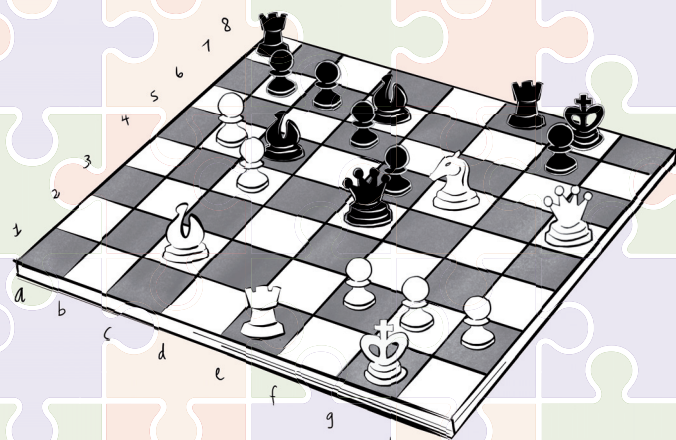
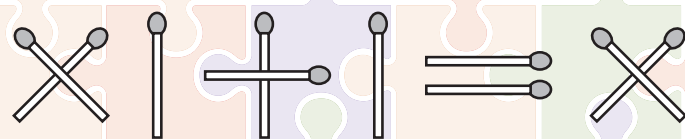


Enter the world of secret codes, cunning puzzles, and mind-bending conundrums. Inspired by the *Raising Arcadia* trilogy, this book offers a step-by-step guide to each type of problem and then a quiz to test your progress. Use it to hone your own detective skills, or to baffle your friends and relatives.

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SIMON CHESTERMAN

CODES, PUZZLES, AND CONUNDRUMS

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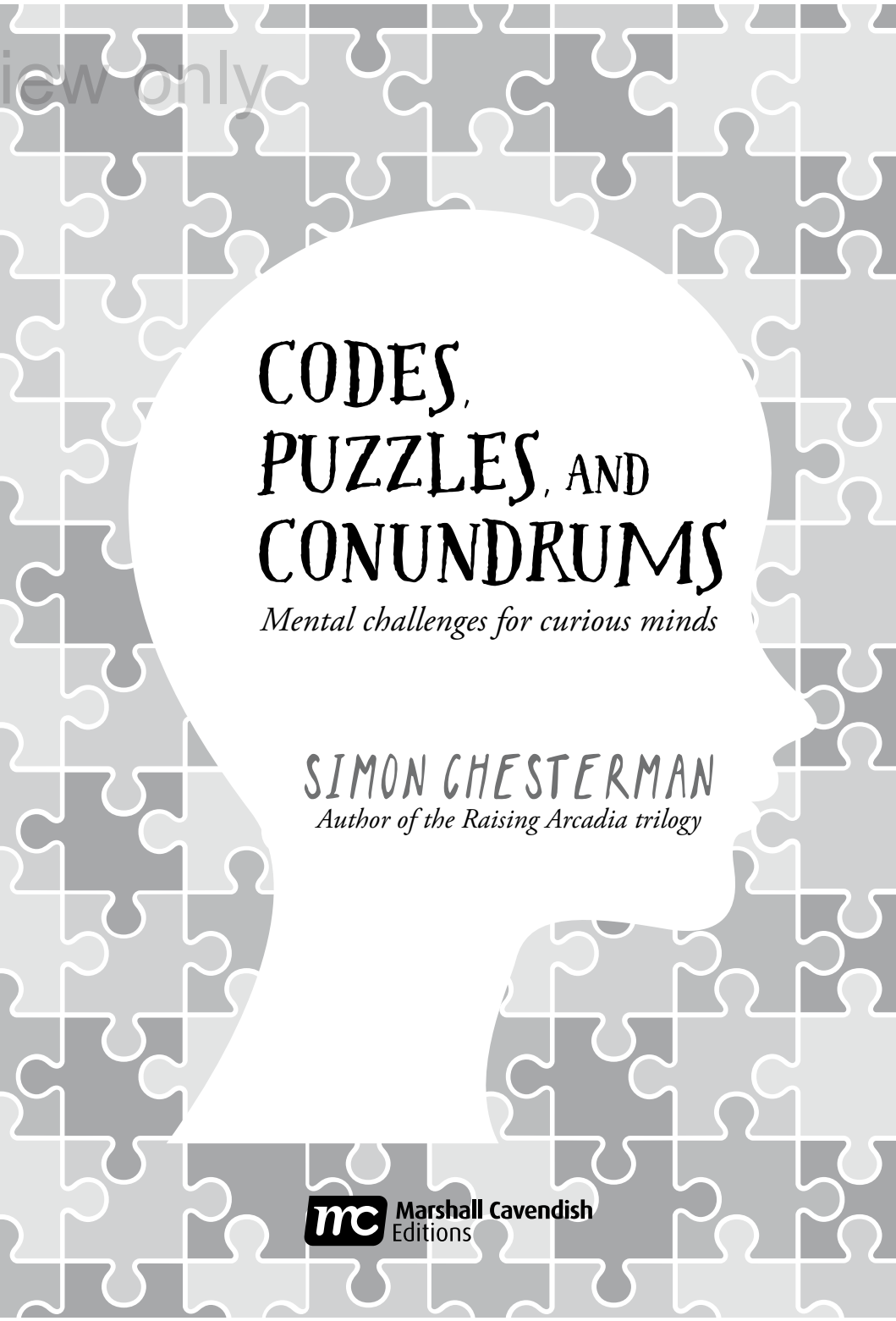
CODES, PUZZLES, AND CONUNDRUMS

Mental challenges for curious minds

SIMON CHESTERMAN

Author of the Raising Arcadia trilogy

For Review only



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Cover design by Benson Tan
Illustrations by Hasyim Isa

Published by Marshall Cavendish Editions
An imprint of Marshall Cavendish International



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Marshall Cavendish International (Thailand) Co Ltd. 253 Asoke, 12th Flr, Sukhumvit 21 Road,
Klongtoey Nua, Wattana, Bangkok 10110, Thailand • Marshall Cavendish (Malaysia) Sdn Bhd,
Times Subang, Lot 46, Subang Hi-Tech Industrial Park, Batu Tiga, 40000 Shah Alam, Selangor
Darul Ehsan, Malaysia.

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National Library Board, Singapore Cataloguing-in-Publication Data

Names: Chesterman, Simon

Title: Codes, puzzles, and conundrums : mental challenges for curious minds / Simon Chesterman.

Description: Singapore : Marshall Cavendish Editions, [2018]

Identifiers: OCN 1046082580 | 978-981-48-2809-3 (paperback)

Subjects: LCSH: Puzzles. | Ciphers. | Riddles.

Classification: DDC 793.73--dc23

Printed in Singapore

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EDITOR'S NOTE

This book complements the *Raising Arcadia* trilogy — but does not assume that you have read it. Those three books tell the story of Arcadia Greentree, a precocious teenager who must use her intellect and her wits to unravel the mystery that has shrouded her since birth. The present volume draws on some of the intellectual challenges she confronts along the way, as well as entirely new problems — and a few that are very old indeed. It will be of interest to anyone who enjoys thinking, does not mind occasionally being stumped, and takes pleasure in an elegant solution.

INTRODUCTION

From an early age, my daughter Arcadia demonstrated some facility in deciphering codes, solving puzzles, and doing whatever it is that you do to a conundrum. My husband and I tried to encourage her interest in such endeavours by presenting a new challenge each Saturday morning. This book brings together some of the challenges we set for her, as well as some that she came across or devised herself. (Now that the exploits during her final years at the Priory School have gained her a certain notoriety, the publisher of this volume believes that there is a market for such a compilation. I have my doubts, but I suppose time will tell.)

The first part deals with codes and other such methods of obfuscation: hiding a message, sometimes as apparently random text or images, and sometimes in plain sight under the guise of an innocent (but irrelevant) surface missive. Arky and her brother, Magnus, would sometimes use these tricks to send secret notes to one another, but the use of codes in wartime and by modern spies oftentimes means the security of a communication is a matter of life and death.

The second part offers some puzzles and games that require you to use what my favourite fictional detective Hercule Poirot used to call the “little grey cells” in your head to find a solution.

These puzzles may appear to be trivial diversions, but underlying the solution there frequently lies a principle or idea of larger significance: that one should see a problem from different perspectives, that having a bad plan is better than no plan, and so on and so forth. I think Arky used to enjoy these the most because there was always a solution to be reached, even if the journey there might be somewhat tortuous.

The third part includes some conundrums: problems where sometimes it is unclear what the *question* is, let alone the answer. To be fully candid, I do not particularly care for these myself, perhaps because I usually haven't the foggiest idea how to proceed. Arky, on the other hand, still loves to grapple with the horns of such dilemmas. Now that she is at university, she tells me that this is somewhat like the manner in which she presently spends many of her days. I do hope the text conveys her enthusiasm more than my befuddlement.

The format of this book is — I must apologise in advance, and with no disrespect to the author — a trifle repetitive. Each part goes through several examples and shows how to approach or answer them. Some of these examples are drawn from my daughter's adventures, the publication of which has caused her no little embarrassment, but most are new. (Just as well, for otherwise this book would be quite a waste of your money.) At the end of each section is a little quiz so that one can test one's own skills. Although Arky tends to dismiss all such enterprises as "elementary", the present text thoughtfully categorises them as either "easy", "medium", or "head-scratching".

It is no simple task, I must confess, raising a child whose mind races far ahead of your own — on occasions racing far ahead, round the corner, and down a rabbit-hole. One useful method, I have found, is to keep that mind active. If, by chance, you are a parent

with such a son or daughter, I highly recommend ripping out the pages with the answers (found towards the back of this volume) and hiding them in a safe place. When your son or daughter comes begging for an answer, or a validation of their own solution, you may then trade a correction or a confirmation for some useful task around the house: mopping the floor, raking the garden, and so on and so forth. These chores do not do themselves.

If, by contrast, you are one of those precocious children yourself, then do spare a thought for your parents. As someone once said, the job of a parent is to give children roots and wings: roots to ground them and provide stability; wings so that they can aspire to greatness. I suppose the idea is that a child's development necessarily involves a tension between where they come from and where they must go. (Those of us who actually *do* a bit of gardening realise that the metaphor is nonsense: is it meant to be some kind of plant-bird hybrid? Codswallop.)

In any case, I do hope you get some value from this book, but if not, please direct your complaints to the author and the publisher rather than myself.

Louisa Greentree

Post Script: I must beg your indulgence for a second idiosyncrasy of the text. It has been brought to my attention that, as the proofs of this volume were being edited, a contemporary of my daughter obtained access and inserted some of her own codes and messages. For the life of me, I cannot fathom why the publisher could not simply delete these emendations, but they insisted that something about typesetting and pagination and so on made it too expensive. Instead, they asked me to add this note. Which I have done.

For Review only

PART 1
CODES

FC <E< LJ0 F0JJ >NIV
<E< JF0 70>>707 LLEVO

For as long as people have been able to communicate, they have tried to devise ways to do so in secret. At least two thousand years ago, Julius Caesar is believed to have used a basic cipher that continues to bear his name. Such ciphers are distinct from true codes in that a *cipher* replaces letters while a *code* replaces words or other units of meaning.

1.1 CIPHERS

The most basic ciphers manipulate the letters in a message in a regular way that is reversible. Leonardo Da Vinci literally used so-called mirror writing to conceal text:

Can you decipher Leonardo's message?

(If you cannot, try holding the page up to a mirror.)

Similarly, a basic cipher is to reverse the letters in each word. Fi uoy od siht, ynam elpoep lliw ton eb elba ot daer eht egassem. Interestingly, if you merely jumble the letters but keep the first and last letters correct, text will still be legible to the average reader:

Eevn tohguh tehse ltetres wree jmubelbd,
tehy slitl mkae snese, dno't tehy?

One of the best known ciphers is Caesar's cipher. The Roman historian Suetonius recorded that Julius Caesar encrypted important messages by replacing each letter with the letter three steps before it in the alphabet.

Original	A	B	C	D	E	F	G	H	I	J	K	L	M
Code	X	Y	Z	A	B	C	D	E	F	G	H	I	J

To write the word "gem" using the cipher, simply replace each letter with the one three steps earlier. "G" becomes "D", "E" becomes "B", and "M" becomes "J". So the word "gem" would be written "dbj". (Note that the letter "Z" is treated as coming one before "A".)

So a phrase like "The gem is in the bag" would be written:

The gem is in the bag.
Qeb dbj fp fk qeb yxd.

Other simple substitution ciphers include replacing letters by their numerical place in the alphabet (a=1, b=2, etc):

3-1-14 21-15-21 18-5-1-4 20-8-9-19?

Such numerical codes can be made more complicated by adding a mathematical operation such as doubling the number.

The Freemason's cipher is another example of a relatively simple encryption technique that is simple to use but produces strange looking messages:

ΛΠΓΥ ΓΥ Λ
LEJBJ JBVVJBJ

In all these examples, decrypting the ciphertext is made far simpler if you know the key. For Caesar's cipher, that means the number of letters to shift. In the case of the Freemason's cipher, it requires the recipient of the message to draw a simple diagram that serves as the key (and explains why it is also known as the pigpen cipher:

For Review only

A	B	C	J	K	L		
D	E	F	M	N	O	T	S
G	H	I	P	Q	R	U	V
						X	W
						Y	Z

With enough text, however, it is usually possible to decrypt a simple substitution cipher without knowing the key. If you know that the message is in English, for example, it can be assumed to be made up of recognisable words. Computers now do such decryptions through brute force, testing every possibility to see what produces the largest number of words in its dictionary. But with a little imagination it may be possible to take some shortcuts.

Consider the following message:¹

The code is based on one used in the Sherlock Holmes story “The Adventure of the Dancing Men”. Without a key, Holmes is only able to decipher the messages using statistical methods after acquiring a significant amount of material. In the above message, if we add the information that it was addressed to a young lady named “Arcadia”, things begin to become clearer. The third word has seven letters, the first, fourth, and seventh of which are the same. A reasonable assumption would be that that word is “Arcadia”. Letters from that word are repeated elsewhere in the message. Substituting them in produces a plausible result:

¹ *Raising Arcadia*, chapter 2.

ice d_e, Arcadia. _ are _ear_ read_.

From here a little guesswork and some trial an error lead us to the translation:

Nicely done, Arcadia. You are nearly ready.

QUESTION 1.1: CIPHERS

DEGREE OF DIFFICULTY: MEDIUM

Can you decipher the following letter?

△□◇ □□△△□

□□◆ △□□ △ ▽□□● ▽□□ □◆□×■□

◆≡×• □□□&

◆≡□ □□□•□ □×□≡□□ ?

◆≡△◆ □■●□ ▽□□&□△ □□□◆•□

≡×• □■□○×□• ▽□□□ ×●●×□□◆□

× ▽ ◆≡×• ×• ≡△□△ •◆□□ △■△

□□ □△□& ◆□ ▽×■□□□ □△×■◆×■□

□◆◆ × ▽ □□◆ □□□□□ □■ × ▽×●● •□■△

◆≡□ □□□△•×□■△● ○□•△□□

□□◆□• •×■□□□□■□

○□×□△

If you need a hint, remember that this is text in the form of a letter. How do letters normally begin and end?

If you need an extra hint, this letter comes from Arcadia's nemesis (mentioned in the blurb for "Being Arcadia").

Answer on page 88.

1.2 HIDDEN IN PLAIN SIGHT

Codes hide the meaning of a word or phrase. When the United States prepared to invade Panama in 1989, for example, the military operation was initially referred to as Operation "BLUE SPOON". The two word codename followed the Cold War practice of using randomly generated words for the purpose of increasing operational security. Just before it launched, however, the Commander-in-Chief of Special Operations Command complained about the codename. "Do you want your grandchildren to say you were in BLUE SPOON?" he is reported to have asked, incredulous. The operation was swiftly renamed Operation "JUST CAUSE".²

The most effective codes are the single use of a set phrase with a hidden meaning. Or it could be a symbol. During the American Revolution, two lanterns were prepared in a church outside Boston to warn of an attack. If the British Army marched towards the battle, a single lantern would be lit; if they crossed the waters in boats to a different staging ground, both lanterns would be ignited. "One if by land, two if by sea" remains a famous phrase in American history (and the name of an overpriced restaurant).

² It is an oddity of the intelligence world that the most secure code words are typically written in ALL CAPITALS, meaning that they are the very words that leap out at you from the page.

During World War II, BBC radio broadcast "personal messages" into occupied France that were actually messages to the resistance — or red herrings to distract the Germans. A phrase like "Jean has a long moustache" had a secret meaning that only the recipients understood.

If used properly, such one-time codes can be impossible to break. The problem is that they require the hidden meaning to be agreed in advance. Complex codebooks that provide encrypted versions of many words can be created, but to be secure such books can only be used once each. Most modern encryption therefore relies on ciphers and the difficulty of complex mathematical operations necessary to decipher the information.

A less secure method relies not on disguising the words so much as hiding the existence of a secret message at all. A phrase like "The fat man walks alone" is likely to arouse suspicion, but consider a text message between two siblings that simply reads:

Thanks for calling Arcadia, though I must say
that it was nothing new. That's all 4 the moment.
'Bye now. Magnus³

This might be read as innocuous, but if you understood the significance of the number "4" and read every fourth word, you get a somewhat different message:

Arcadia, say nothing 4 [for] now.

Another simple code is to hide a second message in each word after punctuation marks in the innocent text:

³ *Raising Arcadia*, chapter 6.

Arcadia, **do** let me know if you'll come up this weekend, **watch** the boat races and stay for dinner? **Out** of interest, **for** once you were right; **our** Mother and Father did brag to me about your concert. **"Parents"** as they say! **Magnus**.⁴

Slightly more complex are texts in which certain letters, typically the first letter in each line, spell out a message. Known as acrostics, these tend to be used more for poetry than cryptography. The final lines of Lewis Carroll's *Through the Looking Glass*, for example, are an acrostic that begins as follows:

A boat, beneath a sunny sky
Lingering onward dreamily
In an evening of July –
Children three that nestle near,
Eager eye and willing ear,

It goes on to spell out the full name of Alice Pleasance Liddell, to whom the original *Alice in Wonderland* story was first told during a boat trip.

More complex still are combinations of encryption methods — ciphers that use code words and rely on prior knowledge of the parties, for example. The following text hides a message under multiple layers:⁵

Dear Arcadia, today's challenge will exceed others. Real geniuses should have no trouble with it. Code breaking impresses no one: lies buried within lies! In the end, the only thing that

⁴ *Raising Arcadia*, chapter 9.

⁵ *Raising Arcadia*, chapter 2.

anyone cares about is who won the war. Second place is equal to last from the standpoint of history. Column inches shape that first draft of history as we often see in great men and women's rise and fall. Of course the days are over when a trusted scribe could seek to mould the way that your adventures or reputation reached the public. This highlights the way in which your every deed lives on after your words and especially punctuation. Message ends.

The solution combines two of the methods described earlier. As the text itself suggests, look at the words after punctuation marks. This produces: "Today's real code lies in the second column of this message." That in turn points to an acrostic in the second column of letters. Reading down those letters reveals: "Examine the ivories" — a reference to a piano.

Many other forms of code are possible. Some rely on hiding the true message completely — using invisible ink, for example, or microdots. The latter refers to text or images reduced to approximately one millimetre across — legible only under a microscope and able to be discussed as a full stop in a message. (Don't bother holding this page against a flame or under a microscope, however, as these are not practical methods for inclusion in a book such as this.)

QUESTION 1.2: HIDDEN IN PLAIN SIGHT
DEGREE OF DIFFICULTY: HEAD-SCRATCHING

Can you make out the message in the following text?

Once upon a time, 7AM
to be precise, 7 brutish
knights learned about one
princess who everyone said
had been taken prisoner by a
most fearsome monster. "Terrible
shrieks sound forth each sunrise,"
they opined, eagerly anticipating a
heroic duel pitting man against beast,
a daring prospect of love at first sight,
and also chances that a hefty reward might
follow. Yet on each knight's mind there
was troubling thoughts that the venture
could by various outcomes too gruesome
for imagining be their postscript.
They made it to her farm, rousing
a tremendous cackle from the
storeroom. "I fear you've awoken
the rooster," the girl declared. "Yet
the true quarry you hunt is
the first of each seventh. Toodle-oo!"

Answer on page 88.

ABOUT THE AUTHOR



SIMON CHESTERMAN is a Professor and Dean of the National University of Singapore Faculty of Law. Educated in Melbourne, Beijing, and Oxford, he has lived and worked for the past decade in Singapore. He is the author or editor of twenty books, including *One Nation Under Surveillance*, *Just War or Just Peace?* and *You, The People*. The *Raising Arcadia* trilogy is his first work of fiction.