Fundamentalism

I can no longer remember when I first realised I had become a fundamentalist. You remember those early days of childhood, when every moment you wanted to know "Why?"? And every new answer, if you got one, threw up new questions? I asked my father, "Why do two and two make four?" His answer, now lost for ever, did not satisfy me. But I never forgot the question, and over the years I obtained many answers, none of which satisfied me. Perhaps I was told, one and one is two, so two and two is one and one and one and one, which is four. No inquisitive child could ever be satisfied with such an answer! Why is one and one equal to two? Why is one and one, and one and one, the same as one and one and one and one? If one and one is two, why is two equal to one and one? And so on and on and on . . . You get the idea.

There is a name for a child like this, an ugly name. He is called a mathematician. Once labelled, the stigma never goes away. He may never grow up, doomed forever to keep asking "Why?" As he gets older he finds it more and more difficult to interact with normal people, who have eventually accepted the inadequate answers to their questions and no longer ask "Why?" They ask him, "What do you do?" Cornered, he answers, "I am a mathematician." There is silence. They drift away.

That is what happened to me. I want to tell you about my slow but inexorable drift into fundamentalism. Was it inevitable? Or was there a time, in my early childhood, when this fate could have been averted? Or perhaps later on, some psychotherapy or other could have turned me away from this path? You may judge for yourself—but please don't judge me before you have heard my story.

I put aside for a while the question of why two and two make four. Many years later I discovered that this question had baffled the greatest mathematicians and philosophers, and then I felt a little less stupid for my failure to understand it myself.

I learnt my times tables. Seven eights are fifty-six. Eight sevens are fifty-six. Extraordinary! Why are they the same? I had to know. But the tools for understanding this mystery were not at my disposal. I was fobbed off with a silly rectangle, seven inches one way, eight inches the other, divided into one-inch squares. One way round it looked like seven rows of eight squares. The other way round it looked like eight rows of seven squares. But the number of squares had not changed. So seven eights are the same as eight sevens. QED

Well, dear reader, I dare say you'd be satisfied with that. I dare say most people would be satisfied with that. I dare say my teachers thought that *I* should be satisfied with that. But I think you know me well enough by now to know that I was *not*. It's all very well drawing pretty pictures of nice well-behaved squares, but how do I know it would be the same if I was counting apples in a bucket, or sheep in a field? And what about leaves on a tree? How could I be sure it would still work for really *big* numbers?

You can see that my list of unanswered questions kept growing and growing. If we're ever going to get to the end of this story, I'm going to have to skip over many years and innumerable questions, and pause briefly at an Institution where I began to dimly perceive the true horrors of some of the questions I had been asking. This venerable institution was founded on the outrageous principle that one was equal to three (or should that be, three was equal to one?). And for many years I actually did believe that one was equal to three—but that is another story.

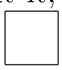
You may not believe this, but for the purpose of justifying the fact, if fact it be, that two and two make four, it is not necessary to know whether one is equal to three, or not. I think this is the point when I first thought I might really be going mad. I thought I knew that one was not equal to three. In all my years of questioning, I had never once thought to ask, "Why is one not equal to three?"

I felt humbled. I felt inadequate. I was in awe of the sheer effrontery of the question. I was in awe of the gargantuan childish intellect that could ask such a foolish question. Clearly I still had a lot to unlearn.

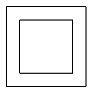
In the meantime, I had learnt to write in symbols, not words. I learnt to write $2+2=4$, and I learnt the rules of algebra. I learnt the immense power of brackets, as in $a\times(b+c)=a\times b+a\times c$, and I learnt that $(a+b)+c=a+(b+c)$, but not why. So I learnt that $2+2=(1+1)+(1+1)=((1+1)+1)+1=4$, but still I did not understand *why*.

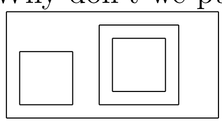
Then I learnt that illustrious mathematicians and philosophers had spent decades deconstructing the sentence "2 + 2 = 4" in an effort to get to its true meaning. It was a religious awakening for me. I sat at the feet of true disciples of this religion, and learnt how the whole of mathematics could be built out of nothing. Yes, you heard me right, out of absolutely nothing.

You see, my questions had not been anything like fundamental. Before you can even ask "Why is 1 + 1 = 2?" you have to answer the questions "What is 1?", "What is +?", "What is =?", "What is 2?". So we sat at the feet of the master, my fellow students and I, and we listened as we hoped for enlightenment.

In the beginning was nothing. We can't see it, because it isn't there. We can't talk about it, because it isn't there. So just to make it visible, put it in a box, thus:  . I say "it", but there is no "it", there is nothing there. And, of course, the box isn't really a box either, but it helps our imagination.

But look here! Now we have *something*: we have an imaginary box, with nothing in it! An adult might cavil at this, and complain that we still have nothing. But any child will tell you that an imaginary box is *not* the same as nothing, even if the imaginary box is empty. This is important, and if you cannot accept it, we had better just refill our glasses and talk about the weather. So let's agree to call our imaginary empty box "zero", or 0, because it's got nothing in it. I say "it", and this time I mean "it", because "it" is not nothing, "it" is something.

Now comes the clever bit: put "it" in a box too, thus:  . We've got an imaginary box with one thing in it (namely an empty imaginary box). You will have to agree that this is progress: our new box is not empty! Let us agree to call this new box 1, because it's got one thing in it.

We've already made two things out of nothing. Why don't we put these two things in a box, so we don't lose them? Thus:  . Aha! We've made a third thing, let's call it 2.

In great excitement we rushed to make some more numbers: each one was an imaginary box containing everything we'd made so far. It was extraordinary how easy it was to make something out of nothing, when you knew how. We felt enlightenment was just around the corner.

It wasn't, of course. Try as we might, we could not make 1 + 1 come to 2. Hardly surprising, really—we did not yet know the true meanings of "+" or

"=". But in time we imbibed enough of this Zen mathematics to appreciate that $1 + 1$ really does equal 2. And that $2 + 1 = 3$. But what about $1 + 2$? This really was our *pons asinorum*. Those few of us who could understand the master's explanation, or "proof", as he called it, that $1 + 2 = 3$, felt we had seen the true nature of numbers, and achieved enlightenment. But nothing could have been further from the truth.

Perhaps then, if someone had said to me "Watch out! You're turning into a fundamentalist!" I might have turned back from the brink. More likely, I would not have appreciated the danger. Even then, I did not see how deep true fundamentalism could go. My fellow students and I had seen how to make numbers and arithmetic out of imaginary empty boxes, and we'd seen the true meaning of the equation $2 + 2 = 4$. We even thought we understood why.

But the bottom dropped out of our world when one of us, more advanced than the rest, questioned the meaning of the word "Why?" itself. That woke us up, I can tell you. We were forced to examine the meanings of the words "if", "then", "because", and to deconstruct the notions of "explanation", "argument", and "proof". More years of ever deeper fundamentalism followed.

It began to seem as though every time I reached what I thought was the fundamental level, there was a deeper level underneath. Would I ever get to the bottom of this? Do you want to hear the stories of all the levels I fell through on my quest, or should I cut a long story short? Perhaps the latter: the night is getting on.

I was taught the essential meanings of the words "why", "because", and "proof". I reached a new level of fundamentalism. But then I asked a fatal question. I asked "What is the meaning of the word "meaning"?" And I knew there was no escape. For what could be the meaning of the question "What is the meaning of the word "meaning"?"? And what could be the meaning of *that* question? And so on and on, for ever. The only way to avoid the complete collapse of the whole of mathematics back into the nothingness from which it was made was to admit the complete meaninglessness of meaning itself.

That is why, when nowadays I am asked for the true reason why $2+2 = 4$, I smile and carry on raking the fallen leaves.