxbury, we climbed around, but did not understand, the overgrown stone walls of an earlier age. These walls – like the ancestors of Africa – remind us that it is not enough to know a landscape in just one moment of time. Landscapes are older than all of us; they live and die and are reborn over much longer spans of time. Anyone who has known a landscape for more than ten years will know what this means. When I was growing up on Manhasset Bay, a friend and I took a rowboat out and sailed it down the bay with a beach umbrella. As any sailor will tell you, beach umbrellas are no use for sailing into the wind. Stranded downwind with an oar-less rowboat and a now useless umbrella, we walked our boat back through the shallows of low tide. To this day, I can feel the mud beneath our feet, slimy and dead, killed by pollutants coming into the bay. There were no tiny spigots of clams, no wading birds feeding on minnows, just a muddy slime. Forty years later, the birds are back, the minnows are back and the blue fish are running thanks to the Clean Water Act passed thirty years ago.[8] At that time, in 1972, we could not imagine how much life would return to Manhasset Bay, yet this one law has revitalised the waters. It demonstrates that living ecologically means doing things now without expecting to enjoy the return; it means planting trees knowing you will never see them mature.

For biologists, the great holy grail is the diversity of life. Each extinction is a cause of mourning; it is another broken thread of the spider's web, another torn strand of the *Utu Net.* How many threads of the web of life can be broken before we are no longer supported? How much of the *Utu Net* can unravel before we fall to the ground, unable to rise? Several economists I know have said, "What difference does it make if we lose a few species?" I don't know. I know that when I am stitching a needlepoint tapestry, I want the whole canvas to be covered. If one thread is missing, I have not done my job. The tapestry will wear out more quickly, the pattern will be broken and I will regret my own careless sewing.

The holy grail of diversity explains my fascination with the possibility that the property rights of living ecologically will have more in common with the mosaic rights of pre-industrial peoples than with the column rights of the industrial age. One day, I would like to invent a market that rewards people for keeping a species alive, rather than rewarding them

for its demise. Today, for example, people are paid to cut down trees. Can we find a way to reward them for leaving a forest standing? Mosaic rights might help here. Imagine holding the rights to something like the swift, a bird which flies between England and Africa each year. In my imaginary market, those people who held rights in the swift would not earn a good living if the populations of swifts fell too far; they would only be paid well if the swifts survived to breed next year. Other people might hold rights in toads, spiders, elephants or even mosquitoes. Some of these rights might not be held by individuals, but by communities who earn their livings by protecting an entire habitat and everything that thrives in it. By protecting the habitat, the people of the community would learn to live ecologically in their own neighbourhood – a neighbourhood populated with every form of life the local habitat could sustain.

All this is just a daydream, but just as new rights were needed to develop the industrial system, so too will a new system of rights one day lead to an economy that rewards mankind for keeping the diversity of life alive. That economy will adapt some of the tools of the industrial age. New statistics will measure new goals and new market mechanisms will distribute the incentives and rewards. The Global Reporting Initiative, for example, is currently developing new statistics and may be another foundation of the ecological age.[9] Reporting alone will not suffice, however. If markets are to learn how to support ecosystems, they will also need new regulators, such as biologists, ornithologists and those who love the macro-invertebrates of rivers and streams. It is also certain that any new markets – like our social systems today –will need a way to resolve disputes over rights and rewards while learning to apply new penalties for new wrongs.

So how will disputes be resolved in the ecological age? This is where the lessons of the Makua political economy become important. I see our leaders taking responsibility not just for the health of their human populations, but also for the health of the land. As Dr. Wembah-Rashid said in Mtwara *" … the land must be kept alive for people to live. If the land is sickly, people are sickly."* Leaders, however, will need to be accountable and here I can imagine a court of ecological accountability. I see this as a hybrid institution combining the structural role of Africa's spirit advisors with the power of the British House of Lords or the American Supreme Court. This court would be supported by similar courts at relevant eco-scales – a court for the local woods, a watershed, or the atmosphere of the planet itself. Such courts are important because we do not know what we are doing. We will often be faced with questions of judgement where we cannot know the right answer right away. We will need a way to learn from experience, to build on case law that helps us understand what succeeded before and what might succeed again. We need a place where the laws of nature and the laws of man can be finely debated and imperfectly grasped, but always aired publicly so we can all learn to find our way.

In all of this, what might be the political boundaries of the ecological age? Here I imagine living in Mme Dugast's map. Others may dream of world governance; I dream of tribes, of neighbourhoods connected by footpaths, where we link with others at different scales through a nervous system of mutual review rather than the dictats of central control. Ecosystems are complex; human societies are also complex. When both are together, their complexity is greater than anyone can grasp except on a very immediate scale. That is why ecological living may mean a closer personal relationship to smaller physical territories, where each of us bears some responsibility for the environment in which we live.

There is another reason for dreaming of tribes at a time of systemic change: small units of responsibility will multiply the experiments we try; with each experiment we will learn something new, while the accumulation of knowledge will help us all. As we imitate each other, we will build useful redundancy into the larger system while finding multiple ways of accomplishing the same ends. All this will increase our ability to adapt and change. Eventually, I can imagine such ecological neighbourhoods will restore to each of us a sense of place based on our personal relationships to each other and to the land. As this deep knowledge grows, we will protect our surroundings and strengthen social trust, creating the skills of diverse neighbourhoods while increasing the resilience of our world as a whole.

No one knows what will happen next. In my lifetime, I have watched our populations and economies grow, creating bigger institutions, bigger markets and bigger volumes of trade. In the process, we have accelerated our damage to the natural world and increased our exposure to the extreme crises of systemic failure. Yet, as the damage has grown, I have also seen the seeds of invention germinating on the margins. They have appeared in small places, among once conquered peoples or in passionate individuals with a different ideal, or in groups who trust each other as they try something new. I do not know how the tension between the efficiency of today's large institutions and the inventiveness of the small scale will play out in the coming decades. It is likely – inevitable, perhaps – that accident and extremity will play their role. It is my hope, however, that in meeting the challenges of ecological invention, we transform ourselves from a hungry and invasive species to more modest mitochondria metabolising life throughout the whole world.

Moving On

As for me, it is time to move on. I want to take what I have learned here and make it come alive in new experiments that reach towards an ecological age. I do not know what those experiments will be. I do know that while my life may seem exceptional to many, each

step has started with what was there and what was needed. Since becoming independent, my work has followed an unpredictable path created as each new assignment came through the door. During this time, the basic principles of ecological thinking have been accumulating at the back of my mind, but usually been neglected in the work I do – they have not fit into society today. Now it is time to ask where and how those principles can squeeze in again.

A more important thing to do has already begun in my London neighbourhood. After fifteen years of urban anonymity, I have stopped to chat and share news with my neighbours. This began when several of us organised a picnic in the square. We provided tables, plates, cups and cutlery, then invited our neighbours to bring food and drinks to share. Over the past three years, in the centre of a vast city, we have been getting to know each other as villagers with common concerns. Like my professional life, I do not know where this will lead. But the square was there, and what we needed was a picnic. All the rest is yet to come.

Many people today are uneasy, sensing that fundamental things have to change. Many of us are afraid of what we might lose, of people who will oppose us or judge us as too extreme. Above all, faced with a task that is both complex and necessary, many of us do not know where to begin. However, we can all start noticing the natural world around us and begin to learn basic ecological ideas. We can share our thinking in the contemporary neighbourhoods of our complex lives. Then, if each of us, one by one and in the company of our neighbours, begins with what is around us and what is needed, we can invent the experiments of systemic change. As that happens, our unspoken fears will become the energy of creation, drawing on and renewing the abundance of life that has – so far – sustained us all.

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[1] Robert L. Galloway, *The History of British Coal*, Macmillan and Co. London 1882, p.50.

[2] This experiment is described and cited in C.S. Holling, "An Ecologist View of the Malthusian Conflict" in *Population, Economic Development, and the Environment.* Kerstin Lindahl-Kiessling and Hans Landberg, editors. Oxford University Press, New York, 1994, p. 79-103. The experiment itself is reported in Huffaker, C.B., "Experimental Studies on Predation: Dispersion Factors and Predator-Prey Oscillations", *Hilgardia, 27:* 343-83, 1958. Holling explains the results by suggesting that with the barriers in place, "Local populations on each orange still went through a boom-and-bust pattern, but out of phase with each other, so that the whole system persisted." P. 86

[3] Keith Wrightson, *English Society 1580-1680*, Routledge, 1982, reprinted 1998, quoting Mildred Campbell, p. 51.

[4] Anyone who wants to see this kind of neighbourliness in action should read *The Warden*, the 1855 novel by Anthony Trollope about a clergyman accused of dishonesty while managing an alms house.

[5] See Rosamond Faith, "The 'Great Rumour' of 1377 and Peasant Ideology" in *The English Rising of 1381* edited by R.H. Hilton and T.H. Aston. Cambridge University Press 1984.

[6] Richard Krause was testifying to the American Congress's House Appropriations Committee in 1982 as the director of the National Institute of Allergy and Infectious Diseases. He tells the story of his testimony in the Foreward to *Emerging Viruses,* edited by Stephen S. Morse, Oxford University Press, 1993.

[7] The idea of the intelligence of hands comes from *The Hand: How Its Use Shapes the Brain, Language, and Human Culture* by Frank R. Wilson. Vintage Books, New York, 1998.

[8] See http://www.epa.gov/region5/water/cwa.htm

[9] See http://www.globalreporting.org/