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The Entanglements of Humans and Things: A Long-Term View

Ian Hodder

OVER RECENT DECADES THERE HAS BEEN widespread recognition in the social sciences and humanities of a “return to things,”¹ in contrast to the earlier focus on representation, and in contrast to the long scholarly tradition that separated subject from object, mind from matter. For example, the scholar of American literature Bill Brown has called for a “thing theory,”² while the philosopher Don Ihde’s “material hermeneutics” denies the opposition between positivism and hermeneutics and explores ways in which technologies and machines shape the way we do science and see the world.³ A similar point regarding the history of science has been made by Steven Shapin and Simon Schaffer in their work on the air pump used in experiments by Boyle.⁴ Like the microscope and the telescope, the pump allowed new things to be seen. Numerous different perspectives, from Actor-Network Theory to anthropological accounts of materiality and the buildup of “stuff” in our contemporary lives to discussions of the agency, vibrancy, and vitality of mute things, have converged on some version of the idea that subject and object, mind and matter, human and thing co-constitute each other.⁵ In these different approaches it is accepted that human existence and social life depend on material things and are entangled with them; humans and things are relationally produced.

There is a darker side to the entanglements of humans and things that is often missed in these relational approaches. A key aspect of our relationships with stuff is that they involve more than networks of humans and things, a symmetry of relations. Rather, our relations with things are often asymmetrical, leading to entrapments in particular pathways from which it is difficult to escape.

Entanglement

I define entanglement as the sum of four types of relationships between humans and things:⁶ humans depend on things (HT), things depend

on other things (TT), things depend on humans (TH), humans depend on humans (HH). Thus entanglement = (HT) + (TT) + (TH) + (HH). In this definition it is accepted that humans and things are relationally produced. But the focus on dependence rather than on relationality draws attention to the ways in which humans get entrapped in their relations with things. Humans get caught in a double bind, depending on things that depend on humans.

It is helpful to distinguish two forms of dependence. The first and more general focus on dependence recognizes that the human use of things is enabling. Human use of things allows humans to be, live, socialize, eat, think. I use the term dependence in the sense of "reliance on." But dependence also often leads to a second focus: dependency involves some form of constraint, as is seen in various dependency and codependency theories from World-Systems Theory to psychology.⁷ Humans become involved in various dependencies that limit their abilities to develop, as societies or as individuals.

Dependence and dependency create a dialectical struggle within entanglement. On the one hand, humans depend on or rely on things to achieve goals (dependence). This is the enabling part of the human use of tools and symbols in order to form the subject, society, and adaptation to environments. As stated by Elizabeth Grosz, "it is matter, the thing, that produces life."⁸ On the other hand, dependency and codependency occur when humans and things cannot manage without each other and, in this dependency on each other, they constrain and limit what each can do. The thing has been associated with a malevolent "biological materiality that is or may be the result of our unknowing (usually atomic or nuclear) intervention into nature, the revenge of the blob . . . which imperils man."⁹ These two components of dependence and dependency, positive and negative, produce and constrain human action and lead humans into entanglements from which it becomes difficult to become detached. Because humans rely on things that have to be maintained so that they can be relied on, humans are caught in the lives and temporalities of things, their uncertain vicissitudes and their insatiable needs. Things appear as hydra-like, requiring Herculean skill to stop them multiplying and entrapping, and yet the entrapment is enticing and productive.

Entanglement can thus be redefined as the dialectic of dependence and dependency between humans and things. The term "entanglement" seeks to capture the ways in which humans and things entrap each other. But it also seeks to recognize the ways in which a continual and exponentially increasing dynamism lies at the heart of the human experience. From the first moment when, as *Homo faber*, we invested in stone axes,

we found we could do more, and yet we found ourselves entrapped in the needs and demands of things and their limits and instabilities. It proved difficult to make things entirely social—they seemed to have lives of their own that we could not predict or control.

Surely it is an exaggeration to say that things are always falling apart, always changing and drawing us into their care; all that is solid does not melt into air. When we wake up each morning, the house is still there, there is sugar on the table for the breakfast cereal and the milk for the cereal is still cold in the fridge, the car is still in the garage and we can drive to work, the streets are still in place. And when something does go wrong, surely I can deal with it because on the whole I can trust that all the other things I need to fix it will be stable enough to get the job done. I can still call for help on my smartphone. On the whole, is it not the case that self and society depend on the stability of things, as Hannah Arendt argued?¹⁰

An answer to this objection is that yes, things do seem stable on the whole. But this is because we are, or someone is, working very hard to produce that stability. We depend on the sweetness of the sugar, and the milk in the cereal, and the electricity grid to light the shops and streets. But in order to produce this ready-to-handedness, this everyday expectation of stability and order, a vast apparatus of humans and things has to be mobilized on a global scale. To get the sugar to the table, to maintain the electricity grid, and to assure supplies of slippers, smartphones, and bikes, a massive mobilization of resources, humans, dependencies is involved. Things have lives of their own that we get drawn into, and society depends on our abilities to manage this vibrancy of things effectively, to produce the effect of stability. We often manage to live relatively unaware of the full complexity of what and who provides for us, but we are nevertheless deeply entangled in the vitality of things and the assemblages of their relations.

The notion that things are unstable is, from one perspective, the product of modern physics. For Newton, matter consisted of a stable mass and the forces that set mass in motion through attraction and repulsion. But Einstein showed that mass and energy can be converted into one another and so can be seen as equivalent.¹¹ We now see matter as made up of atoms that are very active, with a positively charged nucleus surrounded by spinning electrons. At a lower level there are protons, quarks, leptons, and so on. So at the atomic and subatomic level we see that matter “becomes” rather than “is.” And at large scales, complexity and chaos theory suggest that the natural environment is more complex and unstable than was thought, with unpredictable and nonlinear effects. Recent work in philosophy and the social sciences has

come to similar conclusions, and there are descriptions of new materialisms that explore the ways in which matter “becomes” within complex social-material worlds.¹²

Some Problems with the Relational View of Humans and Things

Many scholars have described the complex networks, meshes, mixes, chains, and engagements that result from the dependence of humans on things, things on things, and things on humans. Mauss wrote that “souls are mixed with things; things with souls,” and in this anthropological tradition others such as Marilyn Strathern have talked of enchainment or distributed personhood.¹³ The term “enchainment” as used by Strathern refers to Polynesian and Melanesian cultures where an artifact is not “a thing-in-itself.” It does not acquire identity from those who use it nor give identity to people. A thing is part of a chain of obligations and desires as things circulate, passed around as gifts. “If in a commodity economy things and persons assume the social form of things, then in a gift economy they assume the social form of persons.”¹⁴ In this context persons are “dividuals” or “partible persons”—that is persons are the products of chains of socially reproductive acts, so there is no division between the social and individual persona. So every person is a product of others, or has an identity which is produced from all the social actions that were involved in marriage, giving birth, nurturing, etc. Enchainment is created because of the “hau” of things—that is their need to be moved on, to be mobile. Gifts are treated as responsibilities that are to be quickly got rid of—it is wrong, impossible, for something to be stationary.¹⁵

Sociologists have tended to see the social world as about interpersonal relations. But Bruno Latour, John Law, and Karin Knorr-Cetina have come to see how engines, measuring instruments, laboratory probes, and detectors play a part as actors in structuring social relationships.¹⁶ These authors explore the production of scientific knowledge in the laboratory, but they also argue that similar social/thing processes occur more widely. They focus on the actor networks of big things like the computerized rail transportation system called ARAMIS,¹⁷ but they also look at small things like pipettes, paper blueprints, computer screens, and so on.

The aim of this type of approach, often termed Actor-Network Theory (ANT), is to focus on relationality rather than on apparent fixed and essential dualisms such as truth and falsehood, agency and structure,

human and nonhuman, before and after, knowledge and power, context and content, materiality and sociality, activity and passivity. It is not that there are no such divisions, but that the distinctions are effects or outcomes. "They are not given in the order of things."¹⁸ Thus ANT conducts a "semiotics of materiality." It takes the semiotic focus on relationality and applies it to all materials, producing a relational materiality.

In Latour's study of the "pasteurization of France," the microbe comes to be seen as an "essential actor."¹⁹ Microbes as things connect people and they connect people and things. Those in our guts connect us to what we eat. They also connect us through the spread of contagious diseases, and because we depend on each other to be hygienic and defeat microbes. So there is a clear focus on dependence here. We depend on the microbes that pasteurize beer in order to have economic relations between brewers and customers. We depend on sterilizing milk in order to be able to feed our children milk products. At the end of the nineteenth and early twentieth centuries, the triumph of hygiene allowed the First World War to be conducted, since "without the bacteriologists, the generals would never have been able to hold on to millions of men for four years in muddy, rat-infested trenches."²⁰ The dependence has costs—the costs of "setting up new professions, institutions, laboratories, and skills at all points."²¹

In this case Latour describes the actors as heterogeneous, made up of linked entities such as hygienists, drains, Agar gels, chickens, farms, and insects of all kinds. The actors are human, nonhuman, individual entities, and large institutions. The aim is to avoid reductionism and to focus on the dispersed networks through which such actors come to have form and come to act. In such work there is often an interest in what happens when things don't work and go wrong. Knorr-Cetina discusses a broken laboratory instrument and the effects this had.²² The scientists started to use a centrifuge in place of the broken instrument. By tinkering with the centrifuge, the measurement process came to be redefined, leading to a reworking of the scientists' problem. The humans, their research, and the instruments were thoroughly entangled in each other. The network required continuous "social, technical, *and* financial maintenance, surveillance, and repairs."²³ There is a "practical codependency between knowledge embodied by the researchers and knowledge incorporated in the instruments."²⁴ Latour talks of this codependence as "a work of hybridization."²⁵

Given this strain in ANT of incorporating dependence and dependency into analyses and interpretations of human-thing interactions, the use of the term "network" might seem inadequate. Latour argues that indeed the idea of network has lost its critical valency because of the

emphasis on information exchange and networks of global interaction in the World Wide Web.²⁶ He suggests that in ANT “network” originally meant transformations and translations. It referred to the complexities of linkages that made things related beyond their supposed existence as stable regional entities. In Spanish “network” is translated as *red* and in French as *réseau*, both of which have the connotations of web or mesh. Tim Ingold suggests that such terms give a better sense of rhizomic flows than does the term “network.”²⁷ The spider’s web is an extension of the spider and makes possible the life of the spider. Ingold prefers the word “meshwork” to give a better sense of flows of force and lived gatherings, rather than objects connected by networks. And yet there remains a tendency for ANT to give insufficient attention to the ways in which humans and things in their physical connectedness entrap each other. Latour’s focus is often on the mixing of humans and non-humans, and he rejects culture/nature oppositions. Indeed the whole of ANT is built upon a move away from fixed essentialist dualisms such as materiality and sociality, human and nonhuman. Pierre Lemonnier took Latour’s symmetrical approach to task for its tendency to overlook material constraints and focus on sociological issues. In his response Latour agreed that pure, asocial material constraints did not exist in his perspective.²⁸ Because Latour is intent on moving beyond subject/object dualisms and dialectical relations, he often appears to show little interest in objects and object relations themselves and the nonhuman ecologies in which they interact. “Objects are never assembled together to form some other realm anyhow.”²⁹ ANT analysis is “not a matter of giving priority to ‘the material world alone,’” since the aim is to supercede subject/object oppositions.³⁰ For Latour, the lack of dualism is a positive aspect of Actor-Network Theory.³¹ But to bring everything into the dispersed human/nonhuman network risks losing one of the main motors of change—the limited unfixed nature of things in themselves and their relationships with each other. There are many changes in natural cycles, in daily, monthly, annual, decadal, millennial rhythms. There are many processes of decay and loss and depletion that impinge on human society and in which things have unacknowledged and unforeseen effects. Because humans and nonhumans are thoroughly embroiled in each other, these material changes entangle humans, they force responses and adjustments. In 2005 Latour abandoned the principle of symmetry between humans and things because “the last thing I wanted was to give nature and society a new lease on life through ‘symmetry.’”³² As a result, in Latour’s analyses things are always already caught up in networks of humans and nonhumans and the object nature of things separate from society is not a key part of the analysis.

There are problems with the idea of a total mixing of humans and things in networks or meshes. At certain historical moments and in certain contexts, humans appear dominant over things, but at other places and times things seem to have the dominant hand (for example, during global warming at the end of the Pleistocene and perhaps during our own current experience of global warming). In ANT everything is relational and this insight is important. But it is also the case that materials and objects have affordances that are continuous from context to context. These material possibilities (whether instantiated or not) create potentials and constraints. So rather than talk of things and humans in meshworks or networks of interconnections, it seems more accurate to talk of a dialectical tension of dependence and dependency that is historically contingent. We seem caught; humans and things are stuck to each other. Rather than focusing on the web as a network, we can see it as a sticky entrapment.

Entanglement as Entrapment

Take the example of an apparently trivial and quite frivolous bit of stuff—Christmas tree lights. In many parts of the world, these have become an important constituent of the Christmas mix, replacing hazardous candles. It can hardly be said that humans in some cultures have come to depend on Christmas tree lights, but they add to the spirit of joy that is supposed to dominate this festival. Their use has extended into streets and the exteriors of shops, so that they have become a key part of the commerce of Christmas. In America whole streets and whole houses and gardens can get covered in lights. The scale of use of these lights results in large numbers of jobs in production worldwide. They use large amounts of electricity, such that we are encouraged to switch from incandescent bulbs to LEDs (light-emitting diodes) in order to be more energy efficient. As we take them off the tree or house or street after Christmas, they tend to get tangled up, or in some cases one of the bulbs fails so the whole string will not work. For various reasons, we throw a lot of them away every year.

Adam Minter starts his recent book *Junkyard Planet* with Christmas tree lights.³³ A single strand weighs almost nothing in the hand. But a hay-bale-sized block weighs 2,200 pounds. There are lots of such blocks in the southern Chinese town of Shijiao. In fact, the factories in Shijiao import and process 2.2 million pounds of Christmas tree lights every year. Cheap labor and low environmental standards meant that the town became an important center in the recycling of the lights. The

container ships that traveled from China to the United States did not want to go back empty; they offered low costs for taking back junk of all types, including Christmas tree lights. Until recently, many factories in Shijiao burned the lights to melt the plastic and recycle the copper wire, releasing toxic fumes into the environment. Today, as Minter describes, a cleaner method is used. When the Chinese started to buy cars in large numbers, the price of oil went up, as did plastics made from oil. So people started looking for alternatives to making plastic from oil. Instead of burning plastic off the copper wires of the lights, people figured out a way to strip it off and reuse it. The lights are now tossed into shredders and the resulting material is then sorted on vibrating tables spread with water. The resulting plastic that is separated off is of a good enough grade to be made into slipper soles, and the copper that remains is made into plumbing, power cords, and smartphones.

The making and recycling of Christmas lights provide large amounts of jobs for people worldwide; asked why Shijiao achieved its odd status as the center of Christmas light recycling, a local factory manager replied “people wanted to make money. . . . that’s all.”³⁴ Christmas tree lights are part of a heterogeneous network of religion, commerce, trade, and production (as well as slippers and plumbing) that has global reach. We could do without them, and they use up a lot of resources and their discard can cause pollution. Yet it is in everyone’s interests to keep using them. We could say that Christmas tree lights are part of a network of humans and things. But it is also true that they are part of a process whereby economically developed countries export their junk, and the hard and dirty labor associated with it, to other countries. The people that have come to depend on Christmas tree lights in various ways do not want to cease their production, use, and recycling, even though pollution may be caused, energy “wasted,” and global inequalities reproduced or strengthened. So we have become dependent on something that we know entraps us.

One of the reasons that we accept to live in Minter’s junkyard planet may be that many of us remain distant from the pollution, low-paid labor, and appalling work conditions. As we innocently reach up and put the lights on the Christmas tree, we do not see the planetary entanglements and entrapments that we create. China and other rising nations make massive profits out of our recyclables—everything from Christmas tree lights to television sets and cars to mobile phones, paper, and cardboard. We recycle, but it is almost as if we seek ways to convince ourselves that our headlong rush to stuff has no implications for our entanglement with the planet. For example, regarding the new digital technologies we use terms such as “air” book, the “cloud,” the “Web,” all of which terms seem light and insubstantial, even though they describe technologies based on

buildings full of wires, enormous use of energy, cheap labor, and toxic production and recycling processes. An average iPhone uses about 361 kilowatt-hours each year after factoring wireless connections, data usage, and battery charging.³⁵ A medium-sized refrigerator with an Energy Star rating only uses about 322 kilowatt-hours a year. The main problem is not the phone itself, but all the systems that run continuously to support it. There are computers and servers that run twenty-four hours a day, seven days a week. There are air-conditioning systems needed to keep the servers cool. There are manufacturing centers to build the devices, and nonstop electricity to power the broadband networks. Mark Mills estimates that the global Information-Communications-Technologies (ICT) ecosystem uses a total of 1,500 terawatt-hours of power every year, equal to the total electricity generated by Japan and Germany combined.³⁶ Coal is still the main producer of electricity in the United States, so Mills can say with some justification that “the cloud begins with coal” and that cellphone use contributes to global warming. We see social networks as flat. But in fact there is a dimension of depth in which dark matters, coal and rare earths, entrap us. It would be difficult to give up smartphones and Big Data; there is already too much invested, too much at stake. The things seem to have taken us over; at least our relationship with digital things has become asymmetrical—we need Christmas tree lights and smartphones (or think we do) and depend on them, even if they lead us further towards greater global inequalities and global warming.

The Irreversible Evolutionary Development of Entanglement

As an archaeologist, I am interested in when this headlong flight to things, our dependence on stuff, began. In my house, as in most modern houses in developed countries, there is way too much stuff. The internet is rife with advice about how to reduce clutter, how to reorganize one’s life and clean up one’s house. In my house there are thousands of objects, and objects within objects. Just take the two cars in my garage; each car has about twenty thousand parts derived from factories, quarries, and sales outlets all around the globe. And we haven’t even started with the washing machines, sinks, fridge, lawn mower, clothes, shoes (and slippers), computers, fire alarms, burglar alarms, and so on and so on. We live in a world in which we are surrounded by human-made things. But it wasn’t always like that.

For at least seventy thousand years, anatomically modern humans, people biologically like us in every way, lived in small mobile groups of ten to thirty people, aggregating from time to time, and sometimes

producing wonderful wall paintings and magnificent implements. Their success and mobility were partly possible because they carried very little stuff with them. The small bands had clothes made of skin tied together with sinews and plant chords. They had baskets and skin containers and through time they added bone tools such as needles. They had wooden spears and bows, as well as tools and weapons made of chipped stone such as flint and obsidian. They lived in cave entrances or in huts made of various plants or bones from wild animals. You could place on a small table all the material belongings of a man or woman twenty thousand years ago. They had very little stuff.

And what is more, when the stuff ran out, wore out, or went wrong, it was easy to replace. Most of the materials used were organic and easily found and remade. Worn out skin clothes could be replaced with the skins of hunted animals, wooden spears could be replaced from nearby trees, baskets could be replaced by fetching reeds from the river. Stone tools were made from local stones in many cases, but some flint and obsidian was obtained by going to farther sources or by exchanging with others. To some degree people were dependent on others and on access to sources of stone in order to survive, but for the most part people were little entangled in large amounts of human-made stuff, and they could get what they needed fairly easily.

But then, relatively suddenly, about ten thousand years ago in the Middle East, the amount of stuff in peoples' lives increased dramatically. By stuff I mean material things made by humans. Colin Renfrew has talked about the increased material engagement between humans and things at this time, associated with the start of farming and the origins of settled life. As Renfrew put it "human culture became more substantive, more material."³⁷ Those following a mobile existence were limited in terms of the accumulation of materials. But once people had settled, the potential for surrounding oneself with material things increased. Or we might turn this around and say that increasing material accumulation forced people to settle down and start farming.

The amount of new stuff that became part of the lives of people is quite striking. Over the course of the period between 12,000 and 7,000 BCE, people started living in permanent houses made of sun-dried mud brick.³⁸ The houses enclosed living and storage areas and often burial and ritual spaces. By 8500 BCE some of the houses were two-story buildings; the roofs were substantial, made of clay and reeds and timbers. In the houses were stored cereals that were now domesticated, changed by human intervention, as were the flocks of domestic sheep, pigs, and cattle. The latter presented humans with large amounts of meat that could be owned, stored, dried, used in feasting. Ground-stone imple-

ments were ubiquitous by 12,000 BCE and were used to make a variety of querns and pounders and abraders; finer stones were ground into polished axes used to cut down trees to provide the timbers for houses and burial chambers. Pottery made of fired clay was invented, providing storage, cooking, and eating containers for sedentary communities; fired clay was also used for pot stands, figurines, and stamp seals. Weaving implements in the form of spindle whorls appeared, suggesting a range of cloth goods which rarely survive, made from wool and flax. There was an increased variety of tools (including spoons and forks) and dress fittings and ornaments made of animal bone, as well as beads and necklaces made of bone, shell, and stone. We know that people expanded the range of wooden containers to include bowls and cups, and used an increasing diversity of baskets. It was no longer possible to place on a small table all one's belongings. People now had too much human-made material culture.

And the stuff was no longer so easy to replace. The more material people accumulated, the more they had to look after it and manage it. People were becoming increasingly entangled in things. Especially problematic were the walls of houses. The sun-dried mudbrick absorbed rainwater very easily, swelled, and then contracted. The walls had a tendency to crack, buckle, bend, and collapse. People had to find solutions to keep them up and stable; for example, they constructed wooden frames within houses or built buttresses against walls or used sandier bricks. So people got increasingly caught up in things and in the care and management of things. One thing just seemed to lead to another, as new solutions were found which themselves depended on getting more things. For example, in order to get the wooden posts that helped stabilize houses, people had to travel to upland areas away from the lowland settled villages. And they needed polished axes to cut the trees down. So they also had to travel to sources of ground stone to make the axes. Everything seemed to be getting much more complicated, entangled.

We see this increased entanglement with human-made things most clearly in the domestication of plants and animals. Once domesticated, wheat and barley plants can no longer shatter and disperse themselves naturally. The domesticated seeds stay attached to the stems of the plants. So if humans wanted to depend on domesticated cereals, they had to invent ways of processing the plants so that they could get the seeds off the stalks. In contrast to the hunter-gatherers who collected wild plants, the early farmers had to thresh and winnow cereals before they could eat them. They also had to plant the grains to obtain a new crop. The cereals had trapped humans into harder work and into getting more equipment (threshing floors and implements, sieves and screens for winnowing).

And much the same was true of domestic sheep and cattle. Domestic animals are smaller and less aggressive than their wild counterparts because humans select for more docile and manageable animals. But in order to protect the domestic flocks from the wild gene pool, they had to be watched, and herded, and their breeding controlled. So humans were trapped into the care of domestic flocks; they needed to shepherd them, provide stalls for the winter, build corrals in order to keep males from females at certain times of the year. And the entanglement only increased when sheep were used for wool and cattle for milk. We know that from very early on domestic cattle were used to produce milk, but since humans at this stage were largely lactose intolerant, the milk had to be cooked and processed into by-products such as yogurt and cheese. Indeed, some of the earliest pots in the Middle East were used to process milk. And so the domestication of cattle had entangled humans and pots into a set of dependencies in which humans got increasingly entrapped.

In all these examples we see increasing amounts of human-made stuff at the time of the first farmers in the Middle East, but we also see increasing entrapment as humans get drawn into more work and labor. There is also an interaction between these two processes. As we fix one thing, so we get drawn into another thing. As we fix the slumping house by building a wooden frame within it, so we need to go farther and obtain large timbers from upland areas and make axes that will cut down trees. We depend more on cattle, so we need to find a way of consuming milk; in fixing that problem by heating milk, we make pots that themselves require fuel to be fired. More stuff requires more investment by humans in more stuff.

There seems to be a directionality in this process. Above I defined stuff as things made by humans. Natural things have their own life cycles of death and birth. But things made by humans, man-made things, cannot reproduce on their own. In addition they need each other to function; milk needs a container to be heated in, and a pottery container needs fuel to fire it. So if humans are to depend on things, they have to get involved in the lives of things, to look after them, repair them, replace them, manage them. But in order to do this, humans need yet more things. And so there is a gradual, relentless inflation, a drive towards more and more stuff and more and more entanglement in stuff. Things made by humans are unstable. If we are to rely on them, we end up responding to them; we are drawn along by them in the direction of greater entanglement with more stuff.

Plotting the amount of stuff in human lives over the last seventy thousand years shows a clear exponential upward curve. This upward curve accelerates during the agricultural revolutions around the world.

But the most marked rate of increase has occurred in the time since the Industrial Revolution. Today we live in a world in which the amount of stuff on a small living-room table makes up only a tiny fraction of all the things in a house or owned by one adult person, and a minute fraction of all the material resources mobilized to produce consumer goods, houses, cities, nation-states, and global communications. In the small beginning in the Middle East ten thousand years ago was set a pattern of growth which continues today.

Unlike seventy thousand or ten thousand years ago, the increased amounts of entangled stuff within which we live our lives are difficult to conceive of, never mind to control. They are drawing us in the direction of greater entanglements that now include environmental change and global warming. Of course we will try and fix these problems as we always have done, by tinkering and finding solutions. But the lesson from archaeology is that these fixings often make the problem worse, because they involve using yet more technology, more things, new materials. The inflationary direction of increased human-thing entanglement moves forward relentlessly.

The Evolutionary Direction of Entanglement: Path Dependency

The stickiness of human-thing entrapments has another implication: entanglements gradually increase in complexity and scale, and it becomes more and more difficult to turn back. We saw that the Neolithic Revolution at the end of the last Ice Age and the start of the Holocene was characterized by a step change in the amount of human-made stuff. But it was also a time that humans became entrapped in the greater labor of dealing with cereals that, once domesticated, demanded human care and engagement. Humans became dependent on domestic cattle and sheep that demanded herding, protection, milking, shearing, and all the associated labor costs. In evolutionary terms, these neolithic changes have resulted in a great success story for cereals, cattle, and other domesticates. These species have proliferated at an exponential rate. There are now about 1.5 billion cows and bulls worldwide. Humans have become very dependent on cattle and it would be very difficult to sustain the planet's current human population levels without them. The entanglements too have proliferated. A cow or bull on average releases between 70 and 120 kilograms of methane per year. Methane is a greenhouse gas. All ruminants in the world emit about two billion metric tons of CO₂-equivalents per year. In addition, clearing of tropical forests

and rain forests to get more grazing land and farm land is responsible for an extra 2.8 billion metric tons of CO₂ emissions per year. According to the Food and Agriculture Organization of the United Nations (FAO), agriculture is responsible for 18 percent of the total release of greenhouse gases worldwide. We recognize and compute the problem; but it would be difficult to go back and manage without domesticated animals and plants—it would be difficult to decrease human population levels sufficiently so that we could return to collecting wild plants and hunting wild sheep and cattle. In much the same way, in the neolithic, once sedentary life had started and humans had invested in domesticated plants and animals, it would have been difficult to dismantle villages, decrease population levels, give up pots and grinding stones, and return to a hunter-gatherer way of life. Once humans had invested in things, they had become trapped in maintaining that investment and the benefits that it produced.

There is a long-term trend towards greater human-thing entanglement that is a product of the fact that human “being” depends on things, and of the fact that things depend on other things and on humans. Things are unstable and finite, so that change within entanglements is continually produced. Technological, social, and cultural solutions need to be found. Humans thus get increasingly drawn into the care of human-made things. Human evolution is thus fundamentally different from biological evolution. As John Maynard Smith recognized, a random change in one part of an organism will often be compensated for by adaptive changes in other parts.³⁹ But random change in one part of a machine often means that humans are drawn into finding technological solutions that often involve greater inputs and expenditures and on-costs. Entanglement thus tends to increase. Becoming disentangled is possible, but in most cases a local disentanglement (the collapse of the Maya or the British Empire) is better interpreted as a transformation and change in scale and nature of entanglements. In fact it is very difficult for humans to become less entangled because of the costs that have been invested in existing technologies and material and social worlds, and because unraveling one part of an entanglement often involves disentangling too many other parts. The directionality of entanglement is a by-product of (a) the instability and finite nature of things, (b) the dependence of things on other things and on humans, and (c) the difficulty of going back, of disentangling. Fixing or improving one part of the machine often leads to the need to improve or fix other parts; soon the fixes themselves need fixing, thus proliferating change. The increased rate and entrapment of entanglement may also be a product of the gradual decrease in the “external” environment. Over the course of human

evolution, the expansion of entanglements has meant that all aspects of the environment have become human artifacts. There is less and less outside the human that can “take care of itself.” The whole environment (in the Anthropocene) is itself an artifact needing care, fixing, and manipulation. There is more potential for unpredictable change and human response within complex unbounded artificial systems.

Conclusion

I have tried in this article to retreat from an entirely relational treatment of matter, to rediscover the object nature of things. The thingly relations of things include object relations; materials provide affordances or potentialities to humans. The brute matter of things has effects on us that go beyond social meaning. We cannot reduce things solely to the relational, to a semiotics of things. To do so undermines the power of things to entrap, and particularly to trap the more vulnerable, whether these be the victims of the AIDS virus, the work gang bound by chains, the women bound by child-rearing, or the populations bound by global agricultural systems. In the modern world, we have come to see that we need to use things sustainably and responsibly, to care for things. But this care and sustainability themselves too frequently involve further management and control, of animals, plants, landscapes, resources, and humans. So things have once again trumped us, entrapped us into their care. Whatever different detailed paths we have taken since we emerged as humans, we have as a species become more and more entangled in things. Ever since the first tool and the first fire, ever since we took the path of being dependent on things, we have been caught up in their lives. Historians have detailed the specific paths that have been taken within this broad movement. We have focused on the origins of agriculture and the emergence of property, or industrialization and the emergence of the nation-state, or on the emergence of new global technologies.⁴⁰ We have explored how some societies became entangled in guns, germs, and steel so that they spread over the Americas, or we have explained why, ultimately for geographic reasons, spurts of activity occurred in the West rather than in the East.⁴¹

There is much to be done in terms of understanding the different paths we have taken as humans, caught up in our varied ways with things. But the big picture is clear. Since a dependence on made things became an evolutionary pathway, there has been one long movement, initially slow, but speeding up exponentially as the strands of human-thing entanglement lengthened and intensified.

We recognize the dangers, but always with a short-term view. We talk today of sustainable use of the environment, of renewable resources, of green energy, of maintaining biodiversity, of resilient alliances, of recognizing that small is beautiful. We try all these paths but they all have the same effects of increasing input, regulating access, managing and increasing entanglements. These short-term solutions do not look at the big picture, that as humans we are involved in a dance with things that cannot be stopped, since we are only human through things. Perhaps there is a future in expanding our dependence on things into the oceans and into space, although both are increasingly cluttered with our detritus and both would involve vast new inputs and colossal entanglements.

Recognition of the long-term increase in entanglement raises the stakes in our ethical consideration of the paths we should consider taking as a species. It seems right that we do what we can to save forests, decrease carbon emissions, protect endangered species. It seems right that we individually use less fuel in our cars and put solar panels on our roofs. All these attempts at fixing problems such as global warming conform with the ways in which we as a species have always dealt with problems. It is in our nature to try and fix our problems now by fiddling and fixing and so becoming more entangled in things and technologies. It is in our very being to devour things. Our bodies incorporate minerals and energies that we gain from things; the electrochemical activity in our brains depends on food from the world around it; our societies are built on and through things. The environment is not just a backdrop within which we fix problems; rather it is actively involved in our being as a species. And this codependence, as we have seen, leads ineluctably to dependency and more entanglement. So to fiddle and fix, as we always have done, seems to be the only solution.⁴² But we have perhaps come close to the end of the sustainability of this human impulse. Perhaps we need to face the possibility that fixing our technologies of codependency only increases rather than resolves the problem. The long-term perspective of increased entanglement offered by archaeology and human evolution suggests the need to look deep inside ourselves and into what it means to be human. The moral choice is substantial: to change what it is to be human, to become something other than ourselves.

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NOTES

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