

*The best laid plans of mice and men gang aft agley.*¹

Abstract

People learn to respond to the world by acquiring and adapting schemas—recipes for dealing with particular situations. Such recipes can lead people to fall into habitual ways of thinking and acting. Habits make it possible for side effects of our activity to emerge without our being aware of them. This aspect of human behaviour makes us like the ants. One result is that a kind of natural selection works on people, creating unexpected social trends and patterns. Just as ants build their nests without conscious planning, so too social trends and patterns emerge as unexpected side effects of human activity. Examples include left-handers being good at certain sports and escalating differences in real estate prices.

Why are Left-Handers Good at Sport?

Sunday 6 July 2008. It is the climax of the 2008 Wimbledon tennis championship: the men's singles final. Out on centre court, five times winner Roger Federer is playing his twenty-two year old Spanish rival Rafael Nadal. After five sets spanning 4 h and 48 min, and two long rain delays, it is finally match point. Nadal serves and Federer's return hits the net. Suddenly it's all over. Nadal is the new Wimbledon champion. Another left-handed player has joined the ranks of champions.

Why are left-handers so good at sport? They account for less than 10 % of the general population and yet at the highest levels of tennis they make up over 20 % of top ranked players. Many champions have been left-handers, including Rafael Nadal and Rod Laver, arguably the best men's singles player of all time.

The prominence of left-handers in sport is not confined to tennis. Left-handers perform equally well, if not even better, in many sports. The list is impressive: cricket, fencing, squash, to name just a few. In boxing, for instance, the “south-paw”, the left-hander, is famous for being difficult to beat.

Why is this so? What is it about left-handers that makes them better at sport than the right-handed majority of the population? Many theories have been proposed, but the truth is simple. Ironically it stems from the very fact that left-handers are rare in the general population. Because left-handers are rare, right-handed beginners do not encounter them very often. When they do meet left-handers, they do not know how to cope. They are all at sea. On the other hand, the left-hander knows exactly what to do. Moreover he or she quickly learns how to exploit the right-hander’s confusion. Of course left-handers sometimes encounter other left-handers. One of the funniest sights in sport is to watch two left-handed beginners trying to compete against one another.

In sports such as tennis, left-handed beginners are able to exploit the confusion of right-handed beginners. They tend to win often. For a beginner in sport there is no greater incentive to continue than winning. If you win you feel on top of the world. If you lose, then your interest in a new sport quickly wanes. So left-handers get a lot of positive reinforcement, but most right-handers get negative reinforcement. The result is that a very high percentage of left-handers are encouraged to continue in their chosen sport. In a very real sense they have a selective advantage over their right-handed contemporaries.

As they progress up the ladder of success and skill, the left-hander continues to exploit the right-hander’s lack of experience. The proportion of left-handers in the more advanced levels of the sport continues to climb. Finally at the pinnacle of international competition the proportion of left-hander players has risen to 20 %. They no longer have the advantage of rarity; only native skill matters. However anyone at the peak of a sport is very definitely a winner anyway.

The above is not the full story. Not by any means. Left-handers do not have an initial advantage in all sports. It matters only in sports where the competitors face each other one on one. This includes most combat sports, such as boxing, fencing, and judo. It also includes many court games such as tennis, badminton, and squash. Some team sports, such as baseball and cricket, also have continual face offs. On the other hand there are many sports where being left or right-handed is irrelevant. Such sports include athletics, equestrian, gymnastics, shooting, sailing, and swimming.

The example of left-handers in sport highlights the way that unseen, unplanned processes shape human affairs, without people being aware of them. To summarize, we have now seen several important points. First there is a selective process that operates to weed out players in sports. Secondly left-handers have a selective advantage in many sports. Finally humans are subject to selective processes. What about other physical attributes? Do they affect performance in sports as well? The answer of course is yes! To begin with, everyone knows that particular sports favour players with particular physiques: basketball players need to be tall, gymnasts should be light but muscular, and long distance runners need long legs and a light build. And so it goes on.

Location, Location, Location

The success of left-handers in sport is just one example of unplanned outcomes that emerge from processes operating in human society. Take the way shops are distributed around a town. A few years ago, the video store down the road from our house closed and moved downtown. The reason for the move was that another video store had opened downtown and was already operating successfully. Businesses of a particular type tend to congregate together in the same part of town. This is not necessarily because those areas have been designated for (say) theatres or law firms. Rather it is because no one wants their competitors to gain an advantage over them. If you set up your business near a competitor, you avoid losing any advantage that their location gives them. You also give yourself the chance to steal customers away from them. As more theatres cluster together, the area becomes known as the theatre district. It is then imperative for new theatres to open in the same area or face a potential loss of patrons.

The same process also operates on other aspects of a city as well. Although most cities in the world today have central planning authorities, most of the older ones grew up in more or less haphazard fashion. This allows business districts and other concentrations to form. Even in the most highly planned of modern cities; the same effect is still at work. The real estate industry sees to that.

In the real estate industry, location is all-important in determining the market value of properties. A good house in a slum district will not fetch a high price, no matter how good it is. But how is it that some locations come to be better than others? Usually, it starts out with a natural advantage. One area may be conveniently placed near to major businesses, or it may be close the sea or a river, or it may be slightly hilly, allowing good views. These natural advantages are enough that people will seek them out and pay slightly more for them than they would for other properties. When some properties attract elevated prices, they raise the prices of other properties nearby. In this way, the average prices in one area will drift to become higher than in neighbouring areas. People naturally assume that the area with higher prices must be better to live in. So the process escalates. Over time, some districts become prestigious and much sought after, while others go into decline as people try to move to better areas. This is an example of the “snowball effect”, which we will look at in [Chap. 10](#).

The Ant Hill

At first sight it looks like nothing more than a large, flattened mound of coarse, dirty sand under the trees. Then you notice ants swarming all over it and realize that you are looking at an ant colony. A large colony, it is at least 10 m in diameter. Looking more closely, you begin to make out dozens of tiny entrances, each guarded by soldier ants, with lines of worker ants passing to and fro. But what you see on the surface is only the beginning. Underground, it is a city in miniature.

Descending from the surface, a worker ant enters a vast network of passageways and chambers. It is a miracle of organization. There are storage chambers for food, nurseries for eggs, and even a hall where the queen ant holds court.

Few groups of animals, other than humans, create large societies with elaborate living quarters. Ants, bees, and termites are the best known, but they include several other groups of insects, and even some mammals, such as moles.

What we humans find most remarkable is that ants, bees and other insects, manage to create complex communities without the ability to design the structures they build. Ants are incapable of abstract thought. They do not consciously plan. And yet they manage to build highly organized colonies comparable to human cities in their complexity and structure.

The ability of ants to build miniature cities without deliberate planning and control holds many lessons. Perhaps the most important lesson of all is that the same kinds of unconscious processes are also at work in human societies.

We humans think that we are superior to the ants. We think that we plan and act rationally. We think that we are in control. And yet in many ways we are just like ants, busy doing everyday things, oblivious of the bigger picture, oblivious of the effects that our activities have. Just as ants create an ant hill without knowing what they are doing, so too humans create situations, social trends and problems without being aware of where our actions are leading.

The results of unconscious processes are all around us. They affect our daily lives. Often they shape and influence human society. Sometimes the results are undesirable, sometimes disastrous. Like the ants, we humans are only dimly aware of them. And yet we need to understand these processes. We need to understand why they occur. We need to understand how they occur. A good way to begin is to look more closely at what the ants do.

Of Ants and Men

An ant has no idea of how to build an ant colony. All it knows are some simple rules that tell it how to behave. We might express some of these rules like this:

If you find a scrap of food, pick it up.

If you find a pile of food, drop any scrap of food you are carrying.

The effect of these rules is that the ants bring isolated scraps of food together (Fig. 2.1).² With hundreds of ants swarming around the ant hill, all behaving the same way, piles of food appear. Once the ants start forming these food piles, a process of positive *feedback*³ comes into play. As ants continue moving scraps of food around, larger piles grow at the expense of smaller piles. Before long, the food becomes sorted into just a few large piles.

The above process, known as *stigmergy*,⁴ is typical of the way in which order emerges spontaneously in many natural systems by self-organization. It is also an example of what has come to be known as *swarm intelligence*,⁵ which refers to a

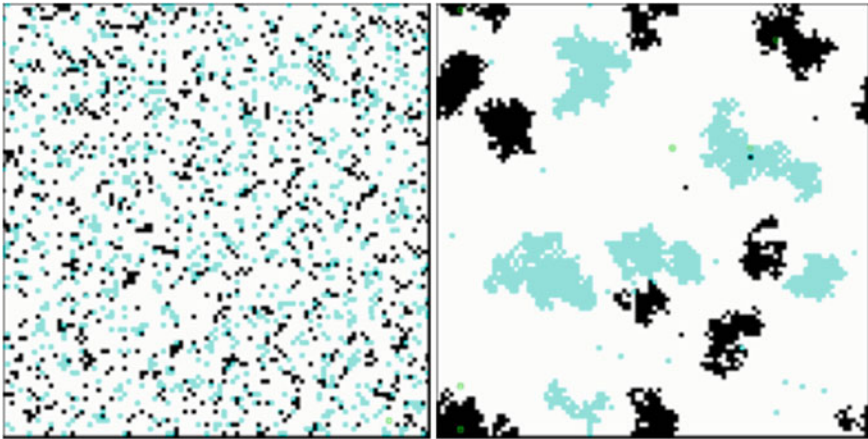


Fig. 2.1 A demonstration of stigmergy—showing how ants sort items in a colony. The *shaded* indicates different kinds of objects within the colony. At *left* is an unsorted nest; at *right* is the nest after ants have been active for some time

wide variety of cases where simple behaviour of many organisms combines to produce an intelligent result.⁶

Although we like to think of ourselves as intelligent individuals, we are also creatures of habit. Just as ants use simple rules to guide their behaviour, we use simple rules to help us to get through our daily lives. Rules of thumb help us cope with life's complexities. Here are some famous examples:

- *A stitch in time saves nine.* (Traditional proverb)
- *Never look a gift horse in the mouth.* (Old saying)
- *Do unto others, as you would have them do unto you.* (Christ's golden rule)
- *Buckle up and live.* (Road safety slogan)
- *Neither borrower nor lender be.* (From *The Merchant of Venice* by William Shakespeare)
- *Be prepared.* (Motto of the Boy Scouts Association)

According to the French psychologist Jean Piaget, children learn to respond to the world by adopting *schemas*.⁷ In effect, these schemas are like recipes: recipes for interpreting things and recipes for doing things.

As an example, think of a situation that you often encounter, say entering a room. You may not be aware of it, but you probably have a schema for entering a room. When you walk into a room, what do you expect to see? "Well of course," you would say, "there will be four walls, a floor and a ceiling. There would also be at least one door, and usually some windows." This is your basic mental model of what a room should look like. There are many possible refinements, such as lights and furniture, and details that depend on what sort of room it is. In a kitchen, for instance, you would expect to see a stove, cupboards and a sink. In a bedroom you would expect to find a bed.

So when you enter a room you mentally tick off the features you see against your mental model. Once you have ticked off an unimportant detail, you can forget it. What really stands out is a room that does not fit your model. Walk into a room with a wall or ceiling missing and you are sure to remember it. A kitchen with a bed in the middle is sure to seem unusual.

Children learn by building on and adapting the schemas they have already acquired. The main processes involved are known as *accommodation* and *assimilation*. Accommodation occurs when a child encounters a novel situation and finds a new pattern of behaviour, a new “schema”, to deal with it. Going to a party, for instance, would not only involve a schema for entering a room but also schemas for meeting new people and various other interpersonal situations. Assimilation occurs when a person encounters a variation on a known situation and adapts an existing schema to deal with it. As a simple example, take the case of a schema for entering a room. By assimilation, this schema can be adapted and generalized to deal with entering all manner of rooms, including bedrooms, bathrooms, kitchens, auditoriums, and even cupboards. By accommodation, it can also be incorporated into schemas for entering a house, entering a theatre, coming home, visiting friends, and so on. In this way children acquire an increasingly rich repertoire of schemas for interpreting and responding to situations they encounter. Piaget proposed that another process, known as *equilibration*, ensures a balance between accommodation and assimilation.

Just as simple rules of behaviour lead to the organisation of ant colonies, so too the individual behaviour of people leads to the self-organization of human societies. Most of the rules that we follow are not at all obvious. For the most part, we are not even conscious that we are following them. And yet we see the results all around us. We see them in class distinctions, in real estate booms, and growing demand for tertiary education. We see them in Internet bubbles, stock markets crashes, in food fads, in football clubs, in discos and in a hundred and one other aspects that we take for granted. Despite all our laws and law enforcement, the orderly running of society would be impossible if people did not adhere to certain basic principles. Anarchy would quickly take hold if most people were not conditioned to be honest, to work hard, to be polite, and to keep their surroundings clean and tidy.

To make it clearer that we live our lives according to simple rules, consider the following question. What happens when you get up and go to work each morning? Most people would answer this question with a list something like the following:

get out of bed
have a shower
get dressed
have breakfast
pack a briefcase
leave home
catch the bus

Of course, the details will vary from person to person, and even from day to day. But we can all identify with this sequence of events. Most of us have a routine that we follow on a regular basis. The point is that we are all creatures of habit. The above sequence is essentially a program for getting up and going to work. What is more, each step in our “going-to-work program” has substeps. Take just one step, say having breakfast. A typical “subroutine” for having breakfast might be as follows:

get out cereal, milk and cutlery
fill bowl with cereal and milk
heat bowl in microwave
sit and eat cereal
clear breakfast table

Each of these steps can again be broken down into a yet finer repertoire of habitual routines that we use. Eating cereal, for instance, might follow a sequence something like this:

dip spoon in bowl
remove spoonful of cereal and milk
put spoon in mouth
chew and swallow cereal
if bowl contains more cereal
then repeat the above steps
else finish eating

If we know exactly what is going to happen, as we do when eating breakfast, then we can work out a “program” that tells us exactly what to do at every stage. However, most real world situations are subject to many events and influences, most of which are unknown to us. Rules of thumb are recipes for coping with this uncertainty.

To take an example, suppose you are visiting a city that you have never been to before. You want to reach the city centre. If you have a road map, then you can plan exactly how to get there, which way to turn at every corner. But if you have no map, what do you do? The first time I visited Edinburgh, I had driven there by car from London. I had no map, but knew that my hotel was on the north of the city centre. So I used some simple rules of thumb: follow roads that lead more or less towards the centre but avoid minor streets and roads. This procedure worked so well I found the place without even resorting to asking locals for directions.

Another example is trying to reach the top of a mountain in heavy fog. You cannot see the top, so you just keep heading uphill. Of course, rules such as this are not fool proof. By going blindly uphill you could wind up on a knoll, not the peak, or reach a saddle where the ground is level in every direction, so it is no longer clear in which direction you should head. Nevertheless the rules are useful because they work in most cases.

We see similar issues in human situations. A rule like “always be polite to strangers” is a recipe for minimizing the risk of unintended conflict when people first meet. A proverb like “A stitch in time saves nine” is a recipe for preventing minor problems from growing into big ones.

The problem with simple rules is that they are based on assumptions, and assumptions often fail. If any of the items we need in our morning routine are missing, then the routine fails and we need to adapt or fall back on some alternative. Most of the time, having to adapt is mere inconvenience, but applying learned or habitual responses in inappropriate circumstances can have all kinds of unfortunate results. We shall see many examples in later chapters.

Another result of habitual behaviours is that they may have unintended side effects. Rules make life simple. But in following them, people ignore life’s complexities. As we saw earlier when we enter a room we mentally tick off details that are unimportant. We then ignore them. But sometimes the details we ignore are important. By ignoring things that do not immediately concern us we ignore the effects that those things might have.

Unexpected trends emerge because we ignore the side effects that our actions may have. That extra salt on your food might kill you one day. Those long showers you enjoy might contribute to a water shortage. Potential consequences of our actions are often unseen and unheeded, until they jump up and take us by surprise. In the following sections, we look at just a few of the ways in which unseen side-effects can lead to surprising outcomes.

The Human Ant Heap

The success of left-handers in sport, and spiralling real estate prices are just two simple examples of the many, many ways in which social trends emerge as unconscious by-products of human activity. In this book we will see why it is that, like the ants, we create unexpected social patterns and problems. The chapters that follow fall roughly into three parts. We begin in [Chaps. 3–6](#) by looking first at people as individuals then at the ways we interact with others, and with the world around us. This sets the scene for understanding why side effects are unexpected. In [Chaps. 7–13](#), we then look at society as a complex network of relationships and interactions, and some of the many ways in which complex networks lead to unpredictable outcomes. Having explored the human and network sources of unexpected results, in [Chaps. 14–20](#) we conclude by looking at how they influence some major social issues.

End Notes

¹From the poem *To a Mouse* (1786) by Robert Burns.

²The way ants go about sorting their nests provides motivation for the Ant Sort Algorithm, which is discussed in [Chap. 12](#). The Virtual Laboratory has a demonstration online at www.vlab.infotech.monash.edu.au.

³Feedback is a process in which the output of a process becomes new input back into it (see notes for previous chapter). See [Chap. 10](#) for a discussion.

⁴Wilson (1975), p. 186. For a demonstration of how stigmergy works, see the Virtual Laboratory ant sort, at www.vlab.infotech.monash.edu.au.

⁵See for example, Bonabeau et al. (1999).

⁶One of the first studies to demonstrate the emergence of spontaneous order from simple behaviour was work by Hogeweg and Hesper (1983). They showed that the organization of bumble bee colonies emerged as a result of simple behaviour by many individual bees interacting with their environment.

⁷Piaget (1972), Block (1982).

Of Ants and Men

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