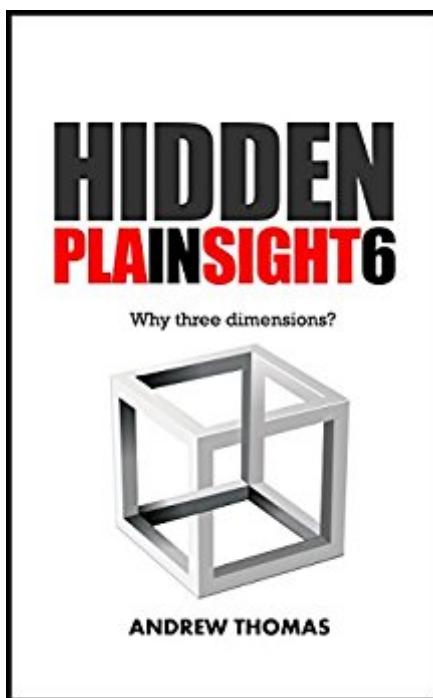


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Hidden In Plain Sight 6: Why Three Dimensions?



Synopsis

Why are there three dimensions of space? It is surprising that science does not know the answer, though there have been some inventive and controversial ideas. This book considers many of those ideas and presents a new solution why three is the magic number.

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Customer Reviews

As usual with his books, Andrew Thomas clearly explains some concepts I thought I understood, in a way that gave me a more intuitive understanding of them. These books are page-turners and worth additional re-reads. I appreciate his measured, reasoned, scientific approach being used to establish agreed-upon groundwork, and relatively unbiased explanations of the basic theoretical concepts. I also love his simple theories about current mysteries in physics, such as the behavior of gravity varying with the distance from the Schwarzschild radius, like the strong force does. In this particular book he shows pretty clearly why 3 spatial dimensions makes sense because it follows Occam's razor, and explains the nature of reality. My mind is always spinning (in a good way) after finishing these books.

Andrew Thomas presents an excellent overview of special and general relativity by covering the fundamentals of tensor algebra and explaining Einstein's thought process. The question of why there are three dimensions is postponed until the final chapter. Chapter 6 makes a strange digression into string theory. In that chapter, Dr. Thomas "proves" the infinite sum of natural numbers is equal to minus one twelfth, somehow causing the existence of 25 dimensions, which string theory then whittles down to 10 (or maybe 11). I think all this proves is just how silly string theory is. The proof concerning the infinite sum relies on a sleight of hand that appears in step 2, namely the assertion that $1-1+1-1+\dots = 0.5$ which is false. If that assertion were true, then $0.5 = 1$ which is obviously false. The infinite sum of natural numbers is can be shown to equal infinity minus one twelfth plus zero. String theorists simply subtract the infinity part to suit their own needs. I don't know why Dr. Thomas took this strange detour -- it adds nothing and only detracts from an otherwise sound and lucid work. The final chapter sets out to prove why there are three dimensions instead of two or four. To Dr. Thomas' credit, he does not invoke what I feared would be the anthropic principle. I agree with both Thomas and Lee Smolin that anthropic arguments can be used to prove virtually anything, and they should never be used in science. Instead, Dr. Thomas argues that space-time emerges from the properties of matter, although this argument seems circular. The argument is that fermions are required to spin in order to move through space-time at light speed, as all non-zero masses are required to do per SR; however, SR itself is predicated on the existence of space-time. Putting that apparent circularity aside for the time being, the number 3 satisfies the condition that the number of translational degrees of freedom equals the number of rotational degrees of freedom, which also happens to equal the number of dimensions we observe. It isn't exactly clear WHY that relationship needs to be satisfied, however. Is it because of some underlying symmetry in nature? Dr. Thomas needs to expand on that, although he definitely seems to be on the right track. There are a couple of minor corrections that should be made in the final chapter. Dr. Thomas states that photons do not experience time, which is quite true. But photons also do not experience space, because space collapses around a body that is approaching light speed due to relativistic aberration and Lorentz length contraction. Thus, a photon is literally everywhere in the universe in its own reference frame, although it appears to be in specific locations in our reference frame. Finally, there is the misconception that elementary particles "age" and then decay. Particle decay is "uncaused" and has nothing to do with the "age" of the particle. Half life is a statistical effect that WE observe through the decay of many particles. Quantum mechanics is quite clear that there are no invisible timers ticking away inside those particles, because these would amount to local hidden variables. Violations of Bell's inequality, as verified in numerous experiments, prove

beyond the shadow of doubt that local hidden variables do not exist in quantum mechanics. It seems as if high relative particle speeds produce local "time dilation" that delays particle decay, but it is actually wrong to infer that. Instead, it should be thought of as a reduced probability of observing a particle decaying when the particle is moving with respect to our reference frame. Dr. Thomas' original statement was correct: in the absence of entropy, there is no arrow of time. I gave this book an overall rating of 4 stars. It is interesting and easy to read, and offers a very simple explanation of a difficult topic of special and general relativity. I think Chapter 6, dealing with string theory, should be changed or omitted entirely. If it weren't for Chapter 6, I'd have given this book 5 stars.

sites.google.com/site/amateurscientistessays/

Once again, for the sixth time, Mr. Thomas has presented a concise, thought provoking book regarding a point of physics. I'm not bright enough to say I completely understood it, but there is plenty for the average person to ponder. The question here is why three space dimensions. It is not something that is generally discussed. I've never seen the question raised previously but it is a basic part of the universe. It is an interesting discussion. Admittedly, the mathematical formulas are beyond me but that didn't keep me from enjoying this little gem.

As always well written and insightful. Dr. Thomas covers the ground here from relativity, string theory, and quantum musings about space. He makes a strong case for why our universe must have AT LEAST three dimensions of space and one of time. His assertion that there are probably not more "compactified dimensions" as described by Kaluza-Klein and string theory is also convincingly defended but not quite as well as the minimal requirement for three dimensions. His ending seems a bit rushed. He nails the need for three dimensions, but it leaves somewhat open the possibility that there are more. He notes at one point that no one has ever observed an infinity in the physical universe, but I was disappointed that he did not go into any exploration of the possibility (or impossibility) of infinity in connection with three dimensional space. An easy read, well written for the lay audience. A good addition to his series.

I have read many books over the last several years regarding the topics Andrew discusses in his books. Since I do not have much of an education background in either physics or math (beyond Algebra), I choose books that explain concepts without much math. I have learned about more about these extremely interesting topics from Andrew than any other author I have read! He is gifted at explaining his topics with simplicity! I have ready everyone of his 6 books and am excited about

books to come!

I was tempted to give it three stars but it is plenty of valuable data. Said that I think it extends so much to say that there is not an answer, also I felt like there were so many detours for things that could have needed less explanations or could have resumed with graphics as this book actually deals with dimensions and space after all. The information I found quite amazing was the sum of the infinite of natural numbers.

I've found all of Andrew Thomas's books to be fascinating. In this book (like his others) he uses powerful and understandable logic to make his point that there can only be 3 dimensions of space (4 in space-time). This kind of logic I find to be very appealing because it undermines string theory which requires many more dimensions in space which cannot be proven. String theory always appeared like "epicycles" to me but I am not at all qualified to make that assertion - still I think string theory defies common sense. Andrew Thomas does make common sense in this book and the reader with an interest in science should be able to follow it.

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