FERTILE GROUND. Gerry Martin, July 1994.

Some very preliminary thoughts.

These comments are divided into two parts, firstly thoughts on what requires explanation and possible explanatory procedures, secondly a list of points and areas for study which may be relevant.

Against the time-span of the evolution of species, the period of existence of Homo S.Sapiens has been very short, maybe 40-50,000 years in our present anatomical form. The outstanding evolutionary changes in species leading to and including Homo S.S. have been changes in the central nervous system. These changes manifest themselves most visibly in the manner in which the species has learned to manipulate matter, and to use manipulated matter to survival advantage.

In these notes, the assumption has been made (and of course the assumption may be wrong) that CNS development was rapid, in the four million years or so since 'Lucy' until the evolution of Homo S.S. but that since H.S.S. CNS evolution has been negligible and that intellectual capacity if fairly uniformly distributed.

From the lower paleolithic until the present time, it seems reasonable to categorize three major shifts in human activity, with periods of steadier, slower change in between.

The first of these shifts occurred with the emergence of the species itself, and consisted of the widespread use of tools of a degree of sophistication much higher than had been attained with other species.

Although developments in the use of tooling have been the basis of all subsequent human manipulation, this first shift although noted is not used further in the discussion.

The second large shift, which is largely dependent upon the first, is the transition from hunter-gatherer to farmer, and the third is the high rate of change associated with the generation of reliable knowledge of the natural world, together with special techniques, for the generation and testings of new knowledge.

This new knowledge has profoundly altered human existence almost solely through its ability to allow the manufacture of novel artifacts. (The relationship between new knowledge and artifact is a complex one. The simple relationship that new reliable knowledge is generated through the techniques of 'science', and that this new knowledge can be used to design new artifacts is very misleading; new knowledge if often initiated in attempts to explain new artifacts.

List of factors which may be worthy of consideration in 'fertile land' studies.

1) Education - formal and informal - the manner in which a society transmits its traditions, knowledge and skills through generations. How seriously does a society undertake this process? What institutions has it developed? How stratified are they? How rigid is the system? How widespread is the formal system?

2) How big is the society?

3) How homogeneous is the society

4) How xenophobic?

Further thoughts.

Our problem is to understand the mechanism of major shifts in human activity, for instance from hunter-gatherer to farmer, from small scale craft based artifact production to sustained industrialization, from craft skill to sustained technological innovation, from knowledge based on experience of particular cases to reliable, tested and more universal knowledge, and from techniques for acquiring and transmitting craft tacit knowledge to techniques for acquiring and transmitting new reliable knowledge. (I'm going to see if I can get through these notes without using the word 'science' again).

The particular case to be examined is that of Japan,moving in the last 150 years or so from commercial capitalism to industrialization and latterly, from the use of craft skills to the production of new reliable knowledge.

The Japanese appear to be a particularly suitable case for study in these transitions firstly because they have been rapid and highly visible - and rather well recorded - secondly because they appear to be very largely dependent on inputs from other societies, thirdly because a policy of isolation and a geographical situation suitable for enforcing that policy have resulted in identifiable occasions of input from external societies and identifiable consequences arising from these inputs.

Japan has been particularly successful in acquiring and using imported techniques, while other societies which have had equal exposure to new techniques have not adopted them, or have only adopted them in a slower, more haphazard manner and so Japan becomes also an ideal comparative subject for 'Fertile land'.

I conjecture that since lower paleolithic times of early toolmaking the most significant human activity has been the innovation and production of new artifacts, and that the great variety of cultural forms which exist are best analysed in two ways,
firstly - by examining how the cultural traits of a subject society are related to, and consequential upon, the artifacts available within that society,
secondly - by examining the above relative to artifacts available to connecting societies,
thirdly - by examining the ways in which cultural traits are congenial to or on the other hand kinder, artifact innovation and artifact production.

Before attempting to construct a list of factors which are congenial or alternatively hindering to the transitions

Commercial capitalism - industrialization
Craft skills - sustained technological innovation
(all four activities require extensive definition and analysis in order to build rational argument).

I would conjecture that all these processes are network processes, that is, that they all require large numbers of people engaging in activities related to the area, some in direct competition, some in different but related activities and that each of these activities which we place under an umbrella name 'industrialization' - 'technological innovation' is best studied through a number of highly detailed case histories of the type already being done in some History of Science (Whoops!) departments.

Thus I am extending the argument in the 'Why Japan never developed!' paper to include all these other activities, and suggesting that we are trying to understand the process by which multi-based (as opposed to growth from a single origin) activities arise.

Additionally, I think that we should take into account that we are examining **wealth creating** activities, and that wealth creation always attracts predation, often in subtly hidden and sophisticated forms, that activity that concentrates on predation is often more successful in producing personal wealth

accumulation that direct wealth production (artifact production or distribution) and so historically we always see a shift to predation after periods of wealth creation. In the west, this effect is masked,
a) by the great increase in productivity related to innovative technology
b) by the **crucial** contribution to artifact innovation made by people generating new reliable knowledge. These people are potentially living in the 'predatory' area and the time lag between their activities and direct wealth creation can be very long, sometimes as much as several hundred years.

It is important that we refine our understanding of the above process, because it can provide important clues to a major aspect of the 'Fertile land' problem, that is, the perception that young people have of their society and the work and career paths they should best take and prepare themselves for.

A further problem that we should constantly bear in mind is the one of small but crucial minorities. The numbers of individuals who break new ground in the education, organization and pursuit of wealth creating institutions, and the number of individuals who contribute centrally to the process of the creation of new reliable knowledge is in each case a very small percentage of the population. The formation of these crucial minorities is untypical of the population as a whole and therefore difficult to explain using broad cultural analysis. Much thought and discussion needed here.

(new section)

1) A well established higher education system into which new learning can feed (notes - questioning, respect for learning, older and younger generation, rigidity).

2) A hierarchy which permits:-
a) an authority structure
b) competence to rise in the structure. Note Japan's interesting 2-tier structure age/ability on parallel tracks.
3) Manufacture must be economically beneficial compared to alternatives, i.e. service industry.
4) xenophobia?
5) A large (new?) market must already exist i.e. no market pioneering.
6) Re 5, note importance of textiles to kick 'start' the move to industrializations but only when other factors are present, i.e. rug weaving universal, but does not automatically lead to industrialization.
7) The whole process is transient - wealth, acquisition.
8) Cities must exist and act as attractions for large numbers of young men.
9) Role of the entrepreneur - he must see manufacture as desirable and he is less than 1% of the population.
10) Large injection of new data, technique needed over extended period.
11) Note difference and mode of transition from society which **absorbs** new knowledge and society which **generates** new knowledge
Phase lag - society which generates once absorbed. Hence networks.
12) Detailed examples from GWP compare Japan, USA.
13) Use looking-backwards approach - examine in great detail what's needed for knowledge generation knowledge dispersal, artifact manufacture with both tacit and coded knowledge in more complex society and see how this it is diffused to less complex.

Re 8. Large numbers of young men more to an area, with a prominent and existing market to seek careers. This will be widely recognized as a 'good job' place. The structure has to be in place to create the nucleus of such a place or places. The attraction is stronger for the more skilled and the more adventurous. But service industry must not be the main attractor. i.e. this must be either a small or newish centre for wealth generation and capable of rapid growth from a surrounding hinterland.
14) Consider the very delicate balance in a society between encouragement and disencouragement of innovation, i.e. large companies. Pressures to do things the same way.
15) Need for very detailed local new work to come into existence before local innovation can take off.
16) Cases to consider.

Diagram:

17) Consider the **existence** of an education system. **Why** did it come into existence? What does it show re the relationship between older and younger generations?
18) Read Hallpike?? 'Principles of Social Evolution Introduction and China', p.294. Awful jumble - he doesn't seem to know what he is trying to explain. Suggest stick to **artifacts** and **knowledge** needed to make artifacts.
19) Consider conditions required for **sustained** industrial activity over many generations (and sustained farming after H.G.) Importance of hierarchy and responsibility between generations.
20) Consider constantly the effect mentioned in Kuhn - internally consistent explanation within isolated group - like economies a form of logic that does not correspond to reality. (cf Einstein).
21) Cohesiveness of the group and rejection of outsiders. See newspaper article.
22) Lack of external predators, and low level of overseas aggression may have contributed to low innovation and low technology. Need to study relationship between innovations and warfare in Europe - see McNeill.
23) The mechanism of **overshoot**.

(new section)

The growth of Japanese industry during the last 150 years or so has been characterised by the acquisition of new (to the Japanese) knowledge from the west, and the use of this new knowledge to produce products.
Initially, the products were inferior to western products, then some of them became equal, eventually, a quite recent development a few have in some respects become qualitatively superior.

This is, initially, innovation of product was once wholly imported, then there was an indigenous innovative improvement, then, with a few products, innovation was exported.

This pattern follows very closely the growth of product manufacture in England 1500-1750, import coming largely from or through Europe.

However, there are important differences in the comparison - during the period of industrial growth in England, the techniques for the generation of new reliable knowledge were themselves being innovated, so:-
a) new date was becoming available to potential product and process designers (and this 'new data' was quite new - not available previously)
b) the systematic intellectual methods for the production of this new data started to diffuse into product design, so that design became more rational, more systematic, more experimental. (This second effect has been entirely overlooked by economic historians, yet is crucial to an understanding of the development of industry in the C18.)

Japan did not go through these phases of development.

In the textile industry, for instance, very extensive hand loom weaving built a successful base on low cost skilled, disciplined labour, then boomed by a combination of low cost skilled labour and automatic power looms imported from Europe and America and new synthetic fibres, also imported.

Gradually, powered automatic machinery was copied locally, and synthetic fibres were also copied.

This pattern has been repeated in many industries, and helps to clarify more exactly what changes we are trying to explain in 'Fertile land' studies.

Some of the characteristics which seem appropriate in this type of shift are:-

1) Large numbers of people, right across the spectrum of intellectual ability, must go into, and stay in the field of material manipulation.
2) Effective education systems must teach large numbers of people in a rationalistic thought mode, and disseminate factual data relevant to product design and manufacture.
3) There must be a 'work ethic'.
4) There must a hierarchy of a form which selects and encourages ability in all the various areas required in complex institutions and permits this ability to influence action in the appropriate parts of the organization.
5) There must be an ethos of **diligence** pervading the whole.
6) Propensity for **frugality**.

Japanese product development can be viewed broadly as a parallel to Thomas Kuhn's 'normal science', rather than paradigm - shifting science - this is, design innovation takes place by rearrangement of data within existing conceptual spaces.