

**An Except From
The Book Review Column¹
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Review of
People, Problems, and Proofs²
Author: Richard Lipton and Ken Regan
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1 Introduction

This is the second book to be written based on the blog *Godel's Lost Letter and P=NP*. The first one was *The P=NP Question and Godel's Lost Letter*. I reviewed that one in the December 2010 issue of SIGACT news.

I write this review in the form of a series of fictional blog posts. If there is a comment by, say, Colbert Nation, then that does not mean that someone named Colbert Nation actually thinks that. It may mean that I think that Colbert Nation thinks that.

Do not confuse this with my real blog or theirs.

INTRODUCING LIPTON-REGAN REVIEW BLOG

April 1, 2014

This blog will be dedicated to reviewing the Lipton-Regan book **People, Problems and Proofs**. The book is based on their blog *Godel's Lost Letter and P=NP*.

I have read the entire book so I will give my general impressions before blogging on particular articles.

When I read their blog I often read it, get interested, but then something comes up so I can't finish it and I promise I'll get back to it *tomorrow*. Like that song: *The blog will get read tomorrow! Bet your bottom dollar that tomorrow, I will read!* Yet having it in book form it seems easier to read. It seems that the chapters in this book are shorter than the blog. If so that's a bit odd since one would think the book version could afford to be longer.

The upshot is positive—I read the entire book (rare for a math book) understood most of it (rarer still) and am inspired to read more about the topics he introduced, and try to prove things for myself. *I'll prove the ther-ems tomorrow! Bet your bottom dollar that tomorrow, I will prove.*

ARE LIPTON AND REGAN REALLY THAT NICE?

April 15, 2014

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Richard Lipton and Ken Regan are nice people. Or their blog-selves are nice people. Most chapters have as its title a person and a subtitle that is more about the content. The link between the person and the content varies. His descriptions of the people in the title of the chapters is always quite positive.

In Chapter 34, titled *Sam Buss: Bounded Logic*, Lipton talks about two courses he had in logic. In one the professor was often confused. The other course was taught in a unmotivated way. He said they were both great courses. That's being too nice.

The chapter itself was also nice. It involved ways to write quantifiers and refers to a result (which I will look up tomorrow) about inexpressibility.

Chapter 38 is about definitions. The title is *Alfonso Bedoya: Definitions, Definitions, and Definitions*. You may be wondering *who is Alfonso Bedoya?* If you are under 35 you've probably already Googled it on some device you carry around and found out that he was the character Gold Hat in *The Treasure of Sierra Madre* who uttered the famous line:

*Badges? We ain't got no badges. We don't need no badges.
I don't have to show you any stinking badges!*

(Number 36 in the American Film Institutes 100 best movie quotes.)

Their point is that you don't need definitions— they can always be removed. I thought they would say:

*Definitions? We ain't got no definitions. We don't need no definitions.
I don't have to show you any stinking definitions!*

But they cleaned it up (I didn't even know it was dirty!) to

Definitions, definitions, we don't need no definitions.

I'm surprised they didn't also remove the double negative, in case children are reading, to obtain

Definitions, definitions, we don't need any definitions.

The chapter itself was nice. It was about what makes a nice definition, and it had some nice history. It was material I already knew but nice to have it all laid out.

COMMENTS:

Town Falconer: You forgot to mention the one time they really were nice to a fault. They were nicer to Deolalikar, the guy who rudely wasted their time with a false proof that $P \neq NP$ proof.

Glacial Warmish: Gee Town, if we ever turned out blog into a book nobody would accuse you of being to nice. Anyway, they wisely spend Chapter One, *The Claimant, the readers, and the crowd*, not replicating their blog, but telling the whole story about Deolalikar from start to finish. This is really good since now that the end is known its good to see how it all began. However, Town, you are right, Lipton and Regan do not have any unkind words about him at all. Not even a tepid *he should at some point make a formal retraction*.

Deolalikar did not quite intend his proof to go public when it did. That gives him more sympathy.

Ken Regan: Too nice! How nice of you to say! However, note that the first paragraph of Section 1.12 of Chapter One I do note that Deolalikar has not addressed the issues raised. So there!

Sonata Consort: Ken, you call that not-being-nice? You use words like *Unfortunate* and phrases like *we glean that (the revised version) did not increase appreciably in content*. Only nice people write like that. If I had spend a month pouring over an obviously flawed paper I would have written

REST OF THIS COMMENT DELETED BY THE MODERATOR

One-Cat Tree: The chapter was more about crowd sourcing math than about the proof itself. This is an interesting topic; however, I think Terry Tao's polymath problems are a better and more productive example. And I also think that Lipton-Regan are too nice to say they disagree with me.

H. K. Donnut: Wow, it sounds like Chapter One is awesome. Would you say it's worth the price of the book?

Bill G: Well ... I got my copy for free. However, yes, Chapter 1 was, as the kids say, jawesome!

Not Porn: I find your posts very nice. For something even nicer click [HERE](#) for what I promise is NOT a porn site. At least not in most states.

FOURTEEN LIGHT CHAPTERS

April 30, 2014

Not every post can be about an interesting piece of mathematics. It would just be too hard (though Terry Tao seems to manage it). And in fact Lipton-Regan do not attempt this. Of the 63 chapters in the book, 14 of them are more *about math* than have hard math in them. Things like how to guess what a result will be, how to try to prove it, the importance of a good notation, how to write up a result. These chapters were light reading but still informative.

COMMENTS

Colbert nation: HEY, it can either be light reading OR informative, but it can't be both. We're at war here, pick a side!

Bill G: Here is an example. Chapter 2, titled *Kenneth Iverson: Notation and Thinking* didn't have any real math in it but it did tell me the following:

1. Descartes is the first person to use x^4 instead of $xxxx$.
2. Euler is the first person to use \sum for summation and also the first one to use the notation $f(x)$ for a function.
3. There is some debate about whether π was the right number to since 2π come up more often.

Alma Rho-Grand: Hey, YOU blogged on the π thing yourself. So that can't be news to you.

Bill G: Yeah, but I FORGOT! As I was reading it I thought it was a neat issue to raise *before* I saw that I was the one who raised. Awkward! More to the point— this book is good at reminding you of things you once knew.

FORTY NINE HEAVY CHAPTERS

May 1, 2014

If there are 63 chapters and 14 are light then 49 must be heavy. Actually the world is not quite so binary. However, there are 49 chapters that have math in them, much of it new and interesting. Since blogs are

themselves summaries if I summarized all of them we may end up with some Quantum effects (Chapter 63 is *Charles Bennett: Quantum Protocols*). Hence I summarize just a few.

Chapter 37 is titled *Thomas Jech: The Axiom of Choice*. Recall the usual axiom of choice:

Let I be a set (it could be of any cardinality). Assume that for every $i \in I$ there is a set X_i . There exists a function f (a choice function) from I to $\bigcup_{i \in I} X_i$ such that $f(i) \in X_i$.

Look at the following restrictions of this. Let C_n be the following statement:

Let I be a set (it could be of any cardinality). Assume that for every $i \in I$ there is a set X_i such that $|X_i| = n$. There exists a function f (a choice function) from I to $\bigcup_{i \in I} X_i$ such that $f(i) \in X_i$.

For which n, m does C_n imply C_m ? This chapter gives a clear statement of when this is true and gives some proofs of the easy direction (showing that C_n implies C_m). The hard direction, showing that C_n does not imply C_m , is really hard—it involves constructing models of set theory where C_n is true but C_m is not. These proofs are wisely omitted.

Chapter 43 is titled *Denis Thérien: Solvable Groups*. Recall that the complex numbers are algebraically closed. Let us put that a different way: If you want to solve a polynomial $p(x) = 0$ over the rationals then there will be a large enough field extension of the rationals where it has a root.

What if you are trying to solve a group equation over a group, such as $ax = bx$ over $S_5 \times S_7$ where $a = (1234)$ and $b = (13)(15)$. (I honestly do not know if that has a solution). If there is no solution then is there some group that contains $S_5 \times S_7$ as a subgroup where there is a solution? For this equation I do not know. But more to the point, is there some general theorem that says you can always find a larger group with a solution? NO. In this chapter they give an example where you cannot find a larger group (and they prove it works—it's not that hard) and state some theorems and conjectures about this issue.

Both Chapter 37 and Chapter 43 were excellent since they told me about a problem I had not thought of but once introduced were very interesting. In both cases they gave me a simple proof that I could follow. I plan to read more on these topics. Tomorrow.

COMMENTS:

Tim Andrer Grant: Is the math serious or recreational?

Bill G: To understand the statements of the theorems you need to know some math, say that of a sophomore math major. Even then, some terms would have to be explained to you. So you might say the statements (not the proofs) are recreational to people who read Martin Gardner's or Ian Stewart's columns AND went on to learn some more math.

Ana Writset: Why are the names of the comments so odd? Even mine!

Bill G: Aside from *Bill G*, *Not Porn*, and *Colbert Nation* all of the names are anagrams. Some of the anagrams are from the April 1, 2014 post on the Godel's Lost Letter Blog (Lipton-Regan blog) and some are from an April 1, 2013 post (more properly, a paper pointed to from that post) of computational complexity blog (Fortnow-Gasarch blog).

WHO SHOULD BUY THIS BOOK?

May 15, 2014

If you are an undergraduate in math or CS (and like theory) then this book will tell you some tips on how to get started in research and give you some nice topics to read up on, though some may be hard. As you go from ugrad to grad student to professional the light chapters will get less interesting and the heavy chapters will get more interesting. I think Lipton and Regan have calculated the exact right balance so the book is good for anyone.