

## Pieter Moree

Korteweg-de Vries Instituut voor Wiskunde

Universiteit van Amsterdam

Plantage Muidersgracht 24, 1018 TV Amsterdam

moree@science.uva.nl

### Boekbespreking Pasta all'infinito

# Italienische Reise

Wiskunde en reizen hebben niets met elkaar te maken. Hoewel... Hoe vaak gaat een research-wiskundige niet naar plaatsen waar hij als toerist nooit naar toe zou zijn gegaan. Albrecht Beutelspracher, hoogleraar meetkunde en discrete wiskunde aan de Universiteit te Giessen (Duitsland) reisde meerdere keren als wiskundige naar Italië; een land dat wel een uitgesproken toeristisch karakter heeft. In het boek *Pasta all'infinito* doet hij verslag van zijn ervaringen. Pieter Moree, verbonden aan de Universiteit van Amsterdam, bespreekt het boek.

This book describes a six week stay of the author (who is also the main character of the book) in Italy as guest of a couple of Italian mathematicians by the names of Franco and Luigia at the University of L'Aquila (just east of Rome in the Abruzzi). This stay took place in the 80's as is apparent at various places in the book (E.T., Ronald Reagan).

The initial contact between the Italian mathematicians and Albrecht was rather indirect and as a consequence Albrecht is in for a few surprises as he arrives at the University of L'Aquila. First of all, this university turns

out to be high up in the mountains and as a consequence temperature plays an important role in the book, in particular as there are problems with the heating (the ominous sentence 'Il riscaldamento é rotto' falls a few times) and the author arrives underdressed at L'Aquila. Secondly, the hosts turn out to essentially speak only Italian, a language not mastered by Albrecht. This then leads to the first of the many cleverly cooked up excuses to do some mathematics, as it is decided that Albrecht will learn some Italian, starting with words for mathematical objects such as line, point, intersection. Thus, the reader's memory of some very elementary geometry is refreshed and he learns, or is reminded, that doing mathematics does not require a large vocabulary. Once Albrecht masters some Italian, he keeps using it; as a consequence, one can learn some Italian from this book as well. Personally I enjoyed this aspect (but see [1]) and it helps create an Italian atmosphere.

The running theme of the book is the research question Albrecht and his hosts occupy themselves with. It arises during a meal with spaghetti Albrecht has with his hosts and their two teenage children Diana and Luca. Al-

brecht explains to the children that he is interested in blocking sets. Franco demonstrates this concept using the spaghetti with minced meat they are eating. Each piece of spaghetti should have at least one piece of minced meat stuck on it and no piece of spaghetti should be completely covered with minced meat. Or, more conventionally, a set  $B$  of points of a geometry is called a *blocking set* if every line contains at least one point from  $B$  and, moreover, no line is fully contained in  $B$ . Diana responds by saying that the most beautiful situation is where each piece of spaghetti has one piece of minced meat stuck to it. Albrecht explains to the children that this is not possible. Luca then asks whether one can be replaced by two. By counting points and lines it is seen that in case of a finite geometry there are no blocking sets such that each line contains precisely two points from  $B$ . They then wonder what happens in case of an infinite quantity of spaghetti. This explains the title of the book. The title also beautifully encapsulates the two main subjects of the book: the Italians and mathematics (moreover, these topics are interwoven in the book just as the strands in a solid helping of spaghetti are...).



Spaghetti alla bolognese

In many popular books on mathematics, the popular and the mathematics do not mix well. Here they do. The reason is that math is always done in company (for example, over dinner in the previous paragraph). It is always an interaction, where one participant knows something and tries to explain it to the other(s). Sometimes this is to Diana and Luca, sometimes it is to students (when Albrecht gives a guest lecture). Socrates would have been delighted to see his method so charmingly used. There is a lot of variation in the social settings where mathematics is being discussed in this book. Usually the starting point is something practical. For example, in order for Albrecht to receive some money he needs a Sofi-number ('codice fiscale'). This then leads to a discussion on error-correcting codes. Moreover, these mathematical discussions are interwoven quite naturally into the story and hardly ever work disruptively. Sometimes there is a recurrence of an earlier subject, but in that case the level of difficulty is slightly raised. This is a natural learning process in mathematics, which Beutelspacher organically splices into the book. For example, when he lectures to the students he

returns to the error-correcting codes, but discusses it at a higher level of sophistication. Beutelspacher likes daily life experiences that lend themselves to mathematical evaluation. He prefers the bottom-up approach to math, as opposed to a top-down (Bourbaki) style, cf. [8]. This has the advantage that everybody can learn something, but the disadvantage that there is less sense of overview.

The research problem that Albrecht and his Italian hosts work on involves infinity and so naturally various concepts related to infinity play a big role in this book. This allows Beutelspacher to home in on infinity, one of the most important concepts of mathematics (indeed, some people have described mathematics as the study of the infinite). For example, the fact that the rationals are countable is discussed (Farey fractions) as is the fact that the reals are not (Cantor's diagonal argument). That there are infinitely many primes is proved and primes later resurface as the RSA cryptosystem is being discussed. Even Diana's kefir making attempts naturally lead to a discussion of exponential growth and Fibonacci numbers (in this respect I enjoyed the observa-

tion that Eva: Braun=3:5, Erich:Honecker=5:8, Albrecht:Beutelspacher=8:13).

The author has a very honest, open, and direct style of writing. For example, he is quite candid about the negative aspects of being a (budding) research mathematician. His observations about the Italians display an open and curious mindset and cover many aspects of Italian life (including a few negative ones). The fact that Beutelspacher chose to make himself (a married man) the main character, however, perhaps prevented him from discussing that great Italian asset: 'le belle donne'. Also rather absent is: 'natura'. Albrecht is close to beautiful mountains and somehow he does not go out into them. For me one of the greatest charms of Italy is the wonderful combination of nature and culture it provides.

Beutelspacher has no literary pretensions, no urges to make things more beautiful than they are. His enthusiasm for Italy and in communicating mathematics is obvious and it made me curious about his further writings. On googling 'Beutelspacher' one finds he has written several other books on mathematics (both popular and technical), the most popular of which went through several editions, for example [2–5]. Franco and Luigia are also easily identifiable (their surnames are not given in the book). It is also quite apparent that the love affair of the author with Italy continues to this day. For example, some of his papers are even in Italian.

The impressive mathematical communication skills of Beutelspacher have been noticed by others as well. In the year 2000, he was the recipient of the first Communication prize. This prize, some DM 100,000, was awarded to him in recognition of his outstanding achievements in communicating his discipline to the public (he was selected from amongst roughly 200 applications from all subject areas). The prize is symbolically represented by a hologram which is not only aimed at emphasizing the notion of transparency in science but also demonstrates that it is worthwhile to show certain things in their 'true light'. For it is only in the right light that the hologram will develop its splendour to the fullest.

Albrecht Beutelspacher (1950) is professor of geometry and discrete mathematics at the University of Giessen. His special research interests are cryptography and projective geometry. After studying mathematics and the subsidiary subjects physics and philosophy at Tübingen University, he first worked at Mainz University. There he did his doctorate and qualified as an university lecturer (habilita-

tion). From 1986 to 1988, he worked at the research department of the Siemens AG company in Munich. He has been teaching at Giessen University since 1988. He has often gone abroad for research (to the USA, Canada, and Belgium, and, not surprisingly, to Italy).

Beutelspacher truly reached a large audience with his exhibition *Mathematik zum Anfassen* (hands-on mathematics), in which models and brainteasers play an important part. This exhibition (which first moved around) attracted tens of thousands of visitors and has been turned into the world's first active museum dedicated to mathematics. It is based in Giessen and is named 'Mathematikum' [6]. Beutelspacher has used part of his prize money to extend this exhibition further and keep it running. Indeed, he spends much time keeping the momentum of the Mathematikum going.

On the whole this book is excellent to give a high school pupil or a beginning student

an idea of what it is to be a research mathematician (though a trifle too romantic, I suppose). The more mathematically educated will admire the author's ability to popularise mathematics and presumably find some unknown mathematics. For example, I had not heard of blocking sets (a concept that arose in game theory, in the study of coalitions that can block decisions), nor of Sylvester's conjecture before. To sum up I enjoyed the book highly, among other things, because of its originality.

The reader who argues that (s)he also wants the opinion of a non-mathematician on this book has a good point, since after all this book is written for non-mathematicians. For several of their opinions the reader can visit the site [1].

Sofar this book has only appeared in German, Italian and Korean. I for one am convinced it deserves a wider audience. ☺



## References

- 1 Amazon.de, <http://www.amazon.de>, Reader's opinions on Pasta all'infinito
- 2 Albrecht Beutelspacher, *"In Mathe war ich immer schlecht..."*, *Berichte und Bilder von Mathematik und Mathematikern, Problemen und Witzen, Unendlichkeit und Verständlichkeit, reiner und angewandter, heiterer und ernster Mathematik*, Third edition, Friedr. Vieweg & Sohn, Braunschweig, 2001. xii+151 p. ISBN 3-528-26783-6
- 3 Albrecht Beutelspacher, *"Das ist o.B.d.A. trivial!"*. *Eine Gebrauchsanleitung zur Formulierung mathematischer Gedanken mit vielen praktischen Tips für Studierende der Mathematik und Informatik*, Fourth edition, Friedr. Vieweg & Sohn, Braunschweig, 1997. iv+96 p. ISBN 3-528-36442-4
- 4 Albrecht Beutelspacher, *Mathematik für die Westentasche, Von Abakus bis Zufall*, Second edition, Piper Verlag, ISBN 3-492-04353-4
- 5 Albrecht Beutelspacher, *Kryptologie. Eine Einführung in die Wissenschaft vom Verschlüsseln, Verbergen und Verheimlichen, [Ohne alle Geheimniskrämerei, aber nicht ohne hinterlistigen Schalk, dargestellt zum Nutzen und Ergötzen des allgemeinen Publikums]*, Sixth edition, Friedr. Vieweg & Sohn, Braunschweig, 2002. xii+152 p. ISBN: 3-528-58990-6 9
- 6 Mathematikum, <http://www.mathematikum.de>
- 7 Vasco A. Schmidt, *Eröffnung des Mathematikums*, DMV-Mitteilungen 1 (2000), p. 53–54
- 8 Vasco A. Schmidt, *Interview mit Prof. Dr. Albrecht Beutelspacher*, DMV-Mitteilungen 1 (2000), p. 54–57