



Jens Soentgen

## Dust - Everything About Almost Nothing

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### The big wide world of tiny particles

When we talk about dust, it's usually because there's a problem: house dust triggering allergies, fine dust polluting city air, or aerosols transporting dangerous viruses like COVID-19. But these small particles can do much more. Dusty soil, for example, is very fertile - the Amazon rainforest depends on fertilisation

by dust from the Sahara Desert, and without dust in the air, it would be much darker on Earth because it reflects sunlight into the remotest corners of the globe.

Even meteorological phenomena such as rain or snow couldn't exist without small particles in the air. Clever, witty and eloquent, dust expert Soentgen's newest book explores these useful irritants that float around us every day – you won't want to leave this one gathering dust.



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Jens Soentgen, born in 1967, leads the environmental research department at the University of Augsburg. His various research projects investigate coarse, fine and – most recently – ultrafine dust. The chemist and philosopher has also already devoted himself to the topic of house lint. Since then, the subject has continued to follow and fascinate him and, since Soentgen realises that resistance is futile, he learned to love dust.

# Dust - Everything About Almost Nothing

## Contents

<b>Introduction: Dust is a Must.....</b>	<b>5</b>
<b>1 Nothing and Almost Nothing: What Is Dust?.....</b>	<b>10</b>
What’s it Like Being a Dust Particle?.....	10
How Do You Define “Dust“?.....	19
“Soup“: The Science of Dust.....	22
Dust, Fine Dust and Ultra-Fine Dust: How Small is Small?.....	26
How Come it Isn’t Killing Us?.....	30
<b>2 Dust Ball or Fine Dust: Which is More Dangerous?.....</b>	<b>35</b>
The Parallel Universe of the Dust Bal?.....	36
Where Does All the Dust Come From?.....	44
The Evolution of the Dust Ball: A Walk Through an Imaginary Museum.....	45
Shoddy, the Giant Dust Ball.....	52
City Air.....	54
<b>3 Colour and Gloom: Dust and Dust Events in Nature.....</b>	<b>67</b>
The Great Dust Stir .....	68
Seas.....	72
Saharan Dust.....	78
Volcanic Ash .....	80
Pear Pollen.....	88



Sample Translation “Dust” (J. Soentgen)

Viruses, Bacteria and Mushroom Spores.....	97
Star Dust.....	103
<b>4 Humans and Dust: A Love-Hate Relationship.....</b>	<b>109</b>
Dust for Cleanliness.....	110
Dust for Art.....	114
Dust for Knowledge.....	119
Dust for Life.....	123
Dust for Justice.....	130
<b>5 Goethe and Dust.....</b>	<b>135</b>
<b>Epilogue: The Future of Dust.....</b>	<b>142</b>
<b>Literature.....</b>	<b>151</b>
<b>Thanks.....</b>	<b>163</b>

## **Introduction: Dust is a Must**

When I moved from northern Germany to Augsburg, it took a while for me to get used to the Bavarian customs. In fact, who should drop in on the topping-out ceremony for the new Environmental Science Centre building, my workplace at the University of Augsburg, but the Bavarian state premier? Back then, it was Edmund Stoiber. He made a powerful – or rather, staunch – speech in which he talked about Bavaria, Bavaria, and nothing but Bavaria. Bavaria’s aim was to be elite in everything! – even the Bavarian *Abitur* (the German equivalent of A’ levels) was the best. Later on, as he came past me, he tapped me on the stomach with the flat of his palm and said, “You need to eat more – you’re too thin!” Copious amounts of beer were drunk; good, solid folk music and marches got everyone’s feet tapping; and a police band – still in the old green uniform (it has since changed to blue) – played some tunes. It was a hearty Bavarian afternoon. But the remark about the *Abitur* rankled me – after all, I came from North Rhine Westphalia. I withdrew into the library and opened up a dictionary that listed the meanings of German surnames. And there it was – an entry on *Stoiber*. It said: “restless spirit who stirs up the dust” – the German word for “dust” is *Staub*.

*[Here half-page illustration #2, Stoiber]*

It seems the surnames of various Bavarian state premiers are quite often connected with stirring up the dust. The surname of Franz Josef Strauß, for example, suggests a person who is always involved in heavy altercations – such altercations often used to be

referred to as *Strauß*. The current Bavarian state premier, Markus Söder, joins the line-up of name-related predecessors. The dictionary says that a *Söder* is someone who stands in the kitchen and literally “keeps the pan hot” by simmering (*sieden*) its contents. On this subject, Söder’s pre-pre-predecessor, Stoiber, said, “If you can’t stand the heat, get out of the kitchen”. And cooking doesn’t just entail heat – there are also the fumes, because grilling, frying and simmering produce lots of tiny particles.

Bavarian politics involves a lot of noise, quarrelling and intrigue. Christine Haderthauer – the first female Secretary General, and later on Minister for Social Affairs, of the CSU (Christian Social Union) – has often lamented this. She rose quickly through the ranks at first, but then her career ended abruptly when she became embroiled in the “model car scandal”. Haderthauer must have had a lot of enemies, but she also gave as good as she got; which brings us back to the matter at hand, for *Hader* also means dispute. It’s an old name for tattered and torn rags, but it also fits with our theme, because shredding rags (*Hader*) in the fabric mill creates thick fibre dust that looks just like those all too familiar dust balls made of entangled (*verhadert* or *veheddert*) fibres.

And in fact all sorts of German surnames suggest people and dust have more to do with one another than we may think. We don’t merely see the word *Staub* in rarer surnames such as *Steubesand* or – in the north German – *Stövesand*, which probably once referred to fast horse riders. Dust is even latent in very common surnames. A *Müller* (miller), for example, is someone who turns grain into a very fine powder, to the point, of course, of covering his workplace in dust. A *Schmied* (blacksmith) is someone whose every activity – e.g. hammering, firing up his chimney – produces a plethora of particles.

The same is true of the names *Koch* (cook) and *Rauch* (smoke), never mind *Aschenbrenner* (ashburner) and *Köhler* (charburner).

We tend to think of dust as annoying, if not dangerous, and for good reason. It can penetrate into our deepest recesses, it overcomes boundaries – and often even the measures we take against it. It can wreak havoc on our bodies, trigger inflammations, cause or aggravate illnesses, and is all in all quite problematic. That’s why research into dust, since its very beginnings, has mainly focused on the effects of dust on our health, asking how we can minimise it, or remove it altogether. This absolutely justified and important perspective also determines our everyday behaviour to a large extent. When we buy a device to help us deal with dust, its purpose is generally to get rid of it. Think of the vacuum cleaner, but also the feather duster, the dust cloth, and all those different kinds of brushes. The fact that dust isn’t merely a perpetual nuisance or threat to our world, rather our world is essentially built on dust, may seem paradoxical at first.

And yet it’s a fact that dust has always been indispensable, especially to the most intellectual spheres of our culture. There’d be no writing without dust. Still today, people write on blackboards with white dust, i.e. gypsum or chalk. Still today, the graphics and letters in books and printed documents almost always consist of soot, along with certain adhesives that help it to stick better to the paper. This book is no exception – it is telling the story of dust by means of dust; it has been written and printed with the aid of dust.

Dust is a synanthrope. Wherever there are people, there’s a whole load of dust. But, like all synanthropes, dust originates from nature, for nature is dusty, and without this natural

dust, the world as we know it would look entirely different. The sky above us would be much less variegated – in fact, it wouldn't exist at all. Without dust, we wouldn't have magnificent blooms in the spring or the rich harvest in the autumn. There'd be no sunset and no gentle daylight permeating through to us even in the shadows, transmitted by countless particles in the atmosphere even into the most obscure nooks and crannies.

Dust is distributive justice.

Moreover, dust has a philosophical, a metaphysical meaning. It amazes us, and all philosophy begins with amazement. Because dust is something that straddles the boundary between being and non-being. It's pretty much nothing, an almost-nothing, and if we study this almost-nothing a little closer, it invites us to reconsider all our ideas about the world. Because dust particles behave very differently to the things we are accustomed to around us – tables, T-shirts, toothbrushes, towels and teddy bears. All the tools and devices we use every day are characterised by the fact that they stay where they are set down or discarded, that they are ready when we need them, and that they don't inadvertently move around of their own accord, or even disappear altogether. But dust eludes our notions of order, seemingly scorning them, in fact. It floats around wherever it likes; it is neither audible nor tangible; it evades our grasp, yet tends to touch and contaminate us, settle, and even encroach, on us.

So, dust has quite a lot to it; in other words, the tiniest of things gives the best account of the whole.

Dust has always attracted the attention of those who aren't satisfied with customary worldviews, centred, as they are, on inert and inflexible things. Recognising the meaning

Sample Translation “Dust” (J. Soentgen)

and peculiarity of the minute is what gave us our modern view of nature in the first place, a view which differs from that of antiquity in part because it gives the same consideration to minute as to colossal things.

A brief look at the major trends, such as globalisation (which has entailed continual transportation of the tiniest particles, including germs), global warming, the worldwide increase in fire due to forest fires and the continued burning of fossil fuels, and the growth of cities and deserts, suggests that in future we will need to give much greater consideration to dust than we do now, including (and especially) in central Europe. This is because with the advance of global warming and the ensuing droughts, Europe too could suffer catastrophic dust events such as in the USA in the 1920s, when dust storms blew away the dry, untenable topsoil. On the other hand, dust itself – artificially produced atmospheric dust – is regarded as one possible last resort against the climate change that is already underway. So, rather than setting about it with dust cloth and feather duster, it is actually worth studying dust more closely.

*[here small vignette illustration #3, dust cloth]*



## **1 Nothing and Almost Nothing: What is Dust?**

### **What's it Like Being a Dust Particle?**

To get straight to the point: life as a dust particle is difficult, but you get used to it. You might think that floating around everywhere, slipping in through window cracks and under doors, and then rising one hundred metres up in the air in just a few minutes must be something akin to a wonderful, angelic state of being. But if you give it some further thought, you realise that life as a dust particle has its tricky moments too.

The most predominant force in our everyday lives is gravity. This is the force that afflicts us the most, causes us the greatest difficulties, and literally makes everything heavier. It is to blame for the fact that in the mornings we have to summon up the energy to heave ourselves out of bed, drag ourselves to work and get through the day until we can sink or fall, exhausted, into bed again. Shopping and moving house are laborious. The daily grind is hard – because of gravity.

Even when we're walking on an absolutely horizontal plane, we're fighting against the pull of this force; with every step we take, our bodies have to push upwards a little.

Gravity is always threatening to defeat us, attacking our balance, our upright position, wherever it possibly can, and it is only satisfied once we're on the floor.

We have to stand up to gravity every single day, from the tender of age of about one – when children learn to stand for the first time and are extremely proud of themselves – through to the end of our lives, when we find standing and walking such heavy(!) going, and gravity finally defeats us. Furthermore, when we say someone has “fallen”, “dropped” or even just “stumbled” in a metaphorical, moral sense, we always mean

something negative by this, i.e. failure. And if someone is making heavy work of something, or if they've hit a stumbling block, it means a process is beginning to falter. Being at constant war with the overpowering adversary that is gravity, we often overlook the fact that its role in our lives is not purely antagonistic but also regulative and stabilising. Arguably, gravity is actually what more or less holds everything together; it's the hidden basic law of our everyday lives. It gives everything a certain stability. The glass stays on the table, and soup, too, stays in the bowl it is poured into. When salad is tossed in the salad bowl, it stays there, instead of floating away leaf by leaf. Wherever furniture is placed in a room, it stays in its allocated position; we don't find it in an entirely different place by the next morning, for instance, or even attached to the ceiling, like helium balloons. And the baby nappies we put in the bin – they might of course give off an unpleasant smell, but they at least stay in the bin instead of flying around our heads while we're trying to make lunch. The cars, bikes, pedestrians and dogs we encounter when we're out and about move horizontally, usually cutting a reasonably clear trajectory rather than floating around in a higgledy-piggledy way. And we ourselves remain where we are, stable – unless of course we decide to get up and move somewhere else.

None of this applies in the dust world, for here weight has only a minor role to play. Instead, it is other forces inherent in matter that are more important. Overall, the world becomes more unpredictable, for everything can be everywhere, and everything can collide and combine with everything else.

If we were as miniscule as a dust particle, we’d have barely any use for our legs. Walking wouldn’t really work. We’d probably look like astronauts “walking” in space. A little tap of the foot, a push off the ground, and we’d be floating away into space. The strong muscles our legs use to keep us “up” would wither away. If we were as big – or rather as small – as a dust particle, it would be much more important to be able to use our arms to keep a permanent grip on something. And arms would be considerably more useful for locomotion, too, as long as we could find something to hold on to and pull ourselves along on.

It would be a restless, nomadic existence! We’d never be able to sit down anywhere, for no sooner would we have got comfy than we’d be floating off again. If we had benches or chairs, we’d have to make sure these were nailed securely to the ground, plus we’d have to practically tie ourselves to the chairs. Eating and drinking would be just as difficult: a droplet or puddle of water on the table could actually be fatal for us miniscule, dust-sized beings, for if we touched it even slightly, we’d inevitably end up attached to it. Our meals – fine, powdery granules, of course – wouldn’t stay on our plates, either, but would float through the room. They might briefly stick to a plate, but at even the slightest hint of a breeze, they’d be off up into the air again, where they would float around, followed by our hungry gaze.

Everything around us would be on the move! Everything would be chaotic! It may be easy for fine, dust-sized particles to float away, but they find it hard to stay in one place. Nor would it be easy to read this book in the dust world, for a miniscule book would cling to your hand or your clothes, thereby becoming an all too captivating read, one you couldn’t put down even if you wanted to.

So, the world of a fine, dust-sized particle is a pretty confusing one. On the one hand, it's easy to travel, you can go through windows and doors, and you can pass through the tiniest, most imperceptible cracks. You don't have any wings, but you can fly or at least float – the slightest draught is enough. Depending on the weather, you can also rise effortlessly up into the air; you can even go as far as space and look down on Earth from above, all at no cost to yourself – but on the other hand, there's no return ticket, for targeted movements are almost impossible.

“Man overboard” is what people call it on the high seas when someone falls out of the boat. The same is true in the dust world: if you don't hold on tight, you'll float away and never be seen again.

And this brings us to the many dangers a dust particle faces. Inadvertently leaving Earth is one of them; another – and much more run-of-the-mill – is sudden burial. In the house, dust might well fear an encounter with the vacuum cleaner or the air purifier. These devices take many smaller, discrete accumulations of dust – which are still moving and floating around – and turn them into one big one, which ends up in the dustbin.

But dust's enemies are not only in the home – they're outdoors too. The worst are the ones that come along peaceably and amicably: the fine, soft droplets of dense drizzle.

But snow is even more dangerous. If, in the human world, we say, “How lovely – it's snowing”, the dust world quakes in fear, for from the dust's point of view, snowflakes are like an enormous army of mops sinking slowly through the air, taking with it any dust that is still floating around, having not made it to safety quickly enough. Every snowflake begins life by finishing off a dust particle, for most snowflakes have at their core a speck

of dust that unwillingly serves as an ice nucleus and is inevitably carried downwards.

And this isn't the snowflakes' only victim.

As the snowflakes sink slowly through the atmosphere, floating left and right, they bond with more and more dust particles. Their movements are similar to those of the dust particles themselves, which makes it easier to capture a great many of them. And a new study has shown that snow's appetite for dust doesn't let up even after it has landed on the ground! This is because snow cools the air just above it, whereupon this sinks downwards, drawing with it the last remaining dust particles in the air, which then stick to the fine crystals.

And this is why white snow – at least, snow in towns and cities – is the dirtiest form of precipitation there is. You can test this by simply placing a handful of freshly fallen snow on a white plate and waiting a while. In a warm room, melting snow soon reveals its black core: the soot particles it has gathered on its leisurely journey, and which have accumulated in the cold winter air of the city as a result of countless fires. And, if you look closer, you'll see a whole host of fibres. If you've ever shoved a handful of snow into your mouth, you'll remember the furry, sometimes even metallic, taste ... If, however, you're not particularly interested in the taste of fine dust and exhaust fumes, you'd do better to keep your hands off this extremely dirty, although indisputably beautiful precipitation.

So, whereas precipitation – snow in particular – is a real drama in the dust world, dry periods, especially when the sun is shining, give dust a new lease of life. That's when dust is set in motion by radiation and warmth, and when the water that has been binding

and weighing it down evaporates. New dust keeps rising up from the ground, and if no winds or precipitation sweep it away, it can also float around for longer periods. And this is when new dust might even form from nothing, from mere air.

If the dust world had its own historiography, the beginning of industrialisation would surely be recorded as a tremendous, revolutionary event, for that’s when dust really began riding high on the air. Ever more, ever stranger particles entered the atmosphere, and the largest industrial cities (which are nowadays actually mainly in Asia) are also the most prolific distributors of dust – their daily particle production beats even that of volcanoes hands-down. Since they first appeared on Earth, humans have been stirring up dust: by hammering, boring, ploughing and stamping, by carrying out their work and activities, but mostly because the fire they’ve been in league with for around a million years – the fire they must set and keep alight everywhere they go – is a highly productive source of dust. Along with ash and carbon dioxide, fine dust is one of the primary products of fire, no matter how technologised its origins. And if we consider climate change, which has been caused by human fires and products and is leading to more droughts, much less snow and more forest fires, the dust world certainly does seem to be on the up! We’ll come back to this later.

*[here illustration #4, fire/oven, half a page]*

So, now you know all about the joys of being a dust particle, its hopes and fears, and the dangers it faces. But what’s behind all this? Why is it that dust particles behave so very differently to ordinary things, even though they are made of the same stuff as dust? Why

does the woollen jumper stay in the wardrobe, whereas the fluffs of wool that come loose from it fly all around the room as if gravity doesn't apply to them? In any case, how come the jumper produces fluff but the fluff doesn't produce a jumper?

Behind all this, as is often the case, is physics. One side of dust's behaviour is explained by thermodynamics. One of the laws of thermodynamics states that entropy, the disorder in the universe, is constantly increasing. This is why fluff detaches from the jumper and forms a tangle of a dust ball in the corner of the room, whereas the same number of dust balls have never yet combined to make a jumper.

The other, perhaps more interesting side of dust behaviour can be explained by studying the physics and chemistry of the surface. In the case of large objects, such as the human body, more is hidden on the inside than is apparent on the outside. Take an onion, for example: we all know it has many flimsy inner layers, whereas it has only one or two protective layers on the outside. Dust particles are entirely different: they barely have an interior that is hidden and protected from their exterior. They are so small that almost everything on the inside is also on the outside. And what is outside can come into contact with other things; it is active and reactive; it can be touched, nibbled, rubbed, heated and burned. There is no surface here concealing hidden depths – everything is surface. And there are enormous consequences to this: dust particles are not only the finest but also the most sensitive, susceptible particles; they not only wear their heart on their sleeve – they are heart through and through, devoid of any protection.

Anyone who knows anything about cooking knows that finely pulverised ingredients act much more quickly and intensively than coarsely chopped ones: icing sugar dissolves more quickly than crystallised sugar, and freshly ground pepper is a stronger seasoning.

This is also the case with non-edible substances: finely spun steel wool, used for scouring pans, is a flammable material – it will glow upon the slightest contact with a spark, whereas a piece of barbed wire will not. Laboratory chemists know that any substance they pulverise (thereby turning it into dust) behaves much more vigorously than coarsely chopped substances. That’s why the mortar used for grinding the substances is one of the emblems of chemistry. You can produce (albeit not in a mortar) extremely fine iron powder that ignites as soon as you tip the test tube and let the powder trickle out. An iron nail wouldn’t dream of behaving in such a way. Similarly, a grain of wheat would never explode if you lit it with a match, but a teaspoon of wheat flour, combined with a good dose of air, would very likely do so. This phenomenon has blown many a corn mill to kingdom come, and it’s one of the reasons why mills are often built outside the boundaries of towns. All fine, dust-sized particles lack, to some degree, a protective layer, a skin – their entire interior is exposed. All fine, dust-sized particles display highly increased reactivity.

And the surface to mass ratio also explains their mobility, their manoeuvrability. Dust particles float because they have more surface area than mass, because their volume has increased, just as a small shred of aluminium foil is certainly able to fly around a little, whereas an aluminium ball of the same weight falls as fast as possible.

Overall, dust can be described as unleashed material. Or as liberated material, for the bonds that otherwise immobilise the material have been largely removed. It is free, but also largely unprotected, forced to keep moving and transforming. But like travelling people, it also connects the sedentary things of this world, sometimes across thousands



Sample Translation “Dust” (J. Soentgen)

of miles and great oceans. It is an anarchist, turning the customary laws on their heads. Yet this almost-nothing is connected with everything, for everything can turn to dust and then transition into a state of reduced visibility but increased effectiveness and mobility. But “almost nothing” is too negative a name for dust, for it is also, at the same time, definitely almost something. It can turn into anything; it is a prospective something, still fermenting, forming as we speak. Earth itself, the physicists tell us, was formed from compacted cosmic dust. The dust world is in perpetual motion; it is constantly transforming, never stable for a moment. And this tiny world always has a hand in all the evolutions, changes and radical transformations of the larger world.

### **How Do You Define “Dust”?**

In German, the word for dust – *Staub* – seems innocent enough. It’s a term connected with the rarely used verb *stieben*, which means a disorderly movement in all directions, e.g. *die Funken stieben* – sparks spray out, or fly. The verb *stöbern*, too, is related to *Staub*; it refers to something similar, namely a disorderly searching in all directions. *Herumstöbern* conjures up dogs sniffing about excitedly or academics hunting eagerly through a library or archive. Then there’s the verb *flusen*, which is connected with flying and also with dust through *Staubfluse* – fluff. So, dust is something that flies around, in all directions. In German, dust even has a plural, *Stäube*, but it’s not very common – it’s only used in science to describe different kinds of dust. In actual fact, the English word “dust” comes from Proto-Germanic *dunstaz*, and the German word *Dunst* means “mist”,

“vapour” or “haze”, i.e. a suspension of fine, widely dispersed water droplets or dry particles in the air.

But the grammar and etymology of the word are one thing – the associations it evokes are another thing altogether. For most people, no doubt, the word “dust” conjures up a grey dust ball they are astonished to discover lying under the bed when they are trying to fish out a toy that has rolled underneath: “How on earth has that got there? I vacuumed under there only yesterday!” This dust ball is also called a *Wollmaus* (wool mouse) in German, a *Mouton de poussière* (wool sheep) in French, and a *dust bunny* in American English. So, this creature might come in various sizes and degrees of cuteness in the different languages, but in each case the dust ball has its own vitality. It moves and appears to try to flee as soon as you approach it. If you take a closer look, its little fine hairs are constantly moving. It’s a very strange thing indeed! It seems to consist of nothing but fibres, hairs and tiny crumbs, everything in disarray – it’s the absolute antithesis of our well-ordered world. The fibres are not combed, brushed and brought into line in the way they are in our textiles and on our heads; they are frizzy and dishevelled, which is why the shape of the dust ball is so indeterminable. It’s hard to say where it begins and where it ends.

And its behaviour is just as erratic, for it turns up right where you’re least expecting it and goes wherever it likes – it flits and flies about. It feeds on the waste and scraps left by creatures and things – especially our own –, but it wouldn’t think of doing anything useful. Its life is not sedentary but nomadic, and that’s precisely why we feel justified in persecuting it, and why we are only satisfied once it has disappeared forever into the dark vault of the vacuum cleaner bag.

But the word “dust” doesn’t only evoke dust balls, for which we might have at least a little sympathy if we think of them as freaks of our material world. “Dust” inevitably recalls the words of the Protestant liturgy, often spoken at funerals: “Ashes to ashes, dust to dust.” For a significant number of people, the quintessence of the Christian religion is precisely this reference to the transience of the flesh.

Expressions such as “turn to dust” or “bite the dust” automatically come to mind. Dust is – at least in common parlance – a word that suggests not the beginning but the end.

The Bible, of course, was written in an extremely dry, dusty land, close to the desert. No wonder dust plays a relatively negative role in this book of all books. When Jesus sends his apostles out into the world, he instructs them to “shake the dust off your feet” wherever they are not well received. In so doing, he is drawing on a Jewish ritual, for when returning from journeys, Jews shook the dust of unholy lands from their shoes as they left, so as not to contaminate the Holy Land. Another reason dust is not held in high regard in the Bible is its ubiquity; it is always used to indicate that someone or something is bad – the serpent, for example, is cursed with crawling on its belly in the dust. The positive aspects of dust are much less prominent in the Bible, such as the fact that it can be the basis for agriculture and life, let alone how pleasant it can be to walk barefoot on fine, silky soft dust – even layers of dust on furniture have something gentle about them. That the Bible gives so little consideration to the positive aspects of dust is probably something to do with the fact that it rarely addresses the positive aspects of humans and their bodies. Humans, as the Bible strongly emphasises, are made of dust, but this is of

course an allusion to their frailty and condemnation to death, rather than to their connection with the earth.

Even those who have not attended a Christian service for a long time, or never have, associate dust primarily with negative things and destruction. Dust reminds us of the ageing process, for all old things are dusty or covered with dust. The layer of dust covering them not only turns them grey but also indicates they are rarely used and so are no longer of much value. If something has “turned to dust”, nothing in the world has the power to restore it. It is lost forever.

And yet this is such a one-sided view of dust, both as a natural and a cultural phenomenon. If we focus on things turning to dust, we lose sight of the fact that dust is a creative force, too. Without pollination, that natural process through which plants reproduce, there’d be no grains of wheat, no apples, no grapes, and no oranges or lemons.

### **“Soup”: The Science of Dust**

Hence, science has tried to create its own word for dust, one that is as neutral as possible, thereby capturing dust’s propensity to flit and fly in all directions. Scientists refer to “aerosols”, although – depending on their native language – they do not always find it easy to pronounce. The word is coined from one Greek and one Latin component, and it approximates to “aero-solution”. So what’s that supposed to mean? Well, it’s definitely not about doing aerial calculations. It’s more to do with thinking about dust and air as connected.

This latest definition, this latest attempt to define the restless dust world goes back to the very first definition given by Saint Isidore of Seville in his etymological dictionary, which was first published in 623 AD. Here Isidore wrote that dust is the substance that is whirled about by the power of the wind: “pulvis dictus, quod vi venti pellatur”. So, dust and air cannot be considered separately from one another. As evidence for this fact, Isidore cites neither an observation nor an experiment, rather a psalm from the Bible. The modern term “aerosol” is only a few decades old. The first educational book about aerosol research was published in 1955; it was written by the Russian physicist Nikolai Albertowich Fuchs. The first journal for aerosol research appeared in 1970. The term “aerosol” means a mixture of floating dust-sized particles or particular gases; the intention behind this neologism was to show that what is interesting is not actually the dust lying stationary on the ground or immobilised in containers, rather the dust that is in motion, floating and swirling around, i.e. the dust in the air. So, an aerosol is tiny particles in the air, and these can be either solid particles, such as soot, or tiny droplets of water; steam is therefore an aerosol, as is smoke. There are artificially manufactured aerosols, such as sprays, which finely dissipate an active ingredient, making it easier to inhale or disperse. Aerosol experts are therefore also concerned with how to produce useful aerosols. Above all, though, they research aerosols we unavoidably breathe in on a daily basis, e.g. city air.

Today there is a large international community of aerosol experts, but even they find the word a little strange. Among themselves, they prefer to call their object of study “soup”, thereby expressing the diverse composition of, for example, city air, but also the fact that these particles all come together to form a new whole. I have taken part in many a

Sample Translation “Dust” (J. Soentgen)

workshop in which the word “aerosol” has not been uttered at all, rather reference has been made to “soup”, an extremely multifaceted soup that can be thick or thin, and with a particular layering. In addition, this soup has a certain dynamic to it, one of “squatting in the city” in the winter, “dispersing as the weather warms up”, or “being blown out of the city by the wind”. “Stirring the soup” – this is how scientists often describe their work, and this seems very apposite to me. By stirring the soup, you bring the sediment to the top, thereby getting to know the soup better. It would perhaps help to look at an example to show that this is not only a whimsical activity; it also has broader relevance.

On 16 November 2016 in Melbourne, Australia, a storm caused an extreme increase in asthma cases. 1,900 emergency calls were recorded in five hours, and the accident and emergency wards in the hospitals were completely inundated. There were nine deaths. There have been reports of similar events in other countries; heavy rain often stirs up more dust than it binds. Because such storms are breaking out more frequently as a result of climate change, a research team at the University of Augsburg decided to get to the bottom of the phenomenon. Our study of so-called thunderstorm asthma, led by Andreas Philipp, showed evidence of an extremely high number of asthma-related interventions by emergency doctors in July in Bavaria too. The storm season, which runs from May to August (in Bavaria, almost all the year’s storms occur during this period), likewise reaches its climax in July. So, there is evidence of a relation between storms and asthma in central Europe too. Thus far, any medically-related research we have on dust is mainly statistical.

Now, this is where soup comes in. What is actually going on in the dusty air when it is stirred up by thunderstorms? Either updrafts (which are common in storms) or drops of water splashing down stir up pollen and fungal spores that may already be bonded to the ground; they are sent back up into the air, thereby increasing its concentration.

Furthermore, we observed that strong everyday winds are already very dusty, so when a thundery shower comes along, the moisture presumably intensifies the winds’ activity. In short, we concluded that the rapidly growing risk groups of asthmatics and allergy sufferers in central Europe should avoid going outside during storms, particularly thunderstorms. This is pretty obvious, and it’s generally what people do anyway, but in addition, they should keep the windows closed. Medicalisation should be adapted, and accident and emergency departments should be informed about the relation between storms and asthma so they can deal better with the increased pressure on the service. The thunderstorm and asthma example shows that aerosol research is not only of medical relevance but is also bringing surprising findings to light: the air in a thundery atmosphere is not (as many believe) thoroughly cleansed; it’s actually quite the opposite – a very thick soup.

The concept of soup might be more conducive to aerosol research’s public relations than the word “aerosol”; some have difficulty pronouncing it, which means it tends to create confusion rather than spread insight. If the dust world were to give itself a name that was free from any judgements but also relatively comprehensible, it might call itself a “microcommunity”. This term would at least express the collective character of this sphere effectively, for it suggests a fairly gregarious inner life, and this certainly is characteristic of the dust world, which is anything but dead. And because it is so alive, it

Sample Translation “Dust” (J. Soentgen)

invites consideration of its state constitution, its basic law; I assume its first paragraph would say: *Anything goes*. It’s a multicultural parallel world in which the poisonous and the healthy, the precious and the worthless, the terrestrial and the extraterrestrial come together, live together and float around together in peace.