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THE FIRST MILLENIAL EVENT

In this millennial year it might be interesting to think about one of the truly revolutionary events which mankind has experienced. It seems to me that there have been only three such times, other than the original appearance of Man, which can be called world-altering. The most recent we are experiencing right now in the transition to the Post-Industrial Age in which the dominant economic and social forces of the world will be centered around computers, communications, and related technology. The last such event was the Industrial Revolution that harnessed the power of steam and created the Industrial Age of the Nineteenth and Twentieth Centuries. From the Industrial Revolution to the Post-Industrial Age was two hundred years. From the Post-Industrial Age to the next revolution will probably be a much shorter time, perhaps only a generation or two, and the shape of that new age we cannot foretell. But we can look clearly at that first revolution that was the ultimate cause of the world in which we live. This revolution took place eight to thirteen thousand years ago at the end of the last Ice Age. It was the domestication of plants and animals.

I want to look in some detail at the outcomes from the domestication of animals, but this must be set in the context of the domestication of plants, which occurred first. Domestic crops were first grown in western Asia Minor in what is called the Fertile Crescent, an area of land running from the Mediterranean Sea around the headwaters of the Tigris and Euphrates Rivers to the mountains of Iraq and Iran. Some ten thousand to thirteen thousand years ago the nomadic hunter-gatherers of that region learned to grow wheat, barley, peas, and flax. They were the first because nowhere else in the world was there a place so suited, both by the availability of wild plants and by an ideal climate, to be the cradle of agriculture. Some two thousand to five thousand years later, after plant cultivation had spread over the entire Mediterranean area, the people of the Fertile Crescent began to domesticate large animals. The dog, which was the first animal to be domesticated, had been tamed centuries before during the Ice Age. The domesticated animals of the Fertile Crescent were sheep, goats, pigs, and cows, followed a millenium or two later by horses.

Why were these animals the ones to be selected? Why not lions, or bears, or deer? All these animals were available to the hunter-gatherers. Why did not some other people try to domesticate the elephant or the zebra? In other words, what characteristics did the successful candidates for domestication possess that others did not? Africa produced no large domestic animals and the Americas only one, the llama. The Americas have over twenty large animal species, Africa over fifty, Eurasia over seventy, so I suspect that early man might have tried to domesticate many species without success.

There are several interesting reasons why so few candidates were successfully domesticated. There is the diet. Conversion of plant protein into animal protein is very inefficient, with perhaps a ten percent conversion rate. Thus to produce a one thousand pound cow would take ten thousand pounds of grain or fodder. But to produce a one thousand pound lion would require ten thousand pounds of animal protein, and those animals must be fed on one hundred thousand pounds of plant food. If for no other reason, this fact ruled out lions and all other large carnivores. But what about bears?

They are omnivores, eating practically anything, as campers in the Smokies or Yellowstone are warned. Their meat is delicious, they are strong, long-lived, and at least as intelligent as horses. This brings up another consideration - disposition. Bears, water buffaloes, zebras, and other similar large animals which might be capable of doing work, providing meat and transport have nasty, dangerous, unpredictable dispositions.

Also important is the rate of growth. That eliminates elephants and gorillas although they are non-finicky vegetarians of great size, strength, intelligence, and of good dispositions. No herder could afford to keep such animals for fifteen to twenty-five years before they are mature enough to be productive. Mature elephants can be trapped and tamed and taught to do work, but they cannot be profitably domesticated.

Domestic animals must not have any unusual mating requirements or courtship rituals. Cheetahs, it is said, must run for miles during the breeding season for the female to come into heat properly, and other species become solitary, belligerent, or otherwise unmanageable.

Domestic animals must not be prone to panic. Some species are programmed to flee when frightened. Antelopes and deer have killed themselves running into fences or have died from shock. Today herds of deer are kept to produce venison, but they cannot be said to have been domesticated.

If you think about it, you will see that successfully domesticated large animals share three characteristics: they live in herds; they have a domestic hierarchy; and they are not territorial. Cattle, pigs, sheep, goats, and horses meet all these requirements. Their hierarchal social structure is perhaps the most important characteristic. A wild horse herd, for example, will have a stallion and several mares with their offspring. The stallion is dominant in the herd, followed by a dominant mare, with the others falling into rank behind her. The second ranking female submits to the first and dominates the lower ranking ones, and so on down the line. When the herd travels, the stallion normally brings up the rear, for this is where the danger is. The dominant mare leads the herd, followed by her offspring, followed by the second female and her offspring, followed by the third, and so on.

This characteristic of dominance allowed mankind to domesticate large herding animals. The herdsman became the dominant figure in the hierarchy. He became imprinted upon the young as they observed the adults submitting to him.

Finally it is very important that domestic animals not be territorial but rather live comfortably on ranges they share with man and other animals, and that they can live in fairly restricted areas.

Only a small percentage of large wild animals have been successfully domesticated because so few have these characteristics which allow compatibility with humans.

Domestication of plants and animals destroyed a life style that had existed everywhere for the previous seven million years. Those peoples who adopted the new culture went on to create civilization. Those who did not remained as Stone Age cultures even up to this century. This domestication of plants and animals was the most revolutionary event which has taken place on this planet. The people of the Fertile Crescent and their neighbors realized that a radical change had occurred. It became part of the legends, myths, and religion of the Jews, Greeks, and Persians. The Biblical myth

of Cain and Abel, for example, is an explanation of the dominance which food producers gained over food gatherers.

The ability to produce food allowed an increase in population. Nomads (food gatherers) typically space their children four years apart because the young child must be able to keep up with the tribe while the mother carries the baby. Food producers, then as now, typically space their children about two years apart. The sheer increase in numbers allowed the producers to overwhelm the gatherers, not to mention the fact that food surpluses permitted the creation of a class of technicians who did not have to hunt and gather every day and who could invent and make weapons, tools, and utensils. Food production brought about the creation of a leadership class, a bureaucracy, and a standing army. These organized the efforts of the community more effectively and led to the creation of civilization with written records, mathematics, and cities and all that went with them.

From our perspective we are not conscious of the time required for these changes to take place. It required about four or five thousand years of development before the first civilizations of Egypt, Ur, and Assyria appeared.

Apart from being sources of food, domestic animals changed the world in other ways. They were economic, cultural, and political accelerators. People learned to use milk, cheese, and butter as well as wool and leather. The population was thus better clothed as well as better fed, healthier, and more numerous.

Animals provided the first source of power, other than human labor, which man could control. Cattle and horses pulled plows, operated water wheels, carried loads and people. Horses could be used for military purposes, enabling their possessors to dominate those without them. The Hyksos, otherwise unknown, with their chariots conquered Egypt in about 6000 B.C. Within a society the control of horses created social classes like the Roman Equites or knights. Last but not least, animal manure provided fertilizer for fields and fuel for fires.

But, alas, the domestication of animals was not an unmixed blessing. From animals mankind acquired food and fuel and other benefits, but also germs, microbes, and viruses which cause our epidemic diseases from influenza to AIDS. This is not to say that all human diseases derive from animals. Primitive people always suffer from chronic diseases to which they do not develop immunity and which repeatedly reinfect them. Such diseases are hookworm, yaws, and, more seriously, leprosy. The soil harbors the microbe or larva that causes the infection, or the victims themselves act as reservoirs of the germs because the sufferers take so long to die of the disease. Primitive societies and animals do not appear to share their diseases because they are not in close contact.

All our acute infectious diseases appear to have come to us from our domesticated animals. An acute disease is one that either kills the victim very quickly, or, if the victim survives, creates antibodies which make him immune. Such diseases are smallpox, measles, whooping cough, tuberculosis, influenza, malaria, plague, and cholera, which have been the major killers of mankind for thousands of years.

I was told a story, supposedly true, about a young American doctor in a third world country who was baffled by an illness. His patient was a small, timid man suffering from pneumonia which seemed to be caused by an unidentified microbe. The patient's wife, who spoke English, was asked to translate the doctor's questions and her

husband's answers. Running out of possibilities he unwisely asked the man if he had had any sexual experiences which could be responsible. The man turned even paler, stammered out an answer, and tried to hide under the bed covers while the wife, with a scream of rage, picked up the water carafe beside the bed, proceeded to hit him over the head with it, and fled the room. When order was restored and the patient revived, it was learned that the man had confessed to repeated intercourse with sheep on a visit to the family farm.

If this story seems bizarre and unique, it probably reflects what occurred many times eight thousand years ago. Greek myths contain many stories of gods assuming the shape of animals to have intercourse with people. The name Europe, for example, derives from Europa, a maiden who was supposedly raped by Zeus in the form of a bull. The Cretans worshipped a bull, the Minotaur, which was apparently mated with young women. The fact that the Jews thought it necessary to put a prohibition against intercourse with animals into their laws is further evidence that this was a common occurrence and probably indicates that they were aware of possible health problems from the practice. In the same way their prohibitions against eating shellfish or pork possibly indicate an awareness that illness could be connected with these practices as well. Even today, if we no longer love our animals carnally, we love them platonically. Many people, especially children, pick up illnesses from their pets, though these are usually nuisances rather than serious matters.

People then were close to their animals in many ways. Barns and stables were usually built adjacent to or part of the house. They had no knowledge of disease transmission and little idea of sanitation, so it is not surprising that people acquired their animals' germs. How did these diseases become the diseases of man? Cat-scratch fever, which people constantly get from their cats, is not contagious; no other human will get it from the sufferer. The earliest diseases that people acquired from their animals must have been limited to the immediate victim as well, but somehow these microbes so enjoyed their human hosts that they evolved over thousands of years so as to be able to live in humans and be passed on.

Thus it appears that measles came from cattle. It seems to be related to the cattle disease rinderpest. Cattle were also the sources of tuberculosis and smallpox. The story of Lister discovering that smallpox could be prevented by an inoculation of cowpox is famous, but it also proves that there has long been a suspicion that diseases of animals and men are connected.

Pigs appear to have been the source of whooping cough and influenza. You will recall that a few years ago there was a tremendous concern about "swine flu", and people were urged to get inoculated. Fortunately swine flu proved to be a non-event, and more people were made ill by the vaccine than by the flu.

Finally, it should be noted that all the acute diseases which man has gotten from his domestic animals are crowd diseases. This is, they require a large population to sustain them, and they wax as new generations of non-immune children are born and wane as immunity is acquired. For example, it is estimated that a population of at least a half million people is required to keep the measles microbe going.

All the animals which were our sources of infectious diseases were herd animals and passed their microbes around to people living in their own herds. As far as I know,

solitary animals do not normally suffer from infectious diseases any more than small tribes of hunter-gatherers did.

When small groups of hunter-gatherers learned to grow their own food and raise animals, they became large groups with all the benefits and ills that their crops and animals brought them. The world was changed forever by this first millennial event. With this thought in mind, the changes in store for us in the Post-Industrial Age do not seem nearly so awesome.

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