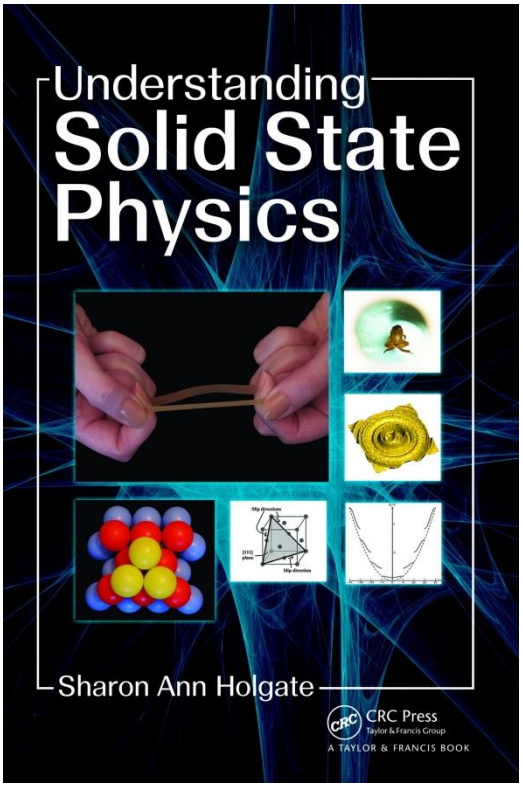

Promo Video

Understanding Solid State Physics 1st edition

Audio transcript

(Caption: Dr Sharon Ann Holgate, Physicist and Science Writer)

I wanted to write this undergraduate physics textbook after I'd been a teaching assistant when I was a postgraduate at university. And so students would come to me and be really good at mathematics, but they'd be really stuck on the concepts behind a lot of the topics. And I just realised there was kind-of a gap in the market for a book that, you know, didn't have so much mathematics in, and just concentrated on getting the concepts over.

So I kind of think in pictures rather than in terms of mathematical equations, and I just thought for all the other people out there that do think in pictures, and see little films of things in their minds, that hopefully this book will be for them.

Well, I've been working as a science writer and broadcaster for just over 10 years now. So I've written for New Scientist, The Times Higher Education Supplement, and Focus magazine, and various things for the Institute of Physics. So I guess having to write for all these kind-of different topics—some of the stuff I do is quite jokey, I was on Chris Evans' Radio Show just before Christmas, and some of the stuff is really serious. And so I'd like to think I've developed ways of writing for

different kinds of markets. And also a lot of what I have to do is obviously for people with no science background at all. So I'd like to think that I've been able to bring a level of accessibility to this book that possibly I wouldn't have had if I'd have remained in academia.

Well, I think that the kind of students that would find this book particularly useful would be students who have not really encountered anything to do with the physics of solids before. Possibly students who are not so keen on mathematics, or maybe slightly less mathematically able. So just to try and just understand basically what's going on, before you're then applying more mathematical 'rigour', I suppose, to the different subjects. So maybe for a first course in solid state physics, let's say, and then you would move on to more complicated things afterwards.

I've started the book off with a chapter on bonding. So basically how the atoms hang together inside a solid, and then I've talked about all the different crystal structures. And then, of course, like most areas of life nothing is ever perfect, and of course there are defects inside crystals. So I've talked about all the different defects in the third chapter. And I've also talked about polymers in Chapter 3, because that's obviously a very important area now when you think about how much we use plastics in our lives. And then in Chapter 4, I've tried to come away a little bit from looking at things on a sort-of microscopic level, so that's more macroscopic things like stress, and strain, and that sort of thing. Chapter 5 is looking at X-ray diffraction, which is an incredibly important technique both in solid state physics and in many other areas. I mean one of the examples I give is using X-ray diffraction to investigate human hair, for example. And then in Chapter 5 I also talk about thermal conduction and phonons. And then Chapter 6 is kind-of the 'biggie'. It's electrical conduction. So I go through various models of electrical conduction—kind-of how far we've got with them. Quite a bit on band theory, which leads nicely into semiconductors, and then in Chapter 7 I've got all about some semiconductor devices. So just some basic ones—the p-n junction and that sort of thing, how solar cells work, and a little bit about insulators as well. Because obviously there's no point having conductors and semiconductors if we've got nothing to insulate ourselves from the current or indeed, you know, to insulate various parts

of electronic components. And then finally I round off with a chapter on magnetism.

Well, solid state physics is clearly something that I love, and I've tried to get over my enthusiasm for the subject in the book. So I hope that comes across. But also I just feel that, you know, whether you are as gripped by it as I am or not, it is just so important. You know, societies are becoming more and more dependent on technology, and I just feel that it is just the basis of so many new technologies, new devices, just things that are everywhere. And I think the pace of life seems to be becoming faster everywhere. We're demanding better, faster solutions to everything, and I think solid state physics is going to play an increasing part in creating the sort of societies that will be in demand in the future.

I've enjoyed writing this book, and I feel I've learnt an awful lot more about the subject myself, you know, having had to revise it. And I really hope that my enthusiasm for the subject is something that I've managed to capture in the book and can pass on to the readers.