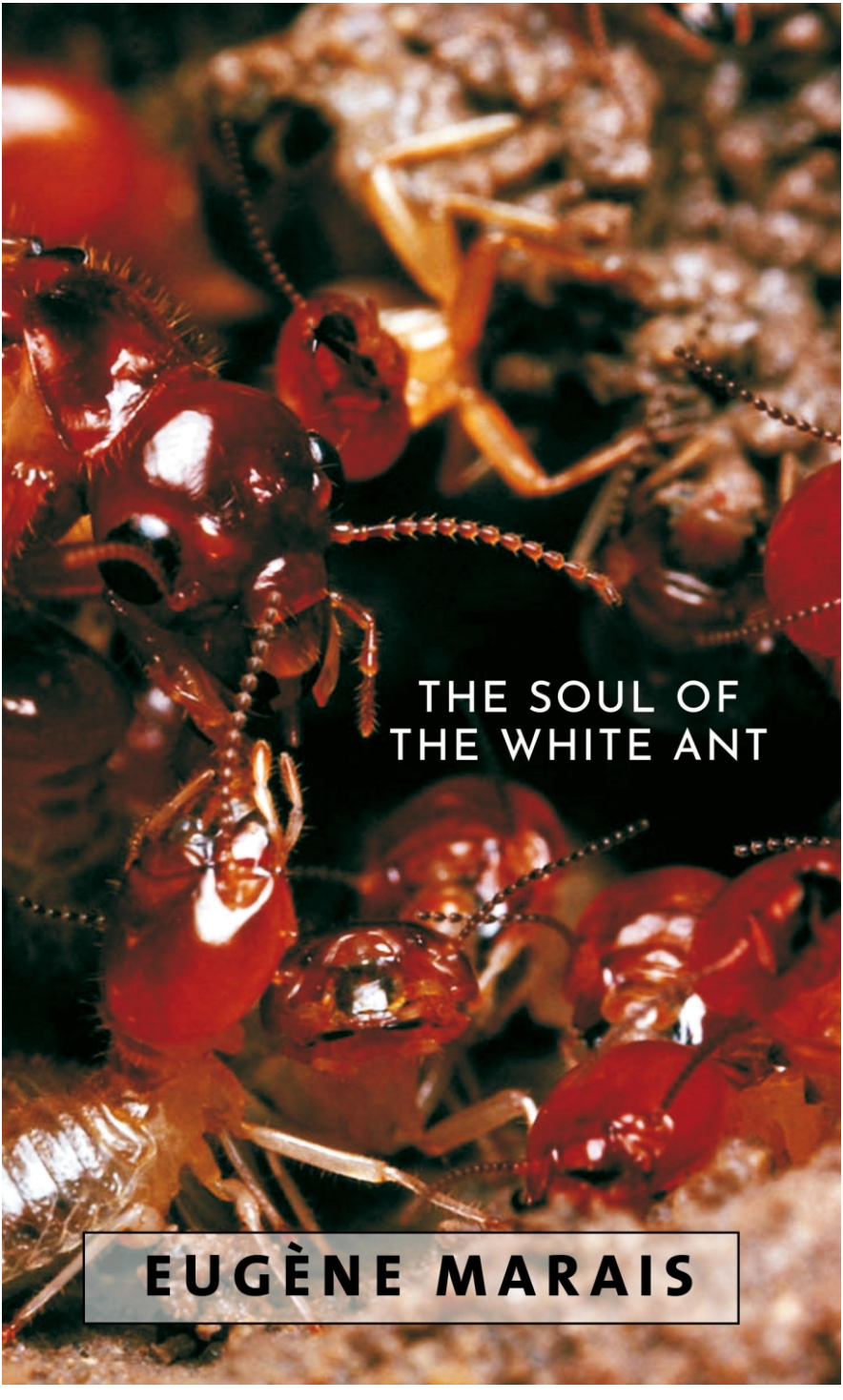
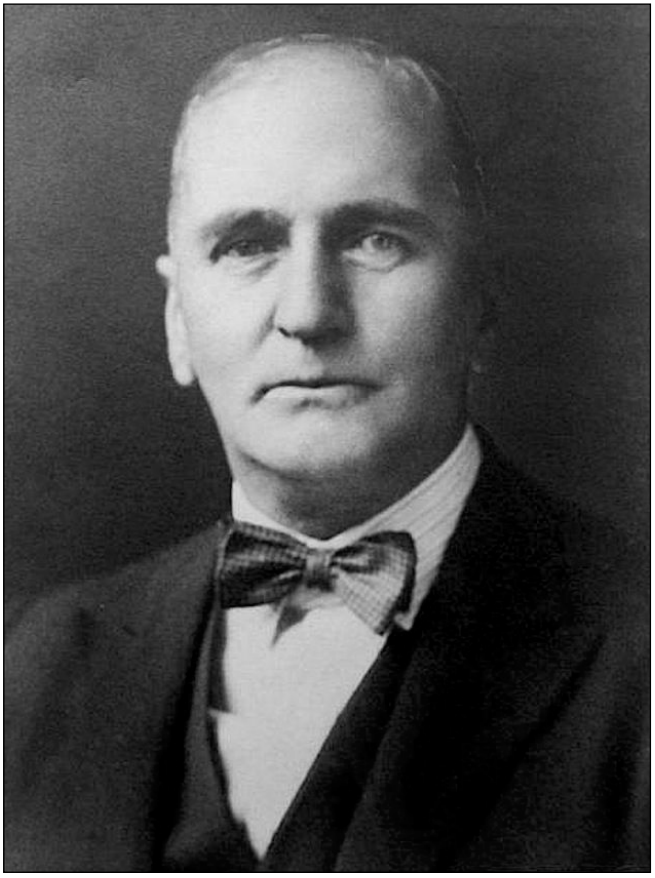

THE SOUL OF
THE WHITE ANT
EUGÈNE MARAIS

The Soul of the White Ant



Eugène Marais

THE SOUL OF THE WHITE ANT

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The Soul of the White Ant

Eugène N. Marais

First published in Afrikaans
under the title *Die Siel van die Mier*

First published in English in 1937.

ISBN 978-0-9802976-5-2

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ORIGINAL PUBLISHER'S NOTE

EUGÈNE MARAIS was born in a farming community near Pretoria in 1872. Journalism was his first career, but he later studied law in London, and by 1910 was in Johannesburg trying to establish himself as an advocate. Increasing depression finally drove him to retreat to Waterberg, a mountain area in northern Transvaal.

Settling near a large group of chacma baboons, he became the first man to conduct a prolonged study of primates in the wild. It was this period that produced *My Friends the Baboons* and provided the major inspiration for *The Soul of the Ape*.

He returned to Pretoria to practise law, to resume his career as a journalist, to continue his animal studies and to write poetry in Afrikaans.

In 1926, the year after he had published a definitive article on his original research and conclusions about the white ant, a world-famous European author took half Marais's life-work and published it as his own. This plagiarism may well have been a major factor in Marais's final collapse.

Plagued for many years by ill-health and an addiction to morphine, he took his own life in March 1936.

ORIGINAL TRANSLATOR'S PREFACE

THE NAME OF EUGÈNE N. MARAIS is known to all Afrikaans-speaking South Africans as a writer of short stories and verse. He himself, however, would wish to be remembered for his lifelong study of termites and apes. He began his working life after leaving college as a journalist, then studied medicine for four years, but eventually took up law.

A scholar and a man of culture, he chose nevertheless to live for a period extending over many years in a 'rondhavel' or hut in the lonely Waterberg mountains, learning to know and make friends with a troop of wild baboons, whose behaviour he wished to study. He tamed them to such a degree that he could move among them and handle them without any fear or danger to himself. At the same time, he also examined the other end of the chain, and studied termite life. This was a study which often meant tremendous hard work and needed endless patience.

During those years, Eugène Marais was not concerned with any sort of publicity. However, a friend persuaded him to write an article for the Afrikaans periodical *Die Huisgenoot*. This proved so popular that the author was besieged with requests for more research information. The articles continued for almost two years.

His years of unceasing work on the *veld* led Eugène Marais to formulate his theory that the individual nest of the termites is similar in every respect to the organism of an animal. He observed that the workers and soldiers resemble red and white

blood corpuscles, while gardens with fungus are the digestive organ. The queen functions as the brain, and the sexual flight is similar in every aspect to the escape of spermatozoa and ova.

About six years after these articles appeared, Maurice Maeterlinck published his book *The Life of the White Ant*, in which he described the organic unity of the termitary and compared it with the human body. This theory created great interest at the time and was generally accepted as an original one formulated by Maeterlinck. The fact that an unknown South African observer had developed the theory after many years of extensive labour was not generally known in Europe.

Excerpts from Marais's articles had, however, appeared in both the Belgian and the French press at the time of their publication in South Africa. Indeed, the original Afrikaans articles would have been intelligible to any Fleming, for Afrikaans and Flemish are very similar.

No one who reads this book, based on the articles published so many years earlier than Maeterlinck's book, would hesitate to give its author the honour due to him.

Eugène Marais intended writing a fuller and more scientific volume, but this intention was frustrated by his untimely death.

– *Winifred de Kok (London, 1937)*

EUGÈNE N. MARAIS

A biographical note by his son

EUGÈNE NIELEN MARAIS was born on January 9, 1872 in Pretoria. He was the son of Jan Christian Nielen Marais of Stellenbosch, who traced his descent to a Charles Marais, a French Huguenot. Into this family had married Baron van Rheede van Oudtshoorn, who had been sent out to be Governor of the Cape but had died on board ship in Table Bay, and Dr. Nielen, an American doctor who had come out to South Africa.

Eugène Marais received his first definite schooling in English from an Archdeacon Roberts in Pretoria in whose school he won a 'prize for divinity' because he could recite the whole of the Catechism of the Church of England. After a journey by ox-wagon through the bushveld he was taken to Boshof in the Orange Free State, where he again went to an English school and later to the Paarl.

At the end of the 1880's he was back in Pretoria, and in a few years seemed definitely to have adopted journalism as

his profession. At first he was a parliamentary reporter of the Volksraad, but because of his caustic comments on the proceedings he had the distinction of being expressly excluded from the press gallery by a resolution of the Volksraad.

He became Editor of various papers, both English and Dutch, and his whole-hearted support of General Joubert against Kruger resulted in his being tried for high treason, on which charge he was acquitted by the Supreme Court in Pretoria. During this period of his residence in Pretoria he showed great interest in animals and insects, and was never without tame apes, snakes, scorpions, and the like.

In 1894 he married Miss L. Beyers in Natal, but she died the following year. The loss of his wife had a profound effect on him, and accentuated the sombre side of his nature which had already occasionally clouded an otherwise bright-spirited temperament.

In 1895 he left Europe with the intention of studying medicine, but he was persuaded by friends in the Transvaal to take up law. He made the change, much to his subsequent regret, and at the Inner Temple in London qualified as an advocate. He studied medicine at the same time, however, and only the Boer War prevented him from qualifying. He was on parole in England during the Boer War until the opportunity presented itself of going on an expedition to Central Africa, from where he intended to take medical supplies and explosives which he had collected to the Boer Forces across the Limpopo.

While still in Central Africa, where he contracted a severe case of malaria, he learned of the conclusion of peace in 1902. The stores and supplies were buried, and he returned to Pretoria via Delagoa Bay. During his travels he had added greatly to his store of knowledge of the habits of insects and animals.

In Pretoria he began to practise as an advocate, and produced a book on Deeds Office practice. He was still interested in his newspaper *Land and Volk*, for which he wrote in what was considered 'Afrikaans'. His poem *Winter Nag* heralded the

new Afrikaans movement.

In 1910 Marais went to Johannesburg, where he again practised as an advocate, but his distaste for the work, coupled with increasing depression, made him give up his practice and move to the Waterberg district.

There, he made an intensive study of birds and beasts. There was no natural phenomenon which escaped his eager mind. He wrote an article for the Government Agricultural Journal on the drying up of Waterberg which was reproduced by the Smithsonian Institute in their annual report. At the same time he was contributing articles on snake poison and stories to the Afrikaans press.

In the district he freely gave of his medical knowledge to help the poverty-stricken population, and acted for years as Justice of the Peace.

But by the end of 1915 his health was so bad that he had to have careful attention, and he was taken to Pretoria, with the happy result that after some months he was able to resume his practice as an advocate. He had chambers nearby and was a close friend of the late Mr. Tielman Roos.

There was again a period of literary activity, but constantly failing health made him give up his practice. There followed a period of practice as an attorney at Bronkhorstspruit and Heidelberg in the Transvaal.

By this time he had completed the draft of what he hoped would be his chief work, *The Soul of the Ape* – a study of the behaviour of apes and baboons and the comparison of their mental processes, as far as these could be gauged, with those of man.

His delight now was to use the newly-fledged Afrikaans as a medium of expression, and the opening it offered for the introduction of new words and modes of expression was eagerly seized by him. While poems, stories and articles flowed from his pen for newspapers and magazines in Afrikaans, he also contributed to English scientific journals in English.

In 1928 another breakdown in health brought him to Pretoria, where he kept up his journalistic work and endeavoured to give form to his work on the termites and ants. There is much that he would have added and possibly much that he would have corrected in this present work, had his health permitted him to give undivided attention to the work. But it was not to be, and on March 29, 1936, he committed suicide on a farm near Pretoria.

Of a singularly pleasant nature, he was adored by and adored children, and especially in his later years could almost always be found in their company.

He has a clear and assured niche among the most noted writers in Afrikaans, and his scientific work and theories written in English have received special notice in America and Europe.

THE SOUL OF THE WHITE ANT

1

The Beginning of a Termitary

SOME YEARS AGO, an article about 'white ants', as termites are commonly but incorrectly called, appeared in a South African journal. Almost everything that naturalists tell us about these insects is important and interesting, and Dr Hesse's article was exceptionally so. The article also made another fact clear; how very little has been done in our country to study the behaviour of animals. Nevertheless, a lot of research has already been done and is still being done in other countries. Everything that Dr Hesse told us was the result of long and patient observation in America and Europe. None of his facts, however, were relevant to our South African termites.

The life-history of most of our South African ants and termites is in every way just as wonderful and interesting as anything that has been discovered in South America. Over a period of ten years, I studied the habits of termites in an investigation into animal psychology. Such observation reveals new wonders every day. To mention one instance, the functioning of the community or group psyche of the termitary is just as wonderful and mysterious as that of people. It has however, a very different kind of psyche, similar to telepathy or other functions of the human mind which border on the supernatural.

When writing about all these wonders, there is a bewildering array of material available. It is, in fact, hard to know where to begin.

I want to tell you about the most common of our termites or 'white ants'. I am also going to explain how anyone may observe what I have. Indeed, readers may even discover new wonders for themselves. Most of these facts have not been published before, nor even discovered by scientists.

The common termite, which is so destructive to wood of all kinds, and builds 'ant hills' or termitaries on the open *veld* (or bush), is known throughout South Africa. I will tell you a little about the beginning of its community life.

The beginning of a termitary dates from the moment when the termites fly, after rain and usually at dusk, in order to escape their numerous enemies. Even here, we see a remarkable instance of the wonder of instinct. The termites, beginning their thrilling flight, know nothing about enemies. They have never been outside the nest before. The peril of their existence is to them a closed book. Yet nine times out of ten, they don't fly until the birds are safely in their nests.

These flying termites are at least twenty times as big as the others of the nest. They are also quite different in colour and form. A termitary must be seen as a single animal, whose organs have not yet been fused together as in a human being. Some of the termites form the mouth and digestive system, while others take the place of weapons of defence, like claws or horns. In addition, others form the generative organs. These flying termites are the generative organs of the colony. Every one of these winged insects is a potential king or queen. The four beautiful wings have taken months to develop and grow to perfection. Months elapse – or even years in very dry districts – before an opportunity for flight occurs. They will never fly until there has been rain, and the reason is obvious. After the flight, they must seek immediate shelter in the ground. When the ground is hard and dry, this is impossible.

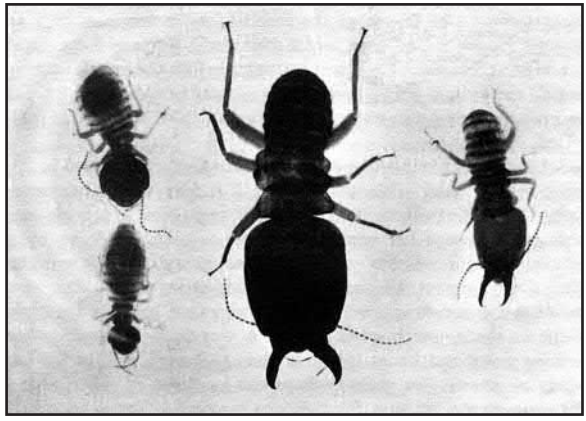
It is interesting to follow the flight of the termites carefully from the moment they emerge from the nest. They crawl out of a little opening, thousand upon thousand. There is obviously much excitement in the termitary. Sometimes the flyers are escorted to the opening by workers and soldiers. The first impulse of the flying insect as it emerges is to try its wings. It flutters and tries to lift itself into the air. If it fails, it climbs a grass stalk and takes off from this height. It is very important to fly though, even if it is only for a few inches. Both flying and protection from its enemies are essential features of this stage of the termite's life.

The object of the flight seems to be to spread the insects over as large an area as possible, just as some plants spread their seed. Some of the termites rise high into the air and travel for miles before they settle. Others sink to the ground, only a step or two from the old nest. No matter what, it is essential that they learn to fly, as it is the sole purpose of their existence.

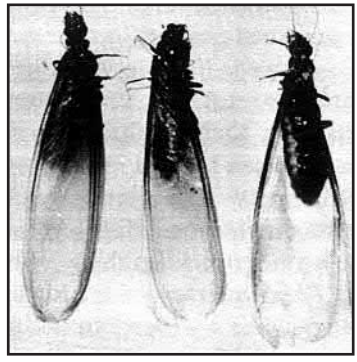
I will describe one of the ants which has flown and settled in the grass nearby. It is impossible to tell the two sexes apart. However, let us take an example and assume it is a female. The first thing she does is to discard her wings. She does this with a lightning-fast movement; it is so fast that we cannot follow it with the eye. One moment we see her with her wings intact, the next moment she steps away, and her four wings are lying on the grass.

It took months for her wings to grow. For years perhaps, she has lived in subterranean darkness, preparing for this one moment. For a period of three seconds, for a distance of perhaps three yards, she enjoyed the exquisite thrill of flight and with that, the object of a great preparation has been fufilled, and the fairy-like wings are flung aside like a worn-out garment. So her wings are discarded straight away, and she walks about rapidly for a few seconds.

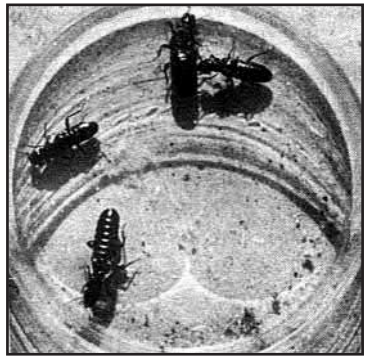
You become aware that she is seeking a suitable place for some further purpose. You are not aware what the purpose



Soldier and worker termites



Winged adult termites



Female termites after shedding their wings

is, and her immediate behaviour does not clear things up for you. You must watch patiently if you want to find out what she intends to do. When she has found a suitable spot, she does something very strange. She comes to rest on her fore-feet and lifts three-quarters of the hind part of her body into the air. She remains stationary in this position, as still as if she were merely the statue of a termite. If you become impatient and walk away, the secret of the flying termite will remain a secret to you forever. What is she doing? She is busy sending a wireless SOS into the air. It is important to stay patient a little longer. There are only a few people who have seen this miracle.

What does the signal consist of? I *think* I know, but I doubt if you will guess what it is. It is only possible to find the clue if you have studied the signals of insects. You may of course think of some sound which cannot be heard by the human ear. You may know of the little South African *toktokkie* beetle (a beetle of the genus *Psammodes*), that knocks in similar circumstances. However, the termite's signal is not a sound. One can prove that by an experiment. For the moment, the fact is that the signal consists of something far beyond our own senses. Yet the male becomes aware of it over incredible distances! How does this happen? Well, it *does* happen, and the female termite's sexuality means that she will make the first advance to a male.

If you wait long enough, you will see another termite come flying through the air, and you will notice that although his flight appears awkward and almost involuntary, he can steer a course and choose a direction, even against the wind. The male sinks to the ground, sometimes a yard or two from the place where the female is standing motionless in her curious posture. As soon as he lands, he makes the same lightning-fast movement which we have already seen in the female, and there on the ground, his wings also lie. His haste is terrible and irresistible. Over and through the grass he crawls, so fast that we can barely follow him with our eyes. He is looking for the

originator of the signal which he received high up in the air. Within a few minutes, he has found her. The female's body has been motionless all the time. Her body has been raised high in the air. However, the instant the male touches her with his antennae, she is affected by his excitement. She begins to run away as fast as her legs will carry her. The male immediately comes behind her. They are now beginning the final search. They are house-hunting, and the male leaves this reponsibilty to his wife. It must be a good house, for they will live in it for a long time. Soon they have found their new home, and while they are digging the front door, we will leave them for a while.

There are even stranger things connected with this little drama, which the inexperienced observer will not be aware of. I have explained the urge to flight. If those two termites had not flown, none of the events we have watched would have occurred. Instinct is something which only works step-by-step. If you destroy one step or omit it, then the whole system of their community collapses. Nature wishes the 'white ant' to spread. If the nests are too close together it would be bad for the communities. As a result, they receive wings and must fly. However, flight is only one step in their sexual life. If this step is omitted, their sexual life, and their very existence, ends there and then.

For as long as two years, the two sexes may live in the same nest after they have grown wings. They are in constant touch with each other but there is not the least evidence of any sexual life. They *must* crawl out of the nest, they must fly, and must settle and lose their wings. It is only then that their sexual life begins. Once it does, it is immediate. If you prevent them flying and break off the wings, both male and female die. It will be imposible to continue the race.

The length and distance of the flight is of no importance. It may last hours or only a second; it may cover miles or only a few inches. The force which we call 'instinct' means that they

Termite mounds in Litchfield National Park, N.T., Australia.

must pass through every stage. The termites must take every step, or they are doomed. If you take a male and female just as they are emerging from the nest and place them beside each other, even in the closest contact, you notice that they take not the least interest in each other. They struggle to get away from each other. If the female flies a few inches, the whole process is carried out and finished. If the male circles round even once, and then he is forced to land near the female, it is only then that events will take their normal course. A second in time, three inches in space, one flutter of wings – are to the termite a gulf as wide as infinity, dividing two kinds of existence. To us, it may appear only a small dividing line. However, the insect may not overstep it, not even with human assistance.

2
Unsolved Secrets

THERE ARE A LOT OF DETAILS related to the building of the termitary. However, I will focus on behaviour, as it important to understand for purposes of comparison. All behaviour, both animal and human, is of importance to the psychologist. Behaviour *is* psychology – at least it is all of the psyche we know or can study. For purposes of comparison, for comparative psychology – especially if you begin at the top of the ladder with the apes – the field available for study is in fact, not very large.

The task falls to the king and queen of feeding and attending to the first children. After the children are fully grown, they take it upon themselves to undertake all the work of the community. In the meantime, the queen grows larger and fatter by the hour. Her small neat body vanishes in increasing layers of fat. It becomes an unsightly worm-like bag of fat. To make matters worse, her mate, in addition, has the blessing of appearing to having discovered the secret of eternal youth. He remains as attractive, active and young as he was on his wedding flight. The queen, on the other hand, has become an immovable worm. It is very hard to imagine that that she ever fluttered gracefully as a young termite. It is almost conceivable that the male could cast around for a mate as equally attractive as himself. However, it is to his great credit that he does not behave in this way!

His attachment to his queen seems to keep pace with her own growth. If the palace cavity is opened or attacked by a predator, he rushes round in consternation, but always returns to her side. There is no question of saving his own life in flight. He clings to her gigantic body and tries to defend it. If the attack is sufficiently ruthless, the male termite will choose to die at the side of his queen. This is an outstanding example of the enduring commitment and fidelity of termites.

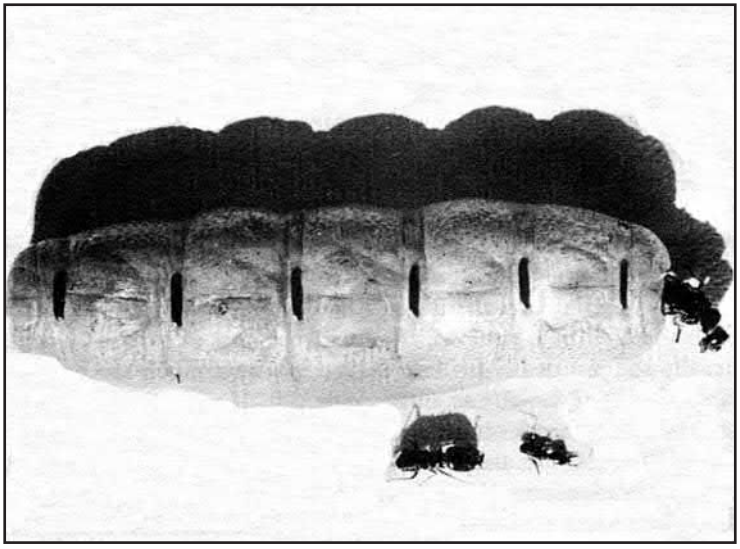
A queen in any kingdom, whether the human or animal world, is often known as 'the mother of her people'. The termite queen quite literally fulfils this role. She is the only mother of the millions which form the community. It is an extraordinary fact that every individual is born from her.

This means that she does not have to take any responsibility for the 'nursery'. All she is expected to do is to keep on laying an endless stream of eggs. This is to counteract the enormous daily loss of workers and soldiers, despite their excellent methods of defence. It is a remarkable feature of termite society that the death of thousands of individuals can be made good by an unending supply.

It is important to note that in actuality, every termitary differs in its growth, but for the purpose of clearly understanding their society, it will be assumed that the environment of our nest has been such that development is entirely normal, and it has not been subject to any disturbing external influences.

The first workers begin to build a palace for the queen. Deep below the surface of the earth, from three to six feet, they prepare a hollow chamber. As years go by, this is gradually increased in size, and the earth which is excavated is taken to the surface, where it is used to form the thick defensive crust. The queen is placed in this hollow chamber. It fits her so well that it would be easy to assume it has been built around her.

In fact, I do not think this actually happens – but at this stage, most of my conclusions are mere guesswork. No human eye has ever seen what actually takes place. No one has ever



A queen termite full of eggs, with two soldier termites

discovered a way in which to watch the termites at work in the queen's chamber. They work in pitch darkness, and to let light into the chamber is as great a handicap to the termites as the sudden destruction of the sun would be to us, as we cannot see in complete darkness.

The queen continues growing until, compared with the ordinary termite, she reaches a gigantic size, and becomes an immobile, still mass. The only part of her which gives any sign of life is the little head, which remains unchanged. If you dissect the skin and body carefully and examine it under a microscope, you will be convinced that during her later stages of growth, the queen is unable to make any voluntary movement, except of course of the head.

You may think she could move like some worms do, by contraction and expansion. However, you will find that no part of the body behind the head can be controlled by what was once an intricate central nervous system. I also believe that it is not possible for her to regain the power of movement,

even temporarily. I have not seen any indication of this, even when emptying the sac for a while. Besides, the very nerves in the body have changed into fluid. The theories that the queen is able to move by contraction and expansion, or that she gains a temporary power of movement, have to be discarded.

An examination of the queen's life history shows that her first palace is a cell made of termite earth. This rapidly becomes as hard as cement. Usually she just neatly fits into it. She is always much too huge to use the door of the cell as entrance or exit. If you wish to remove her, you must break down the cell. The king and the workers, however, can come and go quite easily. She is fed and the eggs which she never ceases laying are removed to the breeding grounds by workers appointed to this task. The king apparently does nothing; he appears to be a mere hanger-on in the palace. Still, the queen goes on growing. Here in her first palace, she has not yet attained even one-third of her eventual size. At last, she very nearly fills all the available space in the cell. There is barely room for the tiny workers to carry the eggs away across the inanimate bulk.

A terrible tragedy appears to be imminent. It reminds us of the question: what will happen if an irresistible force meets an immovable mass? The human observer is not in a position to intervene and avert the threat of this terrible fate. Scientific knowledge should not be instrumental in interfering with the way the termite world is constructed.

But termites have never worried about it at all. They have a solution ready – a very simple one. Just before her majesty finally outgrows her cell, they build a second one, half as big again as the first. It is parallel and adjacent to the first, just as hard, and with a narrow door. The queen is then removed and placed in the second cell. There is space for her to grow here for perhaps another year. So she gets transported from cell to cell, until there have been about six changes, with the queen in the last and biggest. The chamber doors are always equally small, much too small for the queen to come or go by.

There is another fact which makes the whole matter even more complicated. One could easily prove by measurement that the queen's subjects could not possibly move her. The lifting power of one termite can be estimated fairly closely, and the area of the queen's body available for workers to grasp during lifting can be measured. During the later stages, it would need thousands more termites to lift her than there is available space for grasping the body.

So we have the following facts:

- The queen is incapable of movement.
- The doors of the cell are too small for her to come or go by.
- The insects cannot lift her.
- Yet she vanishes from one cell, to appear in another.

The only explanation that seems feasible is that there are several queens and that it is not the same one each time. If the first gets too big for her cell, she is killed and eaten, and the workers carry a potential queen into the second cell where she develops into a queen. This seems to be the most reasonable and simple explanation.

Unfortunately, it is not true. The analogy with bees has led to a false conclusion; we have been deceived by the analogy of the bee world, which makes queens, kills, and moves them.

It is quite an easy matter to mark the termite queen, and so prove that it is the same queen which gets moved. I have tested many theories, but have never found one which coincides with all the facts. Perhaps one day, a future Fabre will discover the truth.

3

Language in the Insect World

SHORTLY AFTER SHE DISCARDS HER WINGS, the flying queen sends a signal into the air. This is always answered by the appearance of a male flying through the air. What exactly the signal is will now be explained in detail. In order to understand the language of animals, one must first of all learn its ABC. It is also necessary to bear in mind that some previous assumptions about human and animal behaviour need to be re-examined and unlearned. We will therefore begin at the very beginning.

An individual member of any animal race which wishes to communicate with another at a distance can use one of three things: colour, scent or sound. If you think of colour, scent and sound simply in terms of the impression which these make on a human being, then it is not feasible to translate this to the termite world.

There is one kind of termite which constantly signals by means of sound. If you have ever slept in a house in which those termites are at work, you will know the sound well. It is a quick *tik-tik-tik*. You can also hear this if you place a microphone through a hole made into a termitary. You will easily observe that not only do the termites make this noise, but that other termites at a distance hear it and immediately

react to it by their behaviour.

If you catch one or more of the signallers and examine their anatomy under the microscope, what you find is very interesting. There is not the least sign or suggestion of any kind of auditory organ; not even the most primitive kind of ear. There is not even a single nerve that could possibly be sensitive to what we call sound. We find the same regarding colour and scent. The termites undoubtedly use both colour and scent as a means of signaling, yet there is not any organ that resembles an eye. There is not even the faintest spot of pigment which might serve as a primitive eye. The termites are quite blind, yet sensitive to an indirect ray of light far below the threshold of perception of the human eye. That is, they can become aware of a very diffuse light not shining directly on them, which a human eye could not perceive. This can be proved by experiment. As for any organ of smell, that, too, seems to be completely absent.

An observation of another insect, the little *toktokkie* beetle, will greatly help to explain the secret. If you wish to learn to know the *toktokkie* really well and to learn his language, you must tame him. The beetle will become so used to your presence that he won't alter his behaviour, even when conscious of being observed. He is very easy to tame – at least the gray-bellied one with pale legs, not the rough-backed one. He readily learns to accept being captive and studied.

Most South African children are familiar with the *toktokkie* and have heard him make his knocking sound. The beetles are easily located, as you can often see them on the road or beside it. If he does not get a fright and fall down dead with stiff legs, as dead as the deadest *toktokkie* which ever lived, then you see him knock, and of course hear him, too. He looks round for some hard object, a piece of earth or a stone, and knocks against it with the last segment of his body – three, four, four, three! This is his morse code. He then listens for a moment or two, turning rapidly in many directions. His behaviour is very

like that of a human. His whole body becomes an animated question mark. You can almost hear him saying:

"I'm positive I heard her knock! Where can she be? I hear it again!"

He answers with three hard knocks, and then he takes himself off in great haste and runs a yard or two away. He then repeats the signal in order to get a further true direction, and so he continues until at last he arrives at his partner's side.

If you study the behaviour of many *toktokkies* during the mating season, you will occasionally have to follow one for an incredible distance in the direction of the answering signal. He can hear the signal over a distance which makes the sound absolutely imperceptible to the human ear. It is at this stage that his behaviour warrants study by a psychologist. If the beetle is studied closely under the microscope, there is still no sign of an ear, or any other complex or nerve which might be linked to sound and hearing. But in spite of this we still think of the behaviour of the *toktokkie* in terms of sound or hearing!

Our version of a laboratory is a stretch of natural *veld* or a fairly large garden where it is possible to study tame *toktokkies*. The observer will soon discover that the *toktokkie* is one of the most credulous of insects. That is, when he is dominated by sexual desire, he will believe everything you happen to tell him. Knock on a stone with your fingernail in his own morse code – and at once he answers. You can teach him quite easily never to knock except in answer to your signal. You can succeed in doing this by not knocking for several days unless he has become perfectly quiet. After a day or two, he will have learnt to knock only in answer to your signal and will answer immediately.

Now get a small, powerful microphone, a headpiece, and three feet of wire (you will find this indispensable in your association with the insect world). The microphone must be so powerful that you are able to hear the footfall of a fly quite easily.

When your *toktokkie* is tame and well trained, it is then possible to test the acuteness of his perceptions. You will discover that they are unbelievably and supernaturally fine.

To continue the experiement, knock on the stone again with your fingernail and gradually make the sound softer until it is quite beyond your own hearing. The *toktokkie* will still continue to immediately answer the signal. Even if you knock with the soft pulp of the finger rather than the nail, so that there does not seem to be any sound at all, still the *toktokkie* answers! Now, take the microphone and place it on the ground with the earphones over your ears. Next, examine its response by knocking on the receiver with the pulp of your finger – a substantial knock, not merely a tap. With a little practice, you can reduce the sound until at last it is inaudible even through the microphone, but still the *toktokkie* hears it!

The solution to the problem is this; it is not sound as such which the *toktokkie* becomes aware of, and there can be no question of *hearing* it. Sound is only our interpretation of certain vibrations in the atmosphere. (Sound cannot travel through a vacuum – you can prove this by sending a sound through a wire inserted in the cork of a thermos flask. It will be imperceptible, except for a faint noise which escapes through the cork.) It is our ear which interprets the vibrations as sound. Beyond the ear, the universe is soundless. Without an ear – or organ of hearing – there can be no sound. But the vibrations which we call sound have a physical function. It is by the exercise of physical force that the drum of the ear and the hammer and anvil bones of the inner ear are set into vibration. In the same way, you can make grains of sand or a thin gas-flame vibrate to a musical note. However, there is another difficulty. The sudden meeting of the surfaces of two physical bodies can result in vibrations of the ether, which are not by any means sound-waves, and therefore have no effect at all on our ears.

We are getting into deep water now. This is where the

study becomes particularly complex and challenging. It would appear that it is vibrations of this kind – waves in the ether, which the ants and the *toktokkie* make use of.

This theory may in fact sound far-fetched, but this explanation links closely to the language of insects. Listen carefully the next time you hear a 'longbreath locust' (apparently so called because it is *not* a locust and the sound is *not* made by its breath). In order to fully understand their physiology, it is essential not to think of 'sound' or 'hearing'. Rather, you must think of vibrations, waves in the ether – which can be sensed by another such locust at a distance of at least eight miles. It is also important to understand this concept when examining the communication which takes place between the outlying sections of termite nests.

This serves as a summary and insight into sound in the insect world. There are two other methods of communication: scent and colour.

Termites continually make use of scents, some of which we can also perceive with our olfactory organ. In the Northern Transvaal there is a well-known termite known as the 'stinking ant'. This creature emits a foul smell to a distance of three or four yards, which has the peculiar property of causing extreme nausea in most people and also in dogs. Then again, all South Africans will be familiar with the characteristic smell of the common termite. This is caused by the discharge of a gas. It is of the utmost importance in the study of termite language to fully understand what the signal of the queen really consists of. After a long period of study, I have come to the conclusion that it consists of something which would affect our senses as *scent* if it were strong enough.

Things always seem pretty hopeless in the beginning when we are dealing with phenomena which lie far beyond our senses, but 'perseverance pays' must be the motto of the traveller along these dark and unknown pathways.

There is another reason for thinking that the signal may be

thought of as scent. You can easily train a pointer to track down the flying termites after they have lost their wings. He will track down a signalling queen for nearly a hundred yards against the wind; with the males, he finds it difficult even over the distance of a yard. But a still more important proof will take me longer to explain.

The following are all the signals used by the termite:

1) *The communal signal,* which is constantly sent out by the queen, who forms the hub of the nest. This serves to keep the community together and enables every termite to recognize every other member of the community. It is a signal which cannot be perceived by our senses.
2) *The call of the workers and soldiers.* This is perceived by us as sound.
3) *Food messages.* (Beyond our perception.)

These three be will examined more closely later on.

4) Lastly, *the sexual signal of the queen*, which is also beyond the reach of our senses.

Throughout nature, scent and colour are used as sexual signals. If there are no brilliant colours, you can be sure that there will be some scent instead.

Allow me to digress for a moment. We have seen how the flight of the termite is the key to which the door to their sexual life is unlocked. Without flight, there can be *no* sexual life. It is simply not possible. I will give another insight. In mammals, the key to their sexual activity is generally *scent*, which may also be allied to colour. This begins in the plant world. The colour and perfume of flowers is of course, purely a sexual phenomenon. In mammals however, scent still remains as the key to attraction, and therefore survival. It is this which makes sexual life possible.

That is why it is possible to keep large mammals for years in

a zoo or a menagerie without their sexual urge being activated. It is interesting to study African kudus in relation to this fact. In the Waterberg, I often had the opportunity to closely observe a wonderful sight. For a week or two every year, the kudu cows become scented or 'on heat'. As soon as this passes, the bulls leave the cows and segregate themselves to graze in small herds. Of course they come in contact with the cows occasionally, but never show the slightest interest.

However, when the cows are in heat again, the scent will travel four or five miles on the wind. Prior to this, the bulls were grazing peacefully. Once they get the scent on the wind, it is as if they have been hit by a thunderbolt. They immediately become restless and they eagerly sniff the wind. The whole herd, which a moment before was grazing so peacefully, responds with deafening bellows. They are then lost in a cloud of dust. The only sound now is the clashing of horns and bellowing of rage. Their sexual life is always preceded by the stimulation of the fighting sense. Without the special scent from the cows, their sexuality would not have been stimulated.

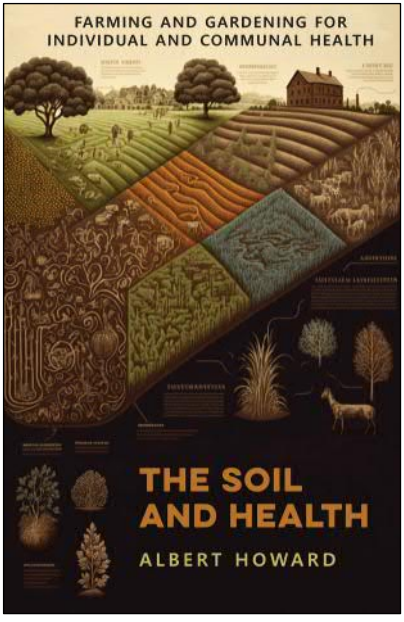
This can be easily proved. Take one of the smaller mammals; the kind dependent on the sense of smell. If its olfactory nerves are destroyed or cut by incision (in some cases nature does this with an ulcer), he will never again be sexually stimulated. This is the case even if a male comes into very close contact with a female, including one in heat. External stimulation, in the form of scent or colour, is always essential to stir their sexual interest. The only animals whose sexual interest can be aroused without this outside stimulation are the higher apes and people. In the instance of the ape and humans, the cultivation of scent and colour is both fascinating and mysterious.

It is very interesting to gain an insight into why some women choose to wear perfume. There is in fact, a subconscious reason. The attraction of wearing perfume is linked to a forgotten instinct from the ancient history of our race. The basis of all perfumes is the sexual secretions of several kinds of cats,

of deer, and (the most expensive of all), the essential sexual material secreted by a certain kind of whale. These scents are today artificially produced for the perfume industry. Musk is the universal basis of the scent sex signals in animals. Even in humans, this phenomenon may still be found. Indeed, about one woman in every thousand still secretes musk on occasion. As a result, her skin becomes strongly and exquisitely fragrant. As in the case with many such primitive characteristics, this secretion of musk is found more frequently in the monkeys or apes. Nevertheless, that is the origin of the role of scent in sexual attraction. In the primate world, it still plays a significant role.

Scent may also be regarded as waves in the ether, or space. It is false to assume that perfumes consist of gases or microscopic substances. Perfume itself is not entirely a physical substance. You may scent a large room for ten years with a small piece of musk and yet there will not be any loss in its weight.

This has been a way of illustrating what the signal of the queen really consists of. It has provided an insight into the sexual signal of the termite queen. It is actually a wave circle in the ether which our olfactory nerves would perceive as perfume – that is, if our senses were even aware of it.



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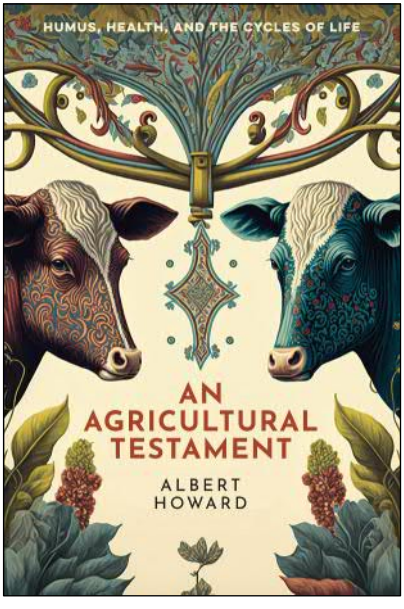

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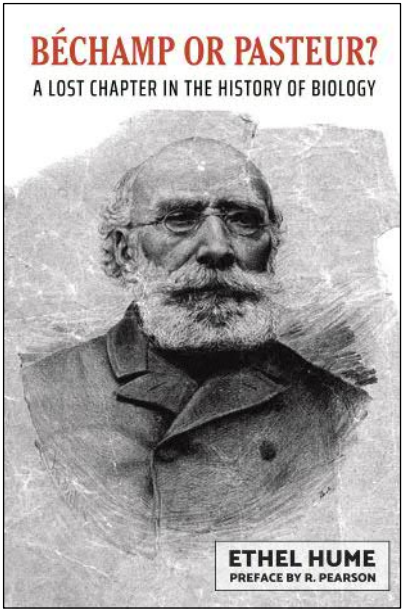

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Ethel Hume / Robert Pearson

Pearson's *Pasteur: Plagiarist, Imposter* was originally published in 1942 and is a succinct introduction to both Louis Pasteur and Antoine Bechamp, and the background to the troubled relationship that they shared for their entire working lives. Ethel Hume documents the evidence in detail, so that there is no escaping the obvious conclusion – Pasteur was a fraud.

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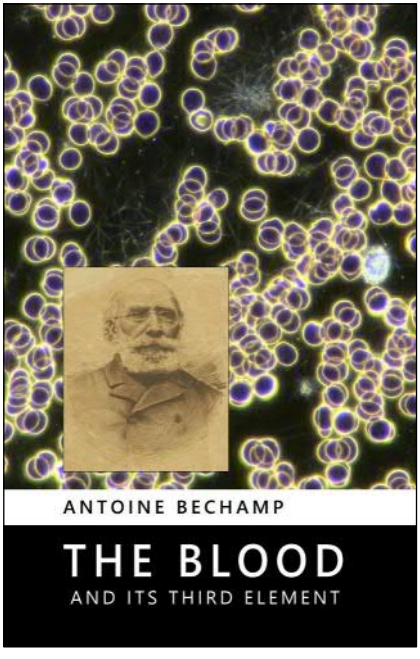

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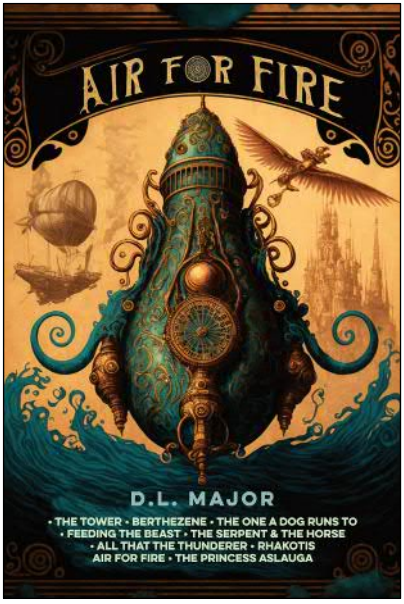

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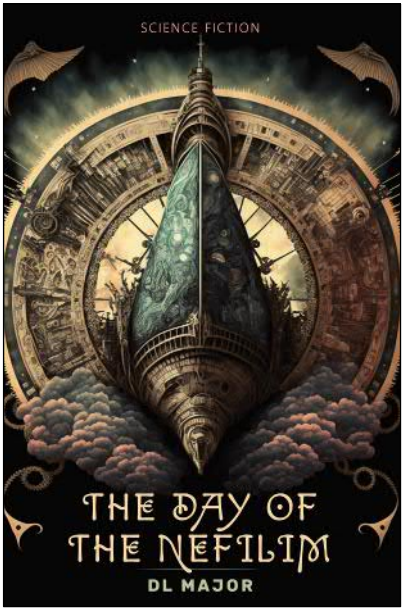

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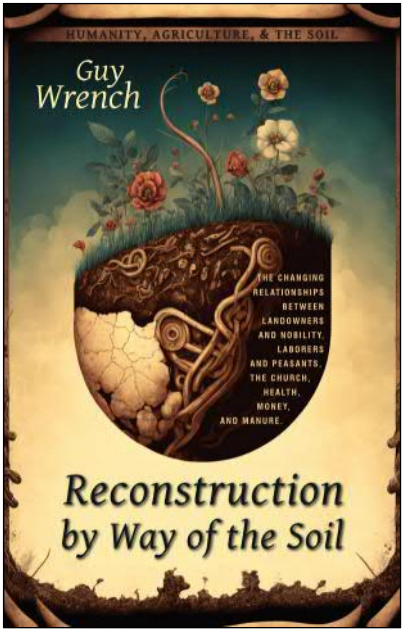

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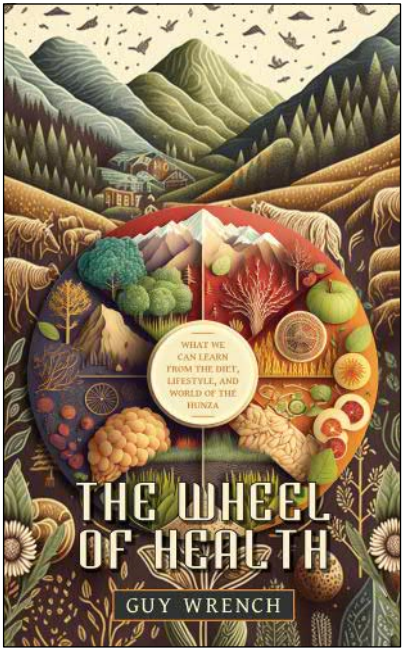

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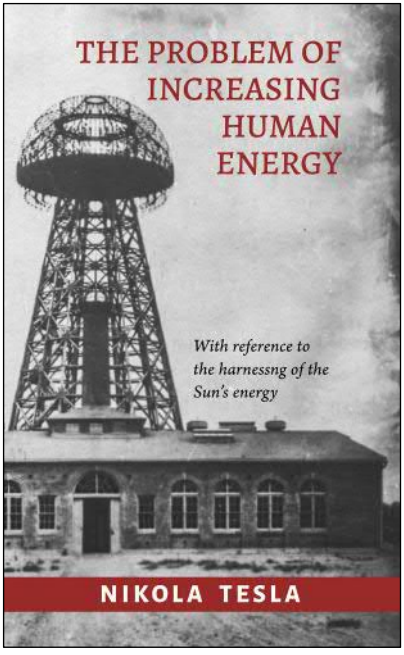

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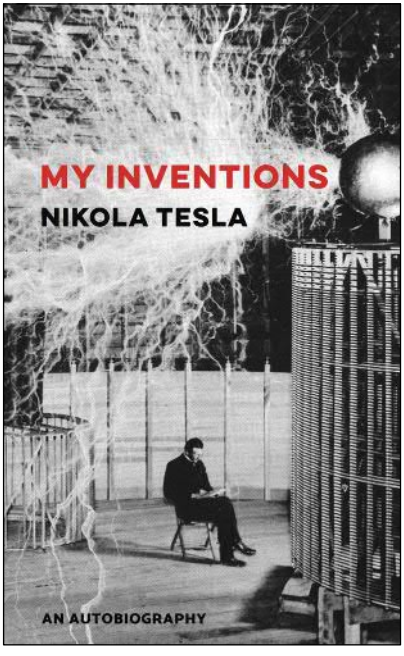

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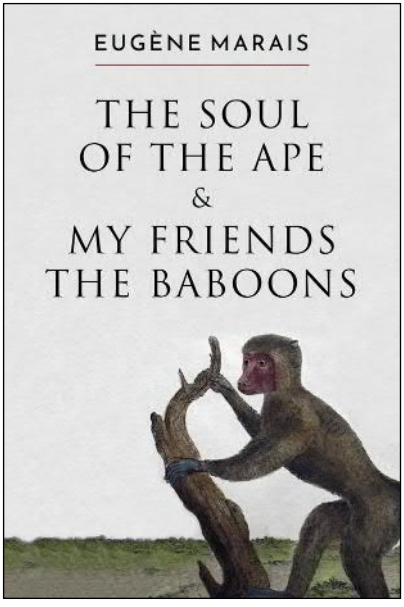

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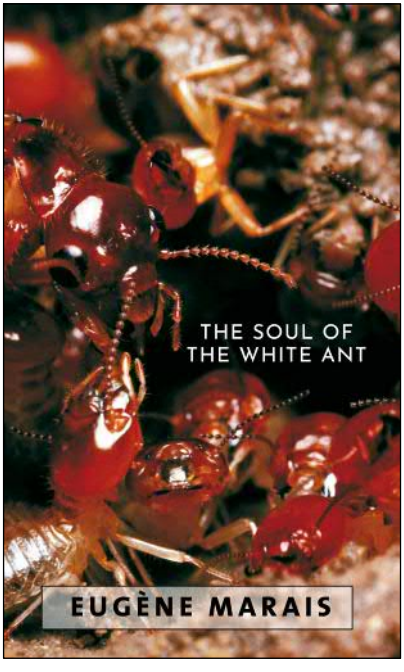

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The amazing results of a long, close study of the lives of termites. Eugène Marais compares the infrastructure of a termitary to that of the human body. Writing from the heart, this scientific author who is also a poet instills a wonder in the reader, of the incredible intricacies of nature, in a light-hearted, easily readable manner.

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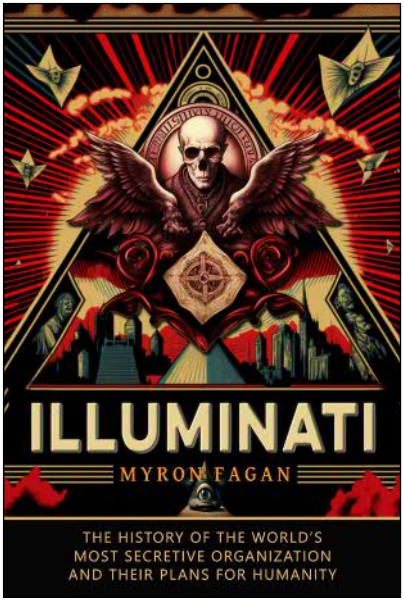

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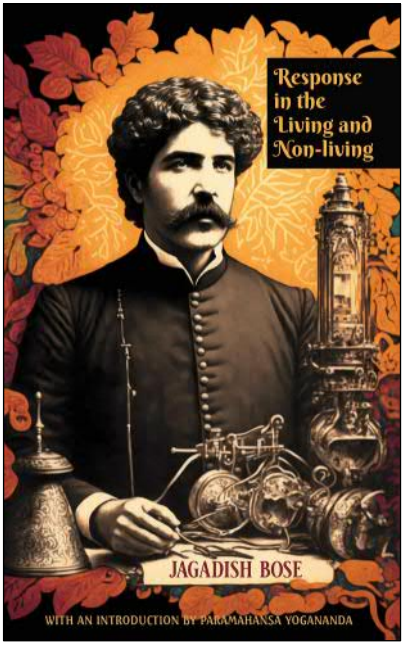

Response in the Living and Non-living

Jagadish Bose

This is one of the great Indian scientist's earlier works. His experiments showed that in the entire range of responses – regardless of whether the subject is metallic, plant or animal – the responses are identical. The living response, in all its diverse modifications, is a repetition of the responses seen in the inorganic. *Everything is alive.*

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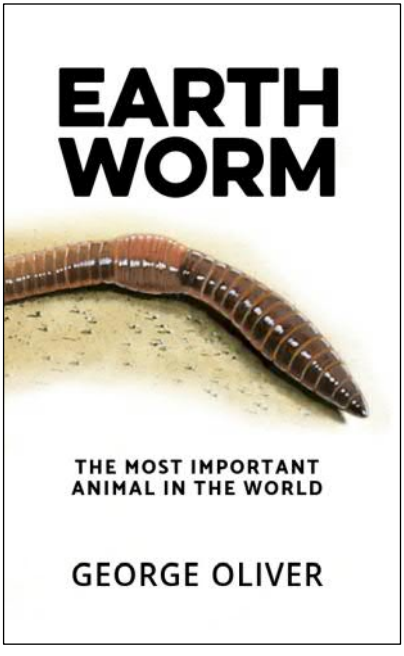

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George Oliver

The author returns the reader to a time and methodology where people took responsibility for what they did and what they produced. In this world of spiraling food prices, huge landfills, diminishing food supplies, loss of topsoil, and water pollution, the reader is reminded that the world's most important animal could well be the humble earthworm.

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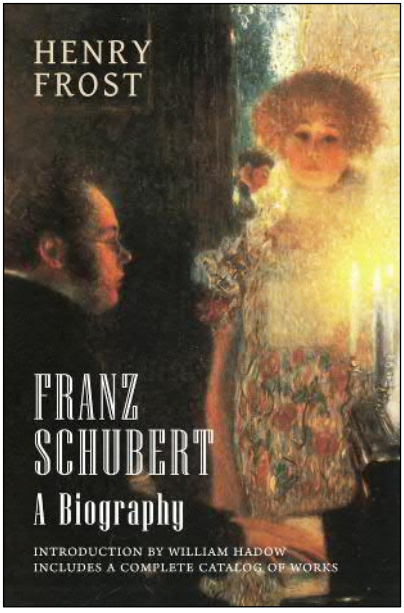

Franz Schubert – a Biography

Henry Frost

"With faith man steps forth into the world. Faith is far ahead of understanding and knowledge; for to understand anything, I must first of all believe something. Faith is the higher basis on which weak understanding rears its first columns of proof; reason is nothing but faith analysed."
– *Franz Schubert*

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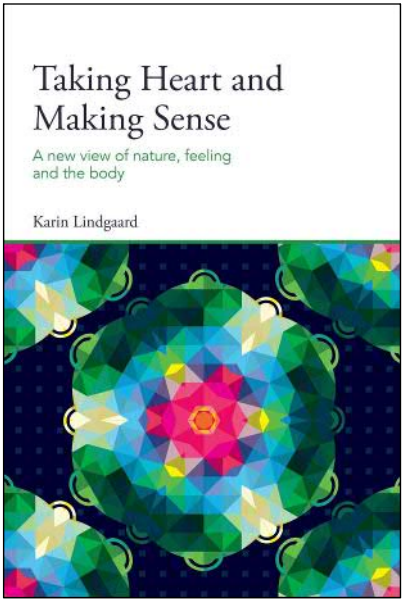

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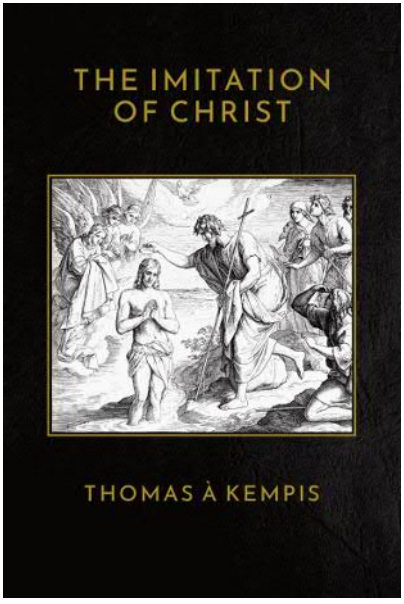

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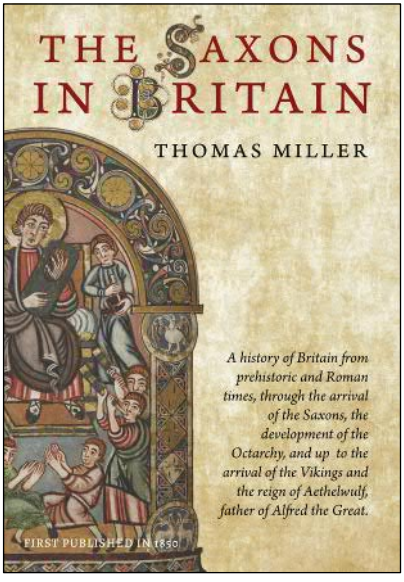

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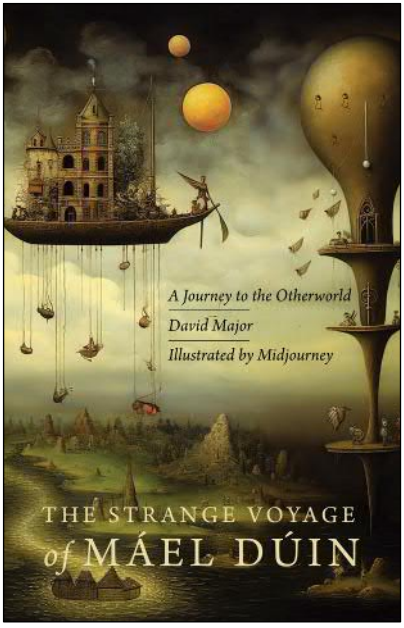

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