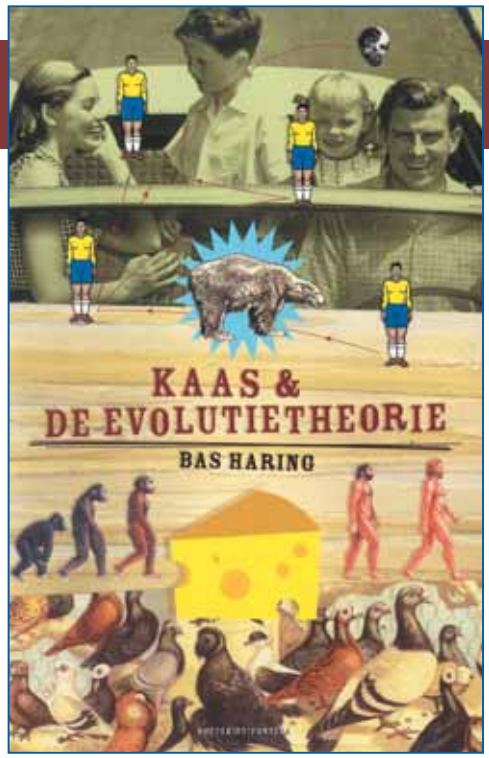
An informative literary jewel

Bas Haring

Cheese and the Theory of Evolution



Cheese and the Theory of Evolution which Bas Haring has written about the ideas of Darwin is a clever book. Haring leisurely explains exactly how, according the theory of evolution, life on earth in all its diversity came about.

What is brilliant about it is that he does not miss out a single step in the reasoning process. As a result, anyone from nine to ninety who is prepared to think logically can follow him. Did you get lost somewhere along the way during biology lessons? Haring will fill you in.

One endearing example is that of the rabbit population in the polder of the youngest Dutch province of Flevoland. The poldered artificial island had lain dry for no longer than a day when the rabbits appeared. How did they get there? They swam. But how did they realise so quickly that there was land within swimming distance?

Serendipity, says Haring. Once in a while an adventurous rabbit jumps into the sea. 'Most likely dozens of rabbits drowned on their way to the Flevopolder over the course of time before it was there.'

Haring uses dry humour in revealing that, although the world is incredibly cleverly constructed, it is, nevertheless, possible that everything originated by pure chance. He goes on to explain how you can win difficult games without understanding a single rule, how cheese was discovered, why plants and animals possess all kinds of useless and awkward body parts, why there are no dogs with feathers, why it is handy that men and women are almost always in the mood for sex, how you can reproduce yourself without having children and why we die.

It almost makes you think: the ultimate schoolbook. But Haring writes far too amusingly and with too fine a turn of phrase to be dismissed as a schoolmaster-turned author. *Cheese and the Theory of Evolution* is not only worth reading to understand the whole world, but also because it is so beautifully written and cleverly composed. An informative literary jewel.

PJOTR VAN LENTEREN

Bas Haring was born in 1968. After secondary school, he studied artificial intelligence at the University of Utrecht. Once he had graduated, he went into the business world, where he has remained. He advises companies on technological developments, such as the Internet, and helps organisations deploy these developments in generating new, better ways of working. He also lectures at the information sciences institute of the University of Leiden. Haring's special interest in the meaning of life led to writing this book which was awarded the Golden Owl for youth literature in 2002. Haring is currently using the prize money to finance the writing of his next book, this time about artificial intelligence.

Cheese and the theory of evolution *is a jewel of a book – my admiration for it increased with every page.* DE MORGEN

Cheese and the Theory of Evolution *by Bas Haring fills a gaping hole in the non-fiction offerings for the young. In an intelligent and playful way Haring reveals the non-teleological (that is the non goal-oriented) aspect of the modern evolutionary biology view of nature. And that is a great didactic service!* BIONIEUWS

Cheese and the Theory of Evolution *shows that the idea of evolution is extremely simple, convincing and easy to understand for everyone. Haring even makes you laugh.* DE VOLKSKRANT

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RIGHTS
Houtekiet
Vrijheidstraat 33
B - 2000 Antwerpen
TEL. +32 3 238 12 96
E-MAIL info@houtekiet.com

Foundation for the Production and Translation of Dutch Literature
Singel 464
NL - 1017 AW Amsterdam
TEL. 31 20 620 62 61
FAX +31 20 620 71 79
E-MAIL office@nlpvf.nl
WEBSITE www.nlpvf.nl

An interview with Bas Haring

"Artificial intelligence will be the theme of the future"

by Christine Huyge
(Datum, Medium)

translated by Roz Vatter-Buck

Anyone who has read Bas Haring's prize-winning, *Kaas en de evolutietheorie* (Cheese and the Theory of Evolution), can only hope that his second book will be on the shelves as soon as possible. In his forthcoming work, the Dutch winner of the Golden Owl for Youth Literature 2002 and the Eureka! Scientific Prize 2002 aims to get the public at large thinking about artificial intelligence, which will take over where the Internet left off. "Artificial intelligence will, in the not so distant future, change the face of not only companies but of the world".

"I wanted to be an artist or a biologist, when I was a kid," says Bas Haring. "But after secondary school I went to the University of Utrecht, to study physics. After two years, I changed over to the new artificial intelligence course, a collaboration between the philosophy, psychology and information science faculties. The discipline studies the phenomenon of intelligence in humans and animals on one hand and, on the other, focuses on the automation of intelligent tasks in computer systems".

Bas Haring is convinced that artificial intelligence will continue to gain ground. "No great technological leaps have been made in that discipline over recent years. Nevertheless, artificial intelligence will increasingly take over electronics and telecommunications. Which will make our environment quite a bit smarter. Within, say, fifteen years, the virtual world will start taking over parts of the physical world we know now. Artificial intelligence will reign supreme in that virtual world. We are currently experimenting with this at the Hogeschool van Amsterdam, where I lecture. We want, for example, to find out how we can make the building smarter using artificial intelligence. Can we get the lifts or other functions to respond to someone's presence?"

Bas Haring's second book will be about such issues. "I'll probably string the chapters together using a key word, such as "artificial". Then you get subjects like artificial learning, artificial sight, artificial brain, artificial reasoning, artificial will, artificial language, artificial life, artificial evolution, artificial emotion and artificial sentience. Take the latter: what is sentience and how do we

see sentience? Can a machine be sentient? If so, can we build that machine? How far have we got already? Sony, for example, claims that its robot dog, Aibo, has artificial emotions. According to Sony, they're actually real emotions. What kind of a claim is that? Is it nonsense or are they actually right?"

Cheese

You will find similar questions in "*Kaas en de evolutietheorie*" (Cheese and the Theory of Evolution). Why did life come about? Why do we have children? Why do we die? Does God exist? Should you bow to the majority? How was cheese invented? "I want to challenge people. Ask questions and make as few judgements as possible", says Bas Haring. Where does he get his inspiration? "I look around and then try to reason logically. I'm fascinated by questions that deal with why things happen and try to look at them through scientific spectacles. I've been doing that kind of thing since I was about twelve. I had views on certain things, feelings about things, but I was unable to really put my finger on the underlying reasoning. At some point, about two and a half years ago, I finally gave myself the chance to put it all together and make a story of it. In other words, I didn't go looking for a gap in the market, but once the book was finished, I just knew that there'd been nothing like it".

Everything is as true as it is untrue

What the Golden Owl jury praised was the author's approach. Nowhere is he judgmental or controversial. "The family I grew up in allowed me to have few prejudices about the world", explains Bas Haring. "Everything was as true as it was untrue. I was given no real incentive to intellectualise profoundly. Neither of my parents was highly educated. My father was a photographer. It didn't matter to him whether I went on to study or not. He would have been just as happy if I had become a photographer, too".

"I was a smart kid with a positive attitude and could always get along with teachers on their level, for instance. I was rather solitary, that's true, but not introverted. At primary school and at the beginning of secondary school I was usually busy drawing. I don't really know how I look back at my childhood. I never look back at it, actually. In any case, I've got no real negative feelings about it. Start a family? Sitting round with a load of kids on Wednesday

afternoons drinking tea and talking about what happened at school? It's not exactly the ideal scenario for me."

Corporate world versus academic environment

After his doctorate, Bas Haring opted for the business world. "I worked for Shell and Bakkenist, which was later taken over by Deloitte & Touche. The best assignment I ever had was an internal task for the consultancy agency itself. In the middle of all that dotcom-hype I was sent to San Francisco to further develop Deloitte & Touche's worldwide e-business strategy in a small international team. They had the idea that they were lagging behind. The moment I came back, in April 2000, the bubble burst."

Bas Haring currently lectures at the Hogeschool van Amsterdam and at the information sciences institute of the University of Leiden. Would he like to go back to the corporate world? "I really have a lot of freedom in the academic environment I'm in right now. Which is fantastic. But there are plenty of disadvantages. The academic world is far more individualistically oriented: there is hardly any real cooperation. In the companies I worked for everyone learned a lot from each other. Learning and development are far better organised in business. In the academic world you can actually only develop in interesting directions when you are a professor. In my opinion, the academic world is also far behind the business world where professionalism is concerned. There's all that political intrigue, the slowness, hour after hour of meetings, taking much too long over make decisions … I can't stand it. And I don't take part in it. I manage a course and try to do so in as professional a way as possible. But it does go against the grain of the prevailing culture. What I think is so strange is that the interest in social and cultural issues is far less in the academic world than in the companies where I've worked. Academics are very often blinkered, I feel."

"No, I wouldn't mind working in the business world again sometime. As an independent consultant, for example. I would like to help companies deploy technology and science to achieve new, better working methods. Being general manager of a relatively small, innovative company appeals to me, too, where you're not only responsible for strategy content but can also keep an eye on the operational, financial and personnel side of the business".

CV

Age: 34.

Childhood: “I grew up in a non-judgemental environment, which has influenced my work. At first I wanted to be a biologist or an artist.”

Education: “I once took the entrance exam for the academy of art. In the end I opted for physics. After two years, I changed over to artificial intelligence, because I found it far more interesting.”

Career: “After my doctorate, I chose to go into the corporate world. For four years I advised companies regarding the significance of technological developments. Now I lecture at the information sciences institute of the University of Leiden and at the Hogeschool van Amsterdam. Science is my profession, but I see myself more as a philosopher.”

Influences: “The American philosopher, Daniel Dennett. He wrote a book about the theory of evolution, as well. If Cheese ever gets translated, I would love him to read it. Apart from that, Johan Cruyff. Because he was a good footballer, but also because he can deviate from established patterns and therefore generated new developments.”

Regrets: “There are some things I should regret, but I don’t.”

Pride: “I’m particularly proud of the fact that I allowed myself the chance to set down my ideas about a whole lot of things on paper. The result is “Cheese and the Theory of Evolution”. Those ideas had been milling around in my head for years. I never imagined the book would get published. And I’m pleased it appears to be relevant for a lot of people.”

Best comment on Cheese: “It is a new way of conducting science.”

Criticism of Cheese: “Actually, there was only one bad review. One journalist felt I had dealt too summarily with God.”

Next step: “A book on artificial intelligence.”

Motto: “To ask questions and make as few judgements as possible.”

Sample Translation

Cheese and the Theory of Evolution

(Kaas en de evolutietheorie)

by Bas Haring

(Antwerpen: Houtekiet, 2001)

Translated by Lance Salway

Part One

The Theory of Evolution

This part of the book explains the theory of evolution. If all goes well, you should know after reading it how evolution works, why there are so many different species of animals and plants, and what genes are.
The second part of the book shows how the theory of evolution can shed light on many different subjects and questions. Questions like: can you become immortal? Why can't a dog have children with a chicken, and can you break the law?

How and why

If you've ever been snorkelling on a coral reef, wandered in a rain forest or just looked around you in a garden centre or a zoo, then you will know that nature exists in an amazingly beautiful and ingenious way. There are countless examples: polar bears have a thick white coat that makes sure they don't get cold and don't look conspicuous in the snow. There are deep sea fishes with luminous body parts that they use as flashlights in the darkest depths. Coconuts are simply cartons of milk that grow on trees, ready to be picked and drunk. And so it goes on.

If you look around at nature in this way, it will very soon occur to you that all these plants and animals did not come into being just by chance. Everything fits together so beautifully. The thick white coat of the polar bear, the flashlights of the deep sea fishes, coconuts, and so on, surely these must all have been developed or devised by some kind of super engineer or something like that?

But this isn't the case. Plants and animals have developed slowly over the course of time by the process of evolution. And evolution – together with all the many different things connected with it – is the subject of this little book. This book is not meant to be a comprehensive and scientific piece of work. I shall

forget to write about a great many things and maybe get it wrong every now and then. This book is meant more as a starting point for further thought.

We begin with an introduction to the theory of evolution. In this introduction we shall find, among other things, an answer to the question: 'Why is a polar bear white?'

But before embarking upon this, we'll first put that very question under the microscope. It may not seem so at first, but 'Why is a polar bear white?' is in fact a fairly complicated question. This is because of that awkward word 'why'. Just compare the following questions:

- Why is a fire engine red?
- Why is a polar bear white?
- Why is the sky blue?

The answer to the first question is simple: a fire engine is red because it can then be easily seen in traffic. Fire engines are therefore red for a purpose. Someone – a fire-engine designer – came up with the idea, and ever since then all fire engines have been sprayed red.

And why is the sky blue? It's obvious that the sky isn't blue for a purpose, as is the case with fire engines. The sky might just as easily be green or yellow. If you should ask a meteorologist why the sky is blue, then he will probably answer with a complicated story about the colour of sunlight, the reflection of light on air particles, and so on. Actually, the meteorologist is then really answering the question 'How does the sky come to be blue?' There is obviously a slight confusion between 'how' and 'why': 'why' can sometimes mean 'how'. So how does this affect the question 'Why is a polar bear white?' Do we mean how did the polar bear come to be white, or do we really mean why? In this question, how and why are linked even more closely together. But who knows, the complexity of the question will become clearer as we go into the theory of evolution.

We shall see that the theory of evolution doesn't just tell us about the origin of plants and animals alone, but has a much deeper meaning. The theory of evolution casts new light on centuries-old philosophical questions like 'Why does life exist?' and 'What is good and evil?' And the theory of evolution also has a bearing on everyday questions. Have you ever asked yourself 'How did cheese come to be invented?' or 'Is homosexuality natural?' These are questions that in one way or another have to do with evolutionary theory. All these questions – and a great many others – will be dealt with in this book.

The theory of evolution

The three ingredients of the theory of evolution – How these three ingredients together form the mechanism of evolution

You've probably already heard something about the theory of evolution. It was thought up by Charles Darwin, an Englishman who lived in the nineteenth century. And you will certainly have heard a thing or two about the development of man from an ape-like animal that lived hundreds of thousands of years ago. And perhaps you also know stories about fossils, and about the mysterious extinction of the dinosaurs. But I'm not going to talk about Neanderthal men, fossils and dinosaurs. We're staying closer to home.

Evolution happened and is still happening. But how does it come about? How exactly does evolution work?

The first ingredient of the theory of evolution

Let's start by buying ten roses. Take a very careful look at them. . . . they are all a little bit different: one has a few more thorns than the others, they are not all the exact shade of red, and so on. This is a very important initial observation: all roses are a little bit different. The same applies to other plants and animals too. Just look in a pasture; no cow has exactly the same pattern of patches as the next cow. And the same applies to people. So every person looks a little bit different.

Every person has a different fingerprint, for example. And so we have already got to grips with the first important ingredient in the theory of evolution:

All animals and plants of the same species are a little bit different.

The second ingredient of evolution

Take another look round at nature: hopping rabbits, flowering moorland and fluttering sparrows – can you picture them all? You might compare nature with the selection of a professional football team – FC Barcelona, for example. Let me explain why.

The Barcelona squad consists of about twenty players, each of them talented and all fine footballers. Sadly, only eleven of them can play in the match. Of course each of those twenty players is under enormous pressure to be one of the best eleven. And so they work their socks off at training. A player who can't make the grade will seek refuge with another club, and if it doesn't work out there either, he will then stop playing professional football. That's tough on him.

It's hard work keeping up to scratch in the squad. And in a different way it's hard work keeping up to scratch in nature. Many more animals are born than there is actually room for; only a small percentage of all baby animals will become adult. In fact, there isn't enough room on the earth for all these youngsters. By way of illustration: rabbits have about ten baby rabbits four times a year; after about five years, one pair of rabbits will have produced a couple of thousand million descendants. If all these rabbits stayed alive, earth would be a sea of rabbits – a hundred rabbits would be living on every square metre! Fortunately it hasn't happened, and this is because a great many rabbits die. Life is tough for rabbits. There are birds of prey who are always after them. There is a constant famine, and the farmer's dog is no joke either. Rabbits always have to be on the alert, and must get rid of the weakest among them in order to survive.

Here is another example of the strong pressure in nature and how animals must get rid of the weakest among them in order to survive. At the South Pole, more

than a hundred kilometres from the sea, lives the snow petrel. In his immediate environment there is only ice, and nothing edible can be found there. So every other day the bird flies the hundred-odd kilometres to the sea, catches a fish there, and eats half of it. Then he flies all the way back again with the other half in his gullet, and gives it to his partner to eat. The next day the partner performs the whole stunt all over again. But what makes this so incredible is this: in the same inhospitable region another bird appears, the skua. This bird eats the eggs of the snow petrel! There are therefore two species of bird that live off a single small fish swimming around in the sea a hundred kilometres away.

It's clear that life for these birds is very hard. And you might be forgiven for thinking that life is hard for these exceptional birds alone, living as they do under such bizarre circumstances. But this is not true: life is difficult for all animals. All animals and plants lead a very hard life and must do the best they can to survive.

Even when the circumstances appear easy, animals have a difficult time. Take the locusts in Africa, for example. Locusts eat grass and there are gigantic grassy plains in Africa. You might therefore think that locusts have an easy time of it in Africa, because there is food for them in abundance.

But because there is so much to eat, very many young locusts survive. These young locusts have more young locusts and a great many of these survive too. And the more locusts you have, the more you get until enough is enough. And so plagues of locusts occur in Africa. Plagues of locusts are gigantic clouds of locusts. They eat up all the greenery they come across in no time at all. Their persistent hunger drives them to strip parts of Africa bare. Locusts do not really do this for the fun of it. Those locusts have such an incredible hunger because there are too many of them and not enough to eat. So, thanks to the fact that there is such a tremendous lot of grass to eat, locusts have to do their level best to find enough.

And so we now have the second important ingredient in the theory of evolution:

All plants and animals have a hard life.

Perhaps you may be thinking that our own country would be more sympathetic to the hard life in nature. Everything looks so peaceful: sparrows here, rabbits there; no fierce struggle between life and death. But you would be horribly disappointed. Take those rabbits, for instance. In the 1950s, the Flevopolder was constructed in the Netherlands. Where the Flevopolder is now, with towns like Almere and Lelystad, there was nothing but water at the start of the 1950s. The Flevopolder was still only a sea of mud, with scarcely a plant to be seen, when the first rabbits appeared there. And this was when there was still a wide stretch of water between the Flevopolder and dry land. How was this possible? How did rabbits manage to appear on the Flevopolder at the very moment when it was possible for them to live there? Did someone set the rabbits free on purpose? Probably not. Perhaps someone left a number of rabbits behind on the island by accident. But that seems unlikely too: you don't just leave rabbits lying around. Then how did the rabbits get there? They swam! Flevoland lies only a few kilometres from the mainland and a rabbit can easily swim that distance.

But how did the rabbits know that land was within swimming distance? Could they smell Flevoland? Perhaps, but presumably the rabbits simply jumped into the water on the off chance, trusting to luck. And the minute they bumped into Flevoland, they did indeed strike it lucky!

For centuries now, rabbits have probably been jumping into the water on the off chance, and they probably still do. And of course it almost always means trouble for the brave ones that take the chance. Over the course of time scores of rabbits have presumably drowned on their way to the Flevopolder that wasn't yet there. And presumably many rabbits that just jump into the water somewhere are still drowned every year. But every now and then a rabbit strikes it lucky and lands on Flevoland, for instance.

What gets into these rabbits, for heaven's sake? Why should a rabbit take a leap into the unknown if he is leading a peaceful life with plenty of grass to eat? Because he isn't leading a peaceful life with plenty of grass to eat! No, life is

hard for rabbits. If you were desperate and hadn't eaten for a few days, then you too would risk a leap into the deep end.

Let's mix the first two ingredients

We have already seen two things: all animals and plants of the same species are a little bit different, and animals and plants have a hard life. We can combine the two observations and take an important step in the direction of the theory of evolution. Let's go back for a moment to the snow petrels we met a short while ago – those birds that live such a lonely life at the South Pole. We have seen that all plants and animals are a little bit different. Snow petrels too. There are snow petrels that are rather bigger than others, snow petrels that have fewer feathers than others, and there are snow petrels that can fly somewhat further. A snow petrel that can fly further is better able to take care of itself: he can go further away in search of fish, or he can take himself a little further onto the ice to avoid the dreaded skua. This small difference will ensure that the bird has a greater chance of becoming an adult: if few young birds survive, then these at least will be the 'best birds', the ones that can fly the furthest.

Compare this with two people having an arm wrestling contest. Two fellows, each as strong as bears, are facing each other. The sweat is standing on their foreheads. Each summons up all his strength in order to defeat the other. But they are of almost equal strength, and the battle lasts a long time. At last, with a mighty heave, one of them slams the hand of the other down on to the table: he has won. They were of almost equal strength but the one who was just that little bit stronger defeated the other in the end. And it is the same too in nature. The snow petrel with a very small advantage over his fellow birds will defeat those fellow birds in the end.

The first two ingredients in the theory of evolution (all plants and animals are a little bit different, and all plants and animals have a hard time) together provide the following:

The differences within a species, coupled with strong competition in nature, guarantees that those animals and plants which are better able to survive, most probably will survive.

A polar bear that is slightly whiter, a crocodile with somewhat stronger teeth, and a rabbit who can run just that little bit faster; they, in the end, are the ones who will probably survive, and not the others.

Ingredient three – the last ingredient

Now we need just one more thing to complete the theory of evolution, and that is heredity. Let's look again at the snow petrels. A bird that can fly just that little bit further has a greater chance of becoming an adult. And when that bird becomes an adult, then it too can have chicks – the bird has therefore an even greater chance of having chicks. Now it is more than likely that a number of these chicks will have the useful skill of their father or mother and will also be able to fly further themselves. This is one of the rules of nature: children resemble their parents. It's the same with you: you resemble your father and your mother. And if snow petrel parents can fly well, their children can probably do so too. Perhaps, by an ironic twist of fate, one of the chicks can fly even further than his parents – a super-chick! This super-chick has, of course, a greater chance of survival than his little friends.

Let's take another look at what happened to the super-chick and his descendants at the South Pole. In the beginning there was just one super-chick. When he was himself an adult, this super-chick had a super-chick too – that is the principle of heredity. Now there were two super-chicks at the South Pole. The super-chicks – or should we say super- snow petrels, because they aren't chicks any more – each have another super-chick in the spring. So there are now four super-chicks at the South Pole. Super-chicks have a better time of it than ordinary snow petrel chicks, and in the no-holds-barred battle for life, the super-snow petrels get the better of the ordinary ones: the four super-snow petrels survive. Four becomes eight and eight becomes sixteen and after who knows how many

springtimes a couple of thousand super-snow petrels are living at the South Pole. The total number of snow petrels has not grown any larger in the meanwhile – there is, after all, only a limited supply of food. The increase in the number of super-chicks has been at the expense of the number of ordinary chicks. And it isn't long before the snow petrel species consists almost entirely of super-snow petrels!

The theory of evolution in a nutshell

At a particular moment, a snow petrel is born that can fly somewhat further than the other snow petrels. This little bird becomes a trendsetter. And a number of generations later, the entire snow petrel species can fly somewhat further. In this way, the snow petrels fly further and further over the course of time. And what holds good for snow petrels, also holds good for polar bears, poppies and people:

- Within each species, all individuals are a little bit different;
- In the hard struggle for survival in nature, even the slightest advantage can make all the difference between life and death;
- By means of heredity, any attribute that offers an advantage will spread to the greater part of the species.

These three elements together ensure that a species will change time and again in small stages. Now we have in a nutshell the theory of evolution as it was devised by Charles Darwin:

The variations within a species, together with heredity and strong competition in nature, ensure that a species can change step by step.

Why is a polar bear white?

Now let's look at another example: polar bears. Why are polar bears so white? Picture to yourself a species of bear that lived a long time ago somewhere in the north of the world.

It was a brownish bear and it lived in the tundra. The hard life there forced the bears to search for food wherever they could, including the ice fields that bordered the tundra. You can imagine how conspicuous a brown bear looked on the ice, and how every seal had all the time in the world to dive calmly into the water when they saw these bears approaching in the distance – polar bears eat seals.

It just so happened, however, that some rather paler bears were born. These light brown bears were less conspicuous in the snow and were better equipped to find food on the ice. This meant that they survived more often than their darker fellows. And so the lighter bears had rather more young. These cubs were also light brown – a quality which they inherited from their parents.

Sometimes a baby bear was born that was even paler than his parents. This one was even less conspicuous in the snow, and had an even greater chance of survival. And so it went on and on: the lightest bear to be born had the upper hand and the greatest chance of breeding. And that is how the bear species gradually became lighter and lighter. The result is the present-day snow-white polar bear.

The same thing happened with all the other useful attributes of the polar bear: his thick coat, his webbed toes and the hair on the soles of his feet. These all came about on their own, without anyone having the idea that they would be useful to a polar bear. Every now and then you might be inclined to think that the thick white coat was specially designed for the polar bear: it suits him so well and it all seems so right and proper. But the thought doesn't really fit the facts: the thick white fur of the polar bear developed all by itself by means of the 'stupid' process of evolution.

It is said that the polar bear has adapted himself to his circumstances. But consider this: there isn't a single polar bear that has adapted himself! Each individual bear has stayed the same all his life; it is the polar bear species as a whole that has adapted. The adaptation of the polar bear species and the adaptation of, say, a car to suit the wishes of a client, are completely different

processes. In the last example, the objective is known, and you can take simple specific steps in the direction of the desired aim: add a spoiler, put on wider tyres and so on, proceeding step by step towards the sporty design that the client is looking for. But in the evolutionary process that takes place in nature, no objective is known beforehand and no specific steps are taken. All the steps are the result of the three ingredients that we have seen earlier.

But why are polar bears now so white? The previous chapter briefly discussed the meaning of the word ‘why’. Why was a fire engine red? A fire engine was red because it was designed that way: first of all someone had decided that fire engines must be red, and so they were sprayed red. But the colour of the sky is a different matter altogether: there is absolutely no reason why the sky should be blue. The sky just happens to be blue and it could just as well have been green or yellow.

Polar bears fit in somewhere between the sky and the fire engines. No one decided beforehand that polar bears had to be white. But it didn’t happen completely by chance either. Polar bears just happen to have become white. And polar bears have remained white because it’s useful to be pale.

Part Two

The theory of evolution and further...

Now we come to the best part! What meaning can we now attribute to the theory of evolution? What more does evolutionary theory have to tell us? We shall find out with the help of questions like: Could we become immortal? How was cheese invented? Is homosexuality natural? May you break the law?

The Abalone champion

A thought experiment that illustrates just how evolution works – A strategy to defeat every world champion in every thought game

Abalone is a modern thought-game that two people can play. You play on a board that has little holes, and in the holes there are little coloured balls. You probably aren't familiar with Abalone, and that's what makes it such fun: I can show you how to play Abalone so that you can beat everyone without even knowing how to play!

The little balls are black and white; each player has his own colour. At the start, the balls lie on the board according to a standard start formation. You make a move by giving a ball of your colour a little push in a fixed direction. With this ball you can push other balls out of the way and even push them off the board altogether. The purpose of the game is to push as many of your opponent's balls off the board as possible. It is probably a bit more complicated than this (I can't actually play Abalone myself) but that doesn't really matter, because you do not need to know the exact rules of the game in order to beat everyone.

You are playing Abalone against the world champion, and now comes the dodge: you can try a hundred different moves at random. You get a hundred boards, plus the balls to go with them. And you do what you like a hundred times – you don't know Abalone at all, remember. And because you don't know the

rules, you make a great many moves that are not allowed. You lose these matches right away. With all moves that are allowed, the world champion responds with a counter-move. This world champion is probably so good that you will lose on at least ninety boards; you put these boards back in the cupboard right away. But on ten or so boards, you carry on to the end. Now for each of the ten boards, you get a hundred more chances – you now have a thousand boards in front of you, but they are all easy to control because you just blunder along a thousand times. A thousand arbitrary moves: you push a ball to the left, a ball to the right, and you haven't the faintest idea what you're doing. Still, among these thousand boards there are probably a couple that you don't lose right away. And so the game goes on: every now and again you make hundreds of arbitrary moves, and of those hundreds there are always one or two that succeed. All other games – those in which you make a bad or illegal move – you lose, and those boards disappear from the scene.

At a particular moment someone comes past. He sees you sitting opposite the world Abalone champion with three boards between you – all the boards you lost have been taken away. So, looking at these three boards, the passer-by gets the impression that you are putting up a good fight against the world champion: he just doesn't see all those thousands and thousands of boards that you lost. The passer-by asks you how the game is going on one of the boards. You have written down the moves and repeat them for him. If the passer-by can play Abalone a little, he will certainly recognise a number of your very crafty moves, and he assumes that there are all kinds of strategies in your game. He thinks that you can play Abalone amazingly well. And then he asks: 'Why did you move those two balls forward in the seventeenth move?' What answer would you give?

You have no idea why you made that move; you just did. Quite by chance, you made a move that panned out well – you just can't help making a move like that every now and then; you're making hundreds all the time. So, looking at the games that 'survive' – the games you haven't lost – it seems as though you know how to play Abalone really well, thinking carefully about the game and making moves with a definite purpose, though this isn't the case at all.

This strategy of playing Abalone is the strategy of evolution: it is all a question of trying to do a great many different things without thinking about them. If something doesn't work – like a really bad Abalone move or a bright red polar bear – then it vanishes all by itself. In this way, only the winning moves are left.

Later on in the game you could probably explain why that seventeenth move seemed to be a good idea. Perhaps that move made sure that in the one that followed you could push a whole row of your opponent's balls off the board. But this isn't the reason why you made that move. You could therefore give an honest answer to the question, 'Why did you win that game with that single seventeenth move?' but you couldn't actually give a sensible answer to the question, 'Why did you make that seventeenth move?' A small but vital difference! And the same difference applies to questions about white polar bears (and other questions about the useful qualities of plants and animals). You could easily say why the polar bear species stays white, but you can't actually say why the polar bear is white: the polar bear just happens to have become white, and he has stayed white because it seems to be particularly useful.

If you're not careful, you could easily make the same mistake as the passer-by who saw you playing Abalone. Suppose that one day you go to a small village in the country. You talk to some of the people who live there, and it occurs to you that most of the people you spoke to were born and bred there. Most of them are farmers who have inherited properties from their parents, attach great importance to tradition, and want nothing to do with city nonsense.

But that conclusion would be a mistake. It may well be the case that half the villagers have emigrated to New York and become artists! But you don't know that because you haven't spoken to those people – after all, they're already in New York, aren't they?

The passer-by gained a mistaken impression of your abilities as an Abalone player because he could only see a part of the reality: he only saw the games you had played well.

You could easily make the same mistake when you look at nature and all the plants and animals that interact with each other so well. We do not see all those millions and millions of plants and animals that haven't been at all successful and have long since died out. It sometimes seems as though an intelligent mechanism must lie hidden behind all those beautiful organisms: scented roses, stinking skunks, armoured turtles, luminous deep sea fishes and so many more. But then you forget all those experiments in nature that have not been so successful – armoured deep sea fishes, stinking roses, luminous skunks and scented turtles.

To sum up

- If you just muddle along anyhow and everyone forgets about your failures, then you come across as being very clever.
- Because all the millions and millions of failed plants and animals have disappeared from the face of the earth and all the successful ones have remained, it appears as though plants and animals have been invented by something rather clever.

The discovery of cheese

You are standing in the kitchen, making a cheese sandwich. It's nice, isn't it, cheese? But actually it's very strange stuff. Have you ever asked yourself who in heaven's name came up with the idea of cheese? Cheese is strange. You make it with fresh milk, into which you pour a little rennet. Rennet is a liquid that comes from the stomach of a calf. Rennet makes the milk curdle; it turns into nasty stuff that looks like milk that has gone off (with those thick white lumps). You pass this stuff through a fine sieve and the white sediment that remains in the sieve you put into salt water. After a while you have cheese.

Who could have thought of anything so ridiculous? Who could ever have thought of emptying the stomach of a calf and throwing it into milk?

There must have been someone once who emptied a calf's stomach into a bucket or jug of milk for the very first time. Do you really think that this person did it on purpose with the intention of making cheese? Do you really think that he

or she thought: hmn, I think I'll put the stomach of this calf into that bucket of milk; it's highly probable that the milk will curdle and from those lumps I will make a solid yellow stuff that I will call cheese – it will be delicious in sandwiches? No, it definitely didn't happen like that. Most probably someone once dropped a calf's stomach in a bucket of milk quite by accident. And it just so happened that it turned out to be a brilliant idea.

Never before had anyone thought that you could make delicious cheese by throwing a calf's stomach into milk, just as never before had anyone thought that you could eat potatoes. People just tried it. People have always just tried everything. Doubtless there have been people in the past who have eaten tree bark, there are people who have roasted beetles over a fire and there are people who have tried boiled hair. But from the majority of these experiments you just get stomach ache or, even worse, you die.

Only the successful experiments – cheese, potatoes and asparagus, for instance – have reached the restaurant menus. Apart from that, these experiments also show the basic crudity of our existence: people have always had to try everything, because otherwise they'd die of starvation.

What have these foodstuffs to do with the theory of evolution? It isn't as complicated as it seems. We have seen that cheese wasn't invented. No one discovered cheese. Cheese happened just by chance or by accident or something like that. But because it turned out to be delicious, cheese still exists and we put it in sandwiches today. Evolution works in much the same way. Evolution is a stupid, 'unthinking' process, and animals are the chance experiments that have survived because they seem to work.

In brief

- Plants and animals are not like cars: every part of a car has a use, but plants and animals have a great many useless appendages and properties.

- People seem to find it difficult to accept that the world is full of useless things – perhaps this is because the things that people make themselves are often useful (or appear to be).
- Cheese was not discovered. Cheese came into being by a twist of fate, and continues to exist because it's delicious in sandwiches.

To sum up

Have you ever gone skiing or snowboarding? Racing down a beautiful sloping piste…

You can also get pistes that aren't so good. Ever seen or skiied on one? Skiiing on these rotten pistes is very difficult. They are not beautifully smooth but unbelievably bumpy. They actually consist of a lot of mini-mountains about a metre or so in height. If you look at one of these pistes from a distance, you can see these little mountains lying next to each other, at exactly the same distance apart. As if they were put there on purpose. But this isn't so. These rotten pistes come into being on their own, in places where the snow hasn't been smoothed out by snow ploughs.

A rotten piste starts out as a beautiful sloping incline. But when a lot of people have skied down the slope, small bumps develop as a result of the skiing. The next skiers avoid the little bumps and tend to follow the same paths as their predecessors – so the skiers all keep together. And because of this, the bumps become even bigger humps. Time for the piste to be smoothed out by a snow plough. But if this doesn't happen, the bumps get higher and higher and a rotten piste comes into being all by itself. And once it's there, it's very difficult to get rid of it. A rotten piste appears somewhere more or less by chance and keeps going all by itself.

And really, life is exactly like one of these rotten pistes: coming into being quite by chance and dying out with difficulty. Nothing more and nothing less. Life came into being once, it is good at surviving and because of that, it's still here.

Here we all are then: people, roses, wild boar, bacteria. And all because of the fact that we are good at remaining in existence. Without any real purpose. What a comedown.

The universe sometimes seems like a great saucepan of soup cooking on a stove that has been left burning in a forgotten mountain hut; no one has been there for years, and no one will come there for years either. All sorts of things are happening in the saucepan: a carrot is floating to the left and a piece of sausage is bubbling on the right. And all to no purpose. But should something in the saucepan just keep going on its own, then it will continue to do so. And so it is with life too. A saucepan of soup, a rotten piste. No grandiloquent instructions from God. Just something that has come into being in the universe and seems to be good at existing. All the things that are here now and were here a long time ago too – plant and animal species, patterns of behaviour, rules, occupations, organisations, ideas, machinery – all these things are here because each in its own way is good at surviving. That's all, it all fits together so simply!

There is no easy answer to the question: why did life develop? Why did the fragrant flowers, delicious strawberries and beautiful parrots come into being? And why did we – people – come into being? For no good reason! We did not come into being to please anyone and no one designed us. Nothing points to the possibility that life originated for a reason or a purpose. We simply came into being and here we all are. There is not even a universal ideal of goodness from which our life can be considered.

This doesn't mean that my life and yours have no purpose. Life itself can indeed have a purpose, it is only the original development of life that has no purpose. And that in itself is a beautiful thing too. Because it gives us the potential to decide our own objectives.