Transcript for *"The Science of Reading"*

Dr. Dipesh Navsaria: [00:00:00] Reach Out and Read where books build better brains. This is the Reach Out and Read podcast. I'm your host doctor Dipesh Navsaria, a practicing pediatrician with degrees in public health and children's librarianship. I'm a clinical professor of human development and family studies at the School of Human Ecology, and a professor of pediatrics at the School of Medicine and Public Health, both at the University of Wisconsin in Madison. At Reach Out and Read, we dream of a world in which every child is read to every day. Our show explores how children and families flourish and thrive through a combination of individual well-being, confident parents, supportive communities, strong public health, and good policy. Join us here for thought provoking conversations on these issues with expert guests, authors, and leaders in the field of early childhood health and literacy. Research shows that reading physical books together brings the strongest benefits to children. That's why we're happy to have Boise paper. A responsible paper manufacturer as the founding sponsor of this podcast through their paper with Purpose promise. Boise Paper looks for ways to make a difference in local communities. Thank you to Boise Paper for investing in our Reach Out and Read community.

Dr. Dipesh Navsaria: [00:01:15] Most of us take reading for granted, but if you stop and think about it, what makes up reading? As a recent book puts it, how is it that the eye, the mind, and the brain are being called upon to perform tasks that are fundamentally unnatural? And what does the act of reading mean for individuals and the society at large? The science of reading is a relatively new field. The first book written on this subject dates back to only 1908, but the need to study the act of reading and its foundational relationship to society is still very much present. As our next guest writes, we live in a world shaped by the science of reading. Our guest today is Adrian Johns, who is the Allan Grant Maclear Distinguished Service Professor of History, also with the Conceptual and Historical Studies of Science, and department Chair of the Department of History at the University of Chicago. He has long studied the history of science, and today we're speaking to him about his latest book, The Science of Reading Information, Media and Mind in Modern America. Doctor Johns, welcome to the show.

Adrian Johns: [00:02:20] Thank you for having me. I'm glad to be here.

Dr. Dipesh Navsaria: [00:02:23] So I want to start with a framing question. I have to admit, I was surprised when I picked up this book because it's titled The Science of Reading. And I initially thought it would be about some of the modern conversations and questions going on about reading instruction. And I was delighted to discover it was a wonderful romp through the history of reading in general. It truly was about the science of reading and its history. And not just about the most current iteration of what's been called the instruction wars.

Adrian Johns: [00:02:58] You know, I'm really glad that you start out by saying that because for me too, it was actually something like a romp to go back that far in this enterprise that's been devoted to trying to understand what happens to us when we read how reading works. We're in a moment right now when the phrase the science of reading is being deployed a lot in sometimes quite partisan ways, actually, to frame policies that often mandate how reading should be taught to children in elementary schools across the country, in different states. And one of the things that's been quite striking to me is that that phrase, the science of reading, is often used in a way that is, I think, totally blind to the fact that the science actually has a history, that it's changed over time. And ironically, quite often the the initiatives that the science of reading now is used to, to back are things that were based on things that are based on the previous iterations of the science of reading. So it's not that they were unscientific, it's that they're based on past science, which I think should give us a certain sense of humility, actually, about how adamant we should be about making these policy changes. But I deliberately didn't engage at great and deep length with the absolutely contemporary fights. I noticed that, you know, because I wanted to go back through its history and not have that history be entirely sort of defined by what we now want to do in our schools today. I do think that the two things are connected, but I didn't want the previous history to be just shaped by that question.

Dr. Dipesh Navsaria: [00:04:41] Yeah, yeah. You actually spend very little time on what the, the current conversations are around those, those things. And honestly, I think that that might be why I said, hey, we really need to get you on on the podcast here because the historical elements are just so fascinating. And so you let's let's go back through the field. You know, science, of course, builds on science. There're many key characters in your book. But one of the early ones was James McKeen Cattell. And he had these psychophysical experiments in the 1880s that laid the groundwork for all the mental processes that concerned in reading, as they put it. Can you tell our listeners more about that?

Adrian Johns: [00:05:31] Yeah. Well, Cattell is actually a major figure in the history of psychology in this country. And like many people who were interested in in psychological sciences in the late 19th century, he went off to Germany to learn in what were called psychophysics labs. There. Psychophysics was an enterprise devoted to the experimental study of psychological processes, rather on the model of electrical physics, actually. And so

the idea was to do precision measurements of things like reaction times and, you know, and how fast you could, you could in this case read, read characters on a page. So Cattell went out and worked in in Germany, then came back and became, after a bit of wandering, a professor at Columbia University where he applied the the instrumentation of psychophysics devoted to things like the precision measurement of of reading characters to students to try to figure out, you know, what he could about the speed and the accuracy with which one read characters and words and phrases. And one of the things that he found out, which became a really foundational idea for the science of reading for the 20th century, was that you read, as it were, by pattern recognition that that words can be if they're recognizable, words can be read faster than you can read the individual characters that make them up, which implies that what's going on when you read is not just a kind of individual character by character kind of recognition process. There's something cognitive going on, right? And so Cattell's sort of quasi physics of, of reading became the factual foundation stone for everything that came after. All the various different theories about how, in fact, that cognitive process works.

Dr. Dipesh Navsaria: [00:07:27] Yeah. It is it is interesting because in a, in a letter, in character and sound based language, like most Western languages, right, that you would think that it really is about our brain sort of piecing together that string of letters, but the sort of a larger, more holistic appraisal that's, that's going on when one becomes certainly a fluent reader.

Adrian Johns: [00:07:50] Absolutely. And I mean, to leap later in time, a little bit in the 1960s, when cognitive scientists were really making great strides. One of the things that the cognitive scientists did was to rediscover this kind of work, and to argue that the process of reading is like a process of experimentation that happens at tremendous speed. So the reader is a is a sort of cognitive experimental scientist and is hypothesizing all the time what the next thing on the page is going to be. And then testing that against what he or she perceives. And this, this idea, which actually became very important for educational policy in the, in the 70s and 80s, you know, it was it involved a kind of rediscovery, like I say, of the Cattell School of thought about this.

Dr. Dipesh Navsaria: [00:08:41] Yeah. And you know, that meshes well with sometimes how we talk about children and unstructured play. Right? As well as, as they test out the world around them. Right. And think, you know, if I do x, what happens? Does y happen, or does it not happen in this context? It feels like reading is another facet of that same sort of element that young children go through.

Adrian Johns: [00:09:03] Yeah, that's very much the idea. And that notion goes back actually to pretty close to when Qatar was working. So what happened in the 20th century? In the

scientific domain about this, is that it actually carried on at various different universities and research labs across the country. But the two big ones are Columbia University and the University of Chicago, mainly because both of those have schools attached to them. So you can experiment with children right there. And of course, the Chicago, the school was heavily influenced by John Dewey. So that pragmatist notion of learning through doing that children are constantly doing experiments really kind of meshed pretty closely with the science of reading as it was evolving. There's an interesting tension or almost paradox about that, which is that this is also the era of emerging behaviorist psychology, which is almost the opposite of this. Right? It's the notion that that thought cognition is not actually something that that is really like investigated by science at all. And that really what we should be doing is looking for a pretty hard line stimulus response mechanisms and, and the science of reading got got caught up in that as well. So it almost becomes a kind of threshold enterprise where the scientists looking at reading are kind of trying to navigate how behaviorism and some notion of cognition can actually work with each other over decades, actually.

Dr. Dipesh Navsaria: [00:10:39] Sure. Yeah. And reconcile these, these, these two ways of approaching it. Sure. So there's another of many characters in your book. There's another main character. And by the way, this bodes well if you're ever hoping that the book gets turned into a motion picture or a musical. You'll have many characters. Edmund Burke, can you tell us a bit about him and what prompted his research and what he found?

Adrian Johns: [00:11:05] Yeah, Huey wrote the first major book in this field called The Psychology and Pedagogy of Reading, which has gone through multiple reprints over the decades and I think is actually still in print in one form right now. And it's actually a fascinating piece. It's the first full survey of a scientific investigation of reading, taken in its broadest sense, actually. So it deals not only with children reading, but with adults with different cultures. At one point, he talks about a dream that he has that you can revive a kind of notion of Egyptian hieroglyphics to make a form of typography that will be more attuned to how humans actually read for patterns. He was an acquaintance of kettles. Actually, they were at university together and and he also went off to Germany for a while to learn, learn psychophysics. But then he came back and worked at Clark University and undertook these researches. One of his big things and this, this actually becomes a kind of defining experimental enterprise for the science of reading, was to use eye cameras to track how when you're looking at a page of text, your eyes hop from one part of the line to the next. The idea being that if you can figure out how the eyes are hopping across the page, you may be able to train them to hop more efficiently. And that will make people into better readers. So there's a direct kind of aspirational payoff of this, but Huey is associated with that pretty strongly. But he becomes a founding figure. Sadly, he died of consumption at quite a young age. He was in his early 40s. So the potential of that, we'll never know what he would have done next after that book, the book that becomes the foundational text.

Dr. Dipesh Navsaria: [00:12:55] And for our listeners, the cover of your book actually shows some photographs, some eye tracking experiments and even has some of the notation that's used to convey the results of how the eye is hopping across the page. And again, for listeners who may not be aware. Yeah, you don't you don't read by just linearly looking down the line, your your eyes are hopping in different ways and even reversing course in some cases.

Adrian Johns: [00:13:23] Yeah. That's right. Yeah. What broadly happens is that the eye hops 2 or 3 words along at a time and then pauses. And so the hops are called saccades which means like jerks in French. And the pauses are called fixations. And what people like, you know, Cattell and Huey and then their successors in the 20th century thought was that if you could deploy instruments like eye cameras to figure out how people's eyes were moving across the page. With these saccades and fixations, you might be able to deploy technologies somewhat like slide projectors, actually, to make them move their eyes more smoothly and more efficiently, almost like a kind of dance. So imagine if you if you dance rhythmically, your use of energy feels a lot less. So you get a lot less fatigued, you move smoother. You're, you know, more efficient. This obviously goes a lot with ideas of things like factory management at this age that you can get your workers to actually, you know, be that much more efficient. Yeah, exactly. Yeah. And they're less tired. They're less fatigued by it as well. So the idea is that we may be able to train readers not simply to sort of recognize characters, not just the the relatively banal, straightforward character recognition part of reading, but you can make them into better, as it were, information processors by training their eye I movements to move to to to work that much more sort of efficaciously.

Dr. Dipesh Navsaria: [00:14:53] Yeah, yeah. And what was also incredible to me was just how the length of time in which I movements has been studied, like, and still is to, you know, varying extents. It wasn't something that was like an experimental fad for, you know, a couple of decades and then went out. It seemed to continue a long time.

Adrian Johns: [00:15:15] Oh, yeah. No, it's been going. So, so this phenomenon of saccades is first noticed or written down and published in the early 1870s in France. And then it's picked up on very quickly by people at researchers across Germany, England, the United States. And, and it does get embedded in programs for, like I say, retraining readers starting in I would say the 19 tens, but running right through the at least the 60s and 70s. And eye tracking machines, of course, are used like all over the place now. Not not so much to teach people to read, but for all parts of our society of what's often called surveillance capitalism. So if you drive a Cadillac, for example, a number of Cadillacs have eye tracking machines in them that will see whether you are looking out at the road or not, or whether you're looking whether you're looking tired. Yeah. You know, I actually for what? So I last year I rented a Volvo for a while because my car was in the workshop, and I was I was dismayed that at one point I was

fiddling with the silly screen in the, you know, to get the, the sound system to work. Right. And the cars showed up this text in front of me on the dashboard that said, are we ready to drive now? And I thought, what a naggy machine.

Dr. Dipesh Navsaria: [00:16:33] Holding you.

Adrian Johns: [00:16:34] Here. Yeah, exactly. And it struck me that I actually don't know whether this is strictly what was happening, but the most likely thing that I could think of was that it had actually noticed that my eyes were not on the road.

Dr. Dipesh Navsaria: [00:16:43] You felt judged by your car?

Adrian Johns: [00:16:45] Absolutely. Yeah. Yeah. So, you know.

Dr. Dipesh Navsaria: [00:16:48] There you go.

Adrian Johns: [00:16:49] Yeah. Society took a wrong turning about, you know, 20 years ago about this kind of thing. But no, the eye tracking machines were advertisers use them. So they have people go through supermarkets and they will track where people's eyes go on the shelves of the supermarket to get a sense of which branding, which advertising and which kind of packaging is most appealing, most effective.

Dr. Dipesh Navsaria: [00:17:12] Yeah. It's also been used in studies of teachers and their interaction with young children. Like which children are they looking at the most because they expect them to potentially misbehave? And how does that fall along both gender and racial lines as well. That's eye tracking as well. Yeah. So I want to pop back into history for a moment here because I think most of our listeners are familiar with, you know, the, the invention of the printing press and, you know, like this idea that suddenly there was this huge flood of printed material, and now literacy was no longer this very elite, very literally cloistered, given monks and all activity. But you write about how it was actually the Industrial revolution that really kicked off so much mass public reading. Can you say more about that?

Adrian Johns: [00:18:05] Yeah, sure. This actually relates to previous work that I've done on the history of the book, going right back to the 16th, 17th century. So, yeah, it is true that the invention of printing in the mid, mid, 16th, mid 15th century does increase the, the circulation availability, affordability of texts. Right. So you'd be much more if you're a layperson, you'll be much more familiar with, you know, writing in general in 1650 than you would have been in, say, 1250. So that's true. But the average output of a printing press of the Gutenberg type is, you know, it's about a thousand impressions a day or something like that. So addition sizes are of the order of high hundreds in that period. But with steam printing that comes in from

the 18 tens onwards, there's really kind of an established by about the 1850s with stereotyping and a new wave of, of industrial reproduction technology. There's an increasing output of maybe a couple of orders of magnitude. So the times by the 1830s, the British newspaper can print sort of 100,000 a day. And with railways, you can circulate these things across the entire nation. And so there's a, there's an idea that for the first time, actually, everything that we might associate with print itself really becomes possible, that you can have this kind of simultaneous access by readers in, in large numbers, not just a few hundred, but hundreds of thousands to the same pieces of writing, that are circulated within the day, you know, across the whole nation.

Adrian Johns: [00:19:48] And that creates both a kind of dramatically optimistic aspiration that you can finally have a democratic information society with, with, you know, well-informed voters who know what they're actually going to be voting for and well-informed workers who can, who can work in sophisticated industrial settings. You know, they can read the instructions, that kind of thing. And it creates a certain disquiet as well, because it may lead to homogenization. You can't easily withdraw from this. You know, one of the early psychologists who succeeds on from Cattell and Huey is a guy called Raymond Dodge, who's another famous figure, actually in the history of experimental psychology in this country. Dodge wrote a warning in a mass circulation magazine, I think it's The Atlantic that when you're riding on a streetcar in a city like New York or Philadelphia, you're bombarded with advertising hoardings, texts, you know, billboards, things like that. And you, you psychologically cannot not read them. And he raises this as a real problem of, of freedom and of, of psychological autonomy and suggests that there should be government action. Actually, he proposes that there should be government action to set up the so that streetcars cannot have seats that face outwards, so that you shouldn't be subjected to this involuntary text.

Dr. Dipesh Navsaria: [00:21:13] Yes.

Adrian Johns: [00:21:13] Yeah, exactly. I mean, it's a it's a kind of interesting thought because we're so embedded in this world that we don't even notice it anymore. We have been for ages, but when you stop and think about it, that's an interesting, you know, fear to have.

Dr. Dipesh Navsaria: [00:21:29] Yeah. Along that, those lines of thinking about democracy. You talked again about Chicago and where the science of reading responded to the great crisis of modern democracy, and there was a concept of communication that came out. And this was engaged in that was Charles Hubbard Judd and the Chicago School. What was going on there?

Adrian Johns: [00:21:53] Well, Judd was an educational psychologist who really dominated the psychology program at the University of Chicago for about 20 years, maybe a bit more than that, and was doing these kinds of researches into, you know, readers using things like eye cameras to try and track how, how their, how, how their reading processes were actually working. But towards the end of the 1920s, he and the authorities at the university created another version of the science of reading, which was much more like a social science, where it would be looking not just at individual readers using these scientific instruments, but would look at whole populations. And it's very much in the line of the development of modern social science itself, for which also the University of Chicago is actually a key place, and Judd and A and a number of other experts. In particular, a man called Douglas Waples set set up publishing programs in the 1930s. So through the American depression, where they would hire researchers who would go off into the the, you know, into the states in America and literally map out things like how common are bookstores, how common are libraries, who goes to libraries, what books are available in libraries? Who decides? How do you train librarians to become the sort of mediators of what you hope to be a universal democratic order across this vast nation? And this is how the science of reading actually starts to merge into what you just referred to as communications.

Adrian Johns: [00:23:29] So by the mid 40s, the university is actually setting up programs in communication studies, which emerge directly out of this library studies is the other library sciences. The other, the other kind of aspect of it, I mean, what they find is actually, for them, very disquieting. They find, of course, that in places like Chicago and New York and Philadelphia and Los Angeles. Yeah, the culture of information is very rich. You know, people people are reading at relatively high rates and it's habitual. It's not just that they can read. They actually do read. There are bookstores and libraries and radio stations and all this kind of stuff. But once you go down to the Deep South and the Cotton Belt, it's completely different. And and they produce these maps which are stark visual representations of the inequities of information in the mid 20th century, which and the aim is explicitly to try to get the state to act about this.

Dr. Dipesh Navsaria: [00:24:23] As a graduate of the library school at the University of Illinois. Actually, I'm just thrilled in this with this section to be able to just think and again, about libraries and how much of a role they play in the the social context of our society as a whole and how they were viewed, and hopefully how they continue to be viewed on different levels.

Adrian Johns: [00:24:48] So yeah, one hope so. Yeah. I mean, certainly all the way through the 20th century, libraries were absolutely critical to the very idea that you could have a free, informed society in America.

Dr. Dipesh Navsaria: [00:25:01] Sure. Late in the book, there was a section that really caught my eye because it it talked about essentially electronic devices that purported to help children learn theoretically better than via teachers, because there was this whole creation of a learning environment. And I had this great name, the Autotelic Responsive Environment, and it and, you know, someone might think like, oh, this is something that was created in the last five years, but no, you have a photograph in there of a child using this thing called the talking typewriter, dwarfed by this huge machine. And this was back in the 1960s. So it was a realization for me that educational technology is not necessarily this brand new phenomenon but has been around. So how well did they work? Because it sounded like the the scalability wasn't there, and they still needed a lot of teacher input for them to work well.

Adrian Johns: [00:25:56] They did need a lot of teacher input and they didn't scale well. Both of those things are true. So the talking typewriter was a device created by a couple of well, one of them was engineer, an emigre engineer from Austria who'd been brought over in World War two called Richard Kobler. And the other was really a kind of social scientist, sociologist called Omar Khayyam Moore. And the idea of these was, was to use computing, such as it then was to help children learn through exploration of, of the system with the system rather than and it's partly in in reaction to behaviorist aims to try to create what we call teaching machines, where you would simply. The machine would ask you a question. You'd press a button about the multiple choice answer and it would reward you or not, depending on whether you were correct. It really was, you know, crudely behaviorist in that way. So more and realized that you could create something that used video and interactivity with keyboards and this kind of thing with, with simple computing technology to really encourage children to learn in a much more creative and dynamic way than that. And what they invented were what they called environments, as you say, autotelic environments, which means like play environments. And they did install these in certain schools, actually, in Chicago, among other places where they got associated with Great Society programs to try to kind of level up, as they would say, the schooling in this country. The problem, and they seem to have worked more or less. There are several problems with them. One is that, as you say, they don't scale.

Adrian Johns: [00:27:38] Well this is this is pre microcomputers. So these are entire room sized things. And so they're actually quite expensive to set up. The second is that they don't have a lot of software for them. And they find originally the idea was that teachers would write their own software for these machines. But they found that teachers don't have time. And they weren't they didn't have the skills to do it. So they had to write their own software for it. And there was never time for them to do this either. So they always lacked the relevant software to actually make it work. Well, the other thing is that by the time that they might have really taken off. Computers themselves had advanced to the point where you're starting to get the first home microcomputers. So, you know, Commodore pets and things like that

are starting to come out, which, you know, were much more affordable, much more, much more amenable to flexible, flexible uses, shall we say. But the Talking Time writer actually was hugely influential on the ways in which subsequent educational technology, but also personal computers in general, came to be designed. So, for example, one of the people who was inspired by them was a character called Alan Kay, who is famous in computing history for being the first person to design a sort of laptop computer. And it's explicit in his writing about the laptop that he was thinking about trying to do something like the talking typewriter, but at a, at a more, you know, manageable scale.

Dr. Dipesh Navsaria: [00:29:07] Sure, sure. Excellent. So, one last closing question here. Is there is there a message or a lesson that we can learn from the history of the science of reading that we should really be taking to heart today as we consider, you know, all the challenges that exist around, you know, children learning to read well and continuing to read well and all. Is there is there something you've found that you think stands out?

Adrian Johns: [00:29:35] I think in the end, the message is the message that a lot of historical understanding gives us, which is one about humility, about our own, you know, omniscience, as it were. It's very easy to think that the current state of the science of reading today tells us everything and is objectively true and final. I think what we learn from looking at the science of reading is that reading itself is a rather fugitive and multitudinous practice. It's always going to escape the grasp of a scientific effort to understand it. Which doesn't mean that those efforts are futile. It just means that they need to be dynamic and ongoing. So I think that the the message is don't think that the story is over.

Dr. Dipesh Navsaria: [00:30:23] Indeed, even when your parent has closed the book and said it's time for bed, there's still more to come, right?

Adrian Johns: [00:30:30] Yes.

Dr. Dipesh Navsaria: [00:30:30] Quite indeed. Thank you so much. This book is just such a marvelous really. As I said earlier, a. Romp through through history and and science and missteps and new directions and insights and as I said, all sorts of interesting characters. And you've you've told it really so well.

Adrian Johns: [00:30:52] Well, thank you very much. I really appreciate it. I'm glad that you enjoyed it.

Dr. Dipesh Navsaria: [00:30:59] Welcome to today's 33rd page or something extra for you, our listeners, early on in today's episode, in the introduction, I commented that there's a quote from the book that we are asking the brain to perform tasks that are fundamentally

unnatural. You might have wondered that. And part of that is because we have a lot of evidence that the brain is not hardwired for reading. It's hardwired for spoken language. There's all sorts of circuits that are around that. But, not so much for this thing we call reading. We're actually repurposing all sorts of other brain circuits in order to do the reading, so to speak. John Steinbeck had a great quote about this. Some people there are who, being grown forget the horrible task of learning to read. It is perhaps the single greatest effort that the human undertakes, and he must do it as a child. Now, you might be a little depressed by that and think, oh gosh, maybe that's why reading doesn't always happen well in families and all, but I'd like to share with you a more contemporary quote, which is from our national Medical director, Richard Henry.

Dr. Dipesh Navsaria: [00:32:10] Doctor Perry class reading is a triumph of the early brain. I agree, and that's today's 33rd page. You've been listening to the Reach Out and Read podcast. Reach Out and Read is a nonprofit organization that is the authoritative national voice for the positive effects of reading daily and supports coaches and celebrates engaging in those language rich activities with young children. We're continually inspired by stories that encourage language literacy and early relational health. Visit us at Richards. Org to find out more. And don't forget to subscribe to our show wherever you listen to your podcasts. If you like what you hear, please leave us a review. Your feedback helps grow our podcast community and tells others that this podcast is worth listening to. Our show is a production of Reach Out and Read. Our producer is Jill Ruby. Lori Brooks is our national senior director of external Affairs. Thank you to our founding sponsor, Boise Paper, for making a difference in local communities like ours. I'm your host, Doctor Dipesh Navsaria. I look forward to spending time with you soon. And remember, books build better brains.