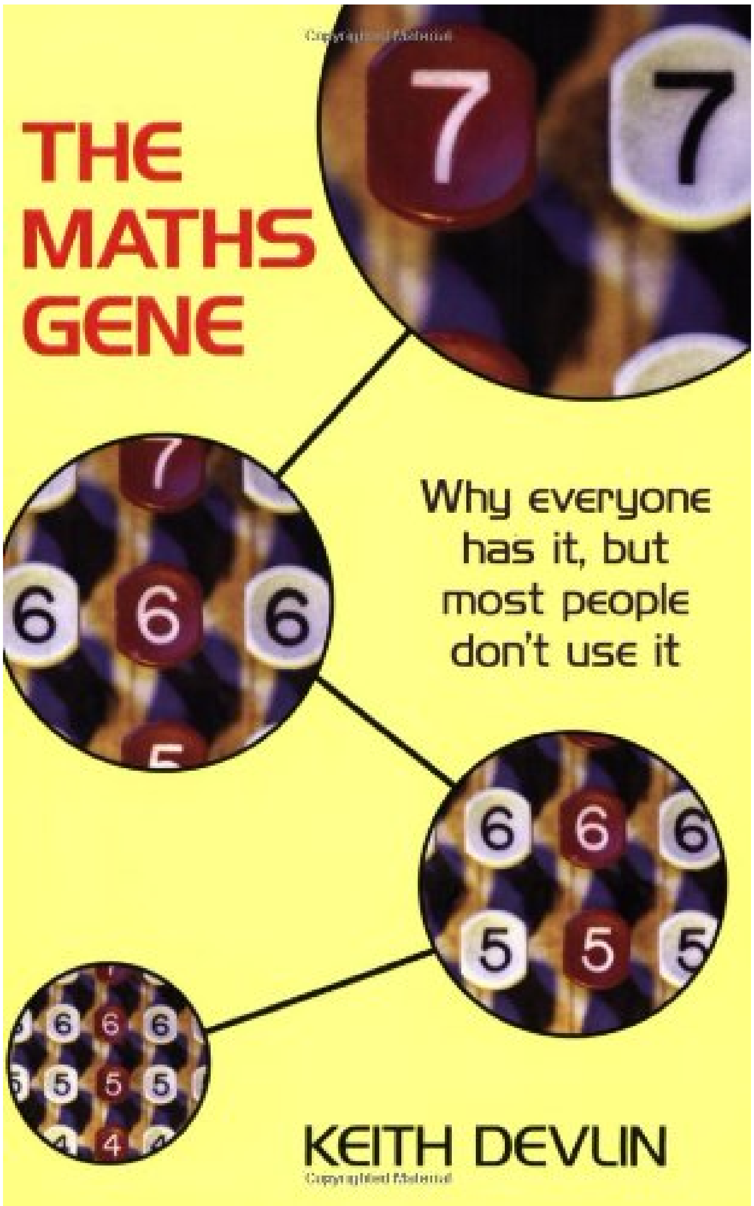
The Maths Gene: Why Everyone Has it, But Most People Don't Use it

Keith J. Devlin



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Keith J. Devlin : The Maths Gene: Why Everyone Has it, But Most People Don't Use it before purchasing it in order to gage whether or not it would be worth my time, and all praised The Maths Gene: Why Everyone Has it, But Most People Don't Use it:

0 of 3 people found the following review helpful. Not So MuchBy ponypinupI tried.... But it felt like I was eating unbuttered toast.13 of 13 people found the following review helpful. Does not provide support for its main theses.By M. Le CorreI am a cognitive scientist who studies how children acquire number concepts and numerical language. Based on the last 30 years of research on the acquisition of numerical thought, I think there are good reasons to believe that math and language are intimately related. Having enjoyed parts of Devlin's "The Language of Mathematics", I had high hopes when I picked up this book. The first few chapters were promising. For example, I completely agree with Devlin that, contrary to what is implicitly assumed in the field, the Number Sense has little to do with mathematical thought. Being a complete math neophyte, I also enjoyed his chapter on the nature of mathematical thinking. Unfortunately, for the rest, I was quite disappointed to find many interesting theses, but little in the way of articulate reasons for believing that they may be correct. Rather, I found much to disagree with.The main theses of this book are:1) Mathematical thought is a type of linguistic thought.2) The math gene is the genetic endowment for Universal Grammar.3) Universal Grammar specifies the "fundamental language tree" - i.e., the basic X-bar tree consisting of an XP, which consists of a SPEC and an X-bar, which consists of an X which optionally combines with another XP.4) During the first hundred of thousands, if not millions of years of evolution of the genus "homo", brain size grew rapidly. Given the cost of growing a bigger brain, it had to be very useful. Growing the brain was useful because it allowed homo to recognize more types (bananas, monkeys, palm trees, etc...)5) Then, sometime around 200,000 thousand years ago full-blown language appears. How? With the emergence of "off-line thinking": the brain can self-trigger patterns of activity that used to have to be caused by external stimuli.6) off-line thinking requires more than types; it requires representations of structural relations between them (e.g., cause-effect).7) types + structural relations = syntax8) being able to talk about relations between people is the same as being able to talk about mathematical relationsThere are several problems with these theses. First, the author rarely considers alternatives. Take for example the argument that goes: a) the increase in brain size had to be useful to make up for its cost; b) being able to recognize types is useful; c) therefore, the brain grew because brain growth allowed homo to recognize more types.This could be. The problem is that there are many other alternatives. It could be that brain growth allowed homo to have a larger working memory, or to store more mental images of individual objects and events, or to inhibit immediate desires in the interest of delayed gratification, etc...To show that the brain grew to represent more types, Devlin would have to consider some alternatives and show that the alternatives are wrong. However, far too little of that happens. Moreover, there are other sources of evidence that could support Devlin's thesis. For example, if evolution endowed us with the capacity to recognize multiple types, then type recognition should be innate - it should be available to young human babies. Much infant research suggests that indeed human infants do distinguish basic types - e.g., animate-inanimate. However, this is a far cry from the whole inventory of types Devlin seems to have in mind. More importantly, Devlin doesn't present other types of evidence that could support or disconfirm his hypothesis.Unfortunately, this is typical of most other arguments in the book. Devlin presents arguments that are consistent with his theses, but rarely considers alternatives. Moreover, the evidence he considers is usually deplorably thin.The other strain of problems comes from loose and usually erroneous analyses of mental representations. For example, Devlin characterizes syntax as the fundamental language tree, a characterization that finds much support in linguistic theory. But then later on syntax is said to be the same as representations of relations between types (or of the structure of the world). The fundamental language tree does not represent any contentful relations between objects or types. Syntax is pure form, not meaning. So the relation between the fundamental language tree and representations of the structure of the world escapes me. More generally, I don't see why Devlin dedicated a whole chapter to the fundamental language tree (which by itself is quite good) because he never goes back to that idea. Be that as it may, there is another problem with the thesis. Syntax is not a representation of structural relations of the physical or of the social kind. For example, consider these sentences: "Joe convinced Bob," "Joe kissed Bob," "Joe purchased a log" and "Joe burned a log". These sentences have the same syntactic structure: NP VP NP. However, they are about completely different types of relations. The first is about mental causation, the second is about contact, the third is about transfer, and the fourth is about physical causation. Clearly then, syntactic structure is not the same as representation of relations between objects and people.This problem recurs in many the arguments of the second half of the book. For example, if off-line thinking evolved the way Devlin says it evolved (i.e., it is an internally generated simulation of on-line thinking), then the capacity to think about the past or the future does not necessarily follow from off-line thinking. On its own, a simulation of on-line thinking (thinking about what is here now), is no more a representation of the past or future than on-line thinking itself. To think about the past or the future, one needs to represent the structure of time. If no such structure is available in on-line thinking, then it cannot appear in a simulation of on-line thinking. The general problem is that, other than being able to run without an external cause, the simulation cannot have properties that are not in what is being simulated.The latter point also holds for the book's final thesis - i.e., that our capacity for math grew out of our capacity to gossip - to talk about relations between people. Devlin's argument for this seems to be that all relations are equal. So if i can talk about relations between people then, necessarily, I can also talk about relations between geometric transformations or between numbers. But this is not so, at least, not patently. Love, argue with, hide from, embarrass, and flirt with are all social relations. Each of them has a particular content, as seen by the fact

that each of them entails particular things (e.g., if A embarrassed B, then it is plausible that B's ego dropped temporarily but if A flirted with B, it is likely that A's ego enjoyed a temporary boost). Likewise, mathematical relations like SUCCESSOR, IDENTICAL, or SIMILAR have their particular content. How the content of any of these relations can be derived from social relations is quite unclear. To argue for his thesis that gossip is the origin of math, Devlin owes us an explanation of how one gets from the content of social relations such as embarass and flirt with, to relations like successor and identical. However, no such explanation is to be found. Therefore, as far as I can tell, there are no reasons to believe Devlin's final thesis. Rather, there are some pretty good ones to doubt it - i.e., that you cannot get representations of mathematical relations out of representations of social relations.What Devlin really needs is evidence for abstract symbols that only capture the most basic logical properties of relations (say whether they are symmetrical or transitive). Here syntactic categories and the fundamental language tree could be part of the answer. But unfortunately Devlin does not make this connection.1 of 1 people found the following review helpful. Great book, bad titleBy Russell MerrisThis well written book concerns the evolutionary origins of mathematical ability. If Devlin's thesis is anywhere close to being correct, mathematical ability is NOT some sort of all-or-nothing genetic accident. There is no "math gene". Everyone is born with some mathematical potential. And, like all human potentials, the development of this one depends on things like interest, upbringing, and social pressure ... which brings me to the title. For readers of the book, it is well chosen. For those who see the cover and pass on the book, it can't help but fuel the popular -- and popularity reinforcing -- misconception that mathematics is best left to the nerdy few.

Where does our mathematical ability come from? Our prehistoric ancestors' brains were essentially the same as ours, so they must have had the same underlying ability. What purpose could it serve in 50,000 BC? And what exactly goes on in our brains when we multiply 15 by 36 or prove Fermat's Last Theorem? The answer, according to Keith Devlin, is closely related to the evolutionary changes in the human brain that gave rise to language. It lies within our genes and more specifically with the pattern-making abilities with which we are born. Devlin uses these insights to show why some people loathe mathematics, why others find it so difficult, and why a select few excel at the subject. He also suggests ways in which we can improve our mathematical skills.

.com For many, the mere word "mathematics" is enough to conjure memories of incomprehension at school, and fear and loathing ever afterward. Countless otherwise well-educated people see mathematics as the skeleton in their intellectual closet--the one key subject demanding a talent that they so obviously did not possess. Or so it seems to anyone who has felt very much on the outside of the subject. British mathematician Keith Devlin is certainly on the inside, and in The Math Gene, he has wonderful news for everyone: we can all join him there. For Devlin argues that we all possess the ability to cope with mathematics--if only we recognize what's required. While a number of recent books, notably Stanislas Dehaene's The Number Sense, have focused on numerical ability, the scope of Devlin's book is much larger. He examines the evidence that we all possess, if not literally a gene, then at least an inherent ability not just for arithmetic but for real mathematics: algebra, calculus, and the rest. Devlin even puts forward a Darwinian explanation for the origin of this ability, based on the idea that being able to handle abstract ideas and relationships confers key evolutionary advantages. Mathematics merely involves a relatively high level of abstraction--but one we can all cope with, if we work at it. "Doing mathematics is very much like running a marathon," writes Devlin. "It does not require any special talent, and 'finishing' is largely a matter of wanting to succeed." In its wealth of wonderful examples supporting the central argument, The Math Gene bears comparison with Steven Pinker's The Language Instinct, and its plain common sense about this most misunderstood of subjects is inspirational. Thoroughly recommended for anyone seeking to rid their intellectual closet of the skeleton of mathematical "incompetence." --Robert Matthews, .co.ukFrom Publishers WeeklyRecently, luminaries like Steven Pinker have shown lay audiences neat theories about how language works and how our "language instinct" evolved. In the same years, writers like David Berlinski have made higher math entertaining and accessible. Here, prolific math writer and NPR commentator Devlin (The Language of Mathematics) has joined these two strands of popular science writing. Using up-to-date cognitive psychology, along with the history of math, Devlin aims to unfold our "innate sense of number" and to show what it has to do with language. He also hopes, more ambitiously, to win readers over to his own hypothesis about how our language and math "instincts" arose. Experiments show that chimps, like us, "use symbols to denote numbers," though human toddlers are far better at it. Combining a number sense with symbolic abilities, we use abstractions to manipulate quantities, leading to arithmetic and potentially to calculus and number theory. After several stellar chapters devoted largely to psychology experiments, Devlin switches gears to higher math, giving examples of how abstract models describe concrete thingsAfrom rotating clock faces to rattlesnake skins. The book takes another sharp turn, into the stimulating but quite crowded field of hypotheses about how our brains came to be. While responsibly laying out several hypotheses, Devlin favors the idea that enhanced symbolic abilities let early hominids think "off-line," asking and answering "what if" questions about tools, predators, habitats or prey. Some may wish Devlin had written two booksAone about math and language, the other about language and evolution; the former would likely ace the latter. Most readers, though, will appreciate the broad, accessible syntheses he does provide. 35

illus. (Sept.) Copyright 2000 Reed Business Information, Inc.From Library JournalThis book is not about mathematics or genetics or why some people are good at math and others are not. Rather, Devlin (Goodbye, Descartes) asks and attempts to answer the question, "How and why did human beings evolve the ability to do mathematics?" His point is that mathematics is more than arithmetic. Real mathematics involves making logical arguments about abstract objects. Devlin briefly outlines Chomsky's theory that we are all born with "hard-wired" linguistic ability. He then explains that the mental process of making logical connections between abstract objects and the mental process needed to construct sentences have the identical structure. Thus, we can see that the genetic heritage that gives us all the ability to communicate by language also gives us the ability to do mathematics. I am convinced that Devlin is correct, and, if you read this book, you will be, too. For all math and science collections.DHarold D. Shane, Baruch Coll. of CUNY