

CRYPTO DECRYPTED

Debunking Myths,
Understanding Breakthroughs,
and Building Foundations for
Digital Asset Investing

JAKE RYAN • JAMES DIORIO

FOREWORD BY **RIC EDELMAN**



WILEY

CRYPTO DECRYPTED

CRYPTO DECRYPTED

**Debunking Myths,
Understanding
Breakthroughs, and
Building Foundations for
Digital Asset Investing**

**JAKE RYAN
JAMES DIORIO**

WILEY

Copyright © 2023 by Jake Ryan and James Diorio. All rights reserved.

Published by John Wiley & Sons, Inc., Hoboken, New Jersey.

Published simultaneously in Canada.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 750-4470, or on the web at www.copyright.com. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at <http://www.wiley.com/go/permission>.

Trademarks: Wiley and the Wiley logo are trademarks or registered trademarks of John Wiley & Sons, Inc. and/or its affiliates in the United States and other countries and may not be used without written permission. All other trademarks are the property of their respective owners. John Wiley & Sons, Inc. is not associated with any product or vendor mentioned in this book.

Limit of Liability/Disclaimer of Warranty: While the publisher and author have used their best efforts in preparing this book, they make no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives or written sales materials. The advice and strategies contained herein may not be suitable for your situation. You should consult with a professional where appropriate. Further, readers should be aware that websites listed in this work may have changed or disappeared between when this work was written and when it is read. Neither the publisher nor authors shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages.

For general information on our other products and services or for technical support, please contact our Customer Care Department within the United States at (800) 762-2974, outside the United States at (317) 572-3993 or fax (317) 572-4002.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic formats. For more information about Wiley products, visit our web site at www.wiley.com.

Library of Congress Cataloging-in-Publication Data

Names: Ryan, Jake, author. | Diorio, James, author.

Title: Crypto decrypted : debunking myths, understanding breakthroughs, and building foundations for digital asset investing / by Jake Ryan and James Diorio.

Description: Hoboken, New Jersey : John Wiley & Sons, Inc., [2023] | Includes index.

Identifiers: LCCN 2022057666 (print) | LCCN 2022057667 (ebook) | ISBN 9781394178520 (hardback) | ISBN 9781394178544 (adobe pdf) | ISBN 9781394178537 (epub)

Subjects: LCSH: Cryptocurrencies.

Classification: LCC HG1710.3 .R935 2023 (print) | LCC HG1710.3 (ebook) | DDC 332.4—dc23/eng/20221201

LC record available at <https://lcn.loc.gov/2022057666>

LC ebook record available at <https://lcn.loc.gov/2022057667>

Cover image: Wiley

Cover design: © Vit-Mar/Shutterstock

Author photos: Courtesy of the Authors

Contents

<i>Foreword</i>	<i>ix</i>
<i>Acknowledgments</i>	<i>xi</i>
<i>Note from the Authors</i>	<i>xv</i>
<i>From our Legal Team</i>	<i>xix</i>
<i>Introduction</i>	<i>xxi</i>

PART I

THE PRIMER 1

1 What's the Big Deal About Blockchain?	3
A Blockchain Is a Specialized Database	5
Nonmoney Examples of Blockchain Technology	10
Blockchain Technical Components	13
2 Bitcoin, the First Application of a Blockchain	20
What's Unique About Bitcoin	24
Getting Started with Bitcoin	30
On Risk	34
3 What Makes a Smart Contract Smart?	37
What Is a Smart Contract Platform?	37
The Foundation of the Age of Autonomy®	39
Smart Contracts and the Supply Chain	39
The Evolution of the Contract	40
How Can We Benefit from Smart Contract Applications?	42
4 What Is DeFi?	49
The Wild West	50
Banking for the Bankless	51
5 The Metaverse, NFTs, and Web 3.0	59
The ABCs of NFTs	60
Not Just Art	62

The Metaverse	63
MANGA and Mainstream Adoption	65
Web 3.0	68
PART II	
DEBUNKING MYTHS	73
6 Myth – Regulation Will Kill Crypto	75
The Sticking Point	76
Crypto Classification: Security versus Commodity	78
The Punchline	80
7 Myth – Crypto Is a Bubble	81
Spring Follows Winter	83
Professor Krugman Is (Still) Wrong	88
Our Silver Lining Playbook	91
The Amazing Merge	92
8 Myth – Crypto Is Bad for the Environment	95
Bitcoin Energy Consumption	96
Blockchain Technologies and Climate Mitigation	99
9 Myth – Crypto Empowers Crime	102
The Internet Is a Criminal Battlefield	104
Tracing the Untraceable	105
Everyone Evolves	108
10 Guarding Against Fraud	110
The SEC: Watchdogs on the Hunt	112
Risk Management and Red Flags	114
Don't Do Stupid Stuff	119
PART III	
THE BREAKTHROUGH	121
11 A Primer on Technological Innovation	123
The Convergence of AI, IoT and Robotics	125
Putting It All Together	130
12 The Byzantine Generals Problem	131
Some Other Top Computer Science Problems	131
What Is BGP and Why Is It So Important?	133
How Bitcoin Solved BGP	133
BBC Show <i>Fake or Fortune</i> Illustrates the Problem	135

13 Peer-to-Peer Models	139
Computer Networking	140
Easy File Sharing	142
Reduced Costs	144
Adaptability	145
Reliability	147
14 Trusting Trustless Transactions	148
The Trust-Minimized Advantage	150
Open-Source Software	151
15 No Permission Required	152
The Permission Monster	152
The Permissionless Solution	154
The Game, Changed	155
16 Digital Scarcity	159
Provable Scarcity	160
Digital Scarcity: The New Frontier	161
Scarcity in the Metaverse	164
NFTs – Provable Uniqueness	165
17 A New Decentralized, Autonomous Economy	166
Sound Money, Required but Not Sufficient	167
Financial Capital versus Production Capital	168
Production Capital Supporting the Autonomous Economy	168
The Autonomous Economy Realized	172
18 Liquid Venture	174
A Cautionary Tale	175
Crypto Assets Revolutionize Investing	176
Get Rich Slow	179

PART IV

THE APPLICATION 181

19 Signals versus Noise	183
All That Glitters Is Not Gold	183
Sound Assets	185
What Makes a Crypto Asset Valuable	186
Putting It All Together	196

20 Interpreting Charts	197
On-Chain Metrics	198
Technical Analysis	202
If Nothing Else, Dollar-Cost Average	206
21 Crypto as Diversification in a Total Portfolio	208
Safe-Haven Assets – Gold and Bitcoin	209
Generating Alpha – Market-Beating Returns	210
Measuring Risk-Adjusted Returns	213
Adding Bitcoin to a Total Portfolio	214
22 Savings, Borrowing, Income Strategies, and Taxes	216
Taxes	216
Saving	217
Borrowing	219
Income Strategies	220
23 Investing and Retirement	222
Ways to Invest in Digital Assets in Retirement Accounts	223
No “40-Act” Spot ETFs (Yet)	225
Investing in Digital Assets	226
24 Looking Ahead	228
The Future of the Metaverse	229
The Future of Sovereign Data	232
The Future of Money	233
The Future of the DAO	234
The Future of Companies	236
Practical Examples	237
The Technology Exists Today	239
A New Long Wave Economic Cycle Has Begun	240
What’s Next?	241
<i>Notes</i>	243
<i>Additional Resources</i>	251
<i>About the Authors</i>	253
<i>Index</i>	255

Foreword

You're about to delve into one of the most fascinating technological innovations ever devised – and I'm a little jealous. You see, when I first heard about bitcoin in 2012, it was still quite new, and I certainly wasn't looking for it. It kind of . . . found me. It was easy to dismiss the notion of “digital money” as a fad or a fraud – and that's precisely what most people did way back then.

Come to think of it, most people are still dismissing it. What a huge mistake – one that you're not making, judging by the fact that this book is in your hands. Unlike most people, you're ready for the knowledge you're about to obtain. Good for you!

You might not yet understand what bitcoin is, or the blockchain technology that underlies it – but that's okay. At least you won't get quizzical glances when you tell friends and family what you're reading about. Come to think of it, the fact that there's a book you can read on the subject is a huge advantage I didn't have back in 2012. So, yeah, I'm a little jealous.

Since you're still in the book's foreword, you're to be forgiven if the subject still makes little sense. A perplexed expression was certainly on my face the first time I heard of bitcoin, despite (or because of) my knowledge and experience in the financial field. Digital money? *What is that?* I wondered. And more to the point, why do we need it? It took me about a year to fully understand the answers. It wasn't easy to get the information; there weren't any books available. And as I'd talk about crypto, most people dismissed the idea as a fad or fraud.

They're wrong, of course. As you'll discover in this fine book by Jake Ryan and James D'orio, blockchain technology and the digital assets it makes possible are revolutionary – the most profound innovation in commerce since the invention of the Internet. Unfortunately, most people don't yet realize this – giving those who do a distinct set of advantages.

By learning about this new tech, you'll be able to incorporate it into your life sooner than others – giving you both career and investment opportunities that evade others.

If there's a downside to this tech, it's the fact that most people still don't get it. And over the past decade, I've found that those with the greatest disdain tend to be the people with the least amount of knowledge about it. Unfortunately, that still includes most financial professionals. As a group, financial advisors are as uneducated about crypto as everyone else – and that's a problem, considering that they collectively manage two-thirds of all American investors' money.

What's an investor to do when their advisor knows nothing about this new asset class? Take control: learn about it yourself – and find an advisor who did the same.

And this book is great place to start. By the time you finish, you'll have a better understanding of blockchain and digital assets than most people. Along the way, you'll discover that Jake and James are great guides. Their passion pops off these pages, thanks to their knowledge and training as computer scientists, along with their expertise in AI and hedge fund management. They link AI, IoT, and robotics to blockchain technology; the result will be autonomous systems used in every industry and by every government to boost productivity and generate, transfer, and store value.

This technological revolution is just getting started, and the convergence of AI and blockchain will change how we live, work, and play. That makes *Crypto Decrypted* essential, and, by choosing to read it, you're taking an important step toward the future.

Ric Edelman

Founder, Digital Assets Council of Financial Professionals
Host, *The Truth About Your Future* podcast

Acknowledgments

Crypto Asset Investing in the Age of Autonomy was a Herculean effort. When the opportunity presented itself for a follow-up, Jake and I agreed that the only way to do it would be together. To say it's an effort is an understatement and, in accordance with the concept that it takes a village to raise a child, it seems to also take a village to write a book. With that in mind, there are far too many people who deserve to be acknowledged but we'll do our best below.

Together we would both like to acknowledge the following:

We would like to thank the entire Tradecraft Capital team. You tirelessly shucked and jived, picked up slack, and filled any gaps required in operating our fund while we were furiously putting pen to paper. Carissa Posch and Albert Perez, thank you for all you do in getting our message out to the masses via our newsletters, TikToks, and podcasts. And, to Sofia Koo, for keeping the firm running when we had to focus on the book, thank you so much!

We also want to acknowledge Ron Levy and METal International and the Crypto Roundtable, the group of brothers really helped in our distribution strategy and more.

We would also like to thank Herb Schaffner. Herb, you brought not only wisdom and guidance but also tremendous contribution and encouragement to this work. Herb, brother, you are the best! Thank you!

And we would also love to thank and acknowledge Bill Falloon for his tireless stand for the authors and we really appreciate you!

We would also like to thank Susie Frank for your amazing work in helping us write our vision.

We would like to thank Ric Edelman for your ongoing partnership and for the fantastic Foreword in this book, as well as Don Friedman of DACFP.

We also would like to thank Michael Terpin, for your wisdom and collaboration; John Durrett, for your confidence in what we are creating; and Anurag Shah, for your insight.

We would also like to thank Josh Hong. Josh, you were among the first with whom we collaborated in this space. We've learned much from you, and you've been a true friend as well as a colleague. Thank you!

In addition to the above, Jake has the following acknowledgments:

I would like to thank, again, my mom, for her support and tireless effort in helping us edit and review the material that goes out. I'd like to thank and acknowledge my ex-wife Onkar, for her support in raising our beautiful son Rome; and my son, who gives me the inspiration to build a better world for him. And to Ellie Ruple, who is an amazing connector and someone who's helped me get my books in the hands of many influential people.

Finally, James has the following acknowledgments:

I'll start with Jake Ryan. I acknowledge you, Jake. You are truly a thought leader and a visionary, and it has been my absolute honor not only to build Tradecraft with you, but to collaborate on this new tome. You started me on this journey into the world of digital assets – little did I know that we'd be partners and co-authors. I appreciate and cherish our partnership. Thank you!

I would like to thank my mom, Patricia Diorio. Mom, you not only have given me the gift of life but have always believed in me no matter what. Thank you!

I also thank OJ Zeleny. OJ, you've been a backstop and a grounding rod for many years and have always provided an environment for me to be creative and produce my best. Thank you!

I want to thank my family – my huge extended Italian family (you are too many to name, and you know who you are). You have been with me through the most difficult of times, and I thank you for your steadfast encouragement and staunch support of a lifetime of entrepreneurial musings. Thank you!

I'd like to acknowledge Maureen Charles. Maureen, as an author, coach, and friend, your mentorship has guided me in so many areas of my life, not the least of which is this one. Thank you!

I'd like to extend a special acknowledgment to Sofia Koo – far more than just my life partner, you're an incredible business colleague and a tireless advocate. I'd not be here without you. Thank you.

Finally, I'd be remiss not to acknowledge my late daughter, Bella Diorio. Bella, it was an honor and a privilege to be your dad. You inspired me to be my best in the world and bring that back home to our family. I know you looked at me funny when I started this crazy blockchain journey, but you were an enthusiastic supporter nonetheless. I wish I could have shared more of it with you. I miss you. Thank you for the years we had.

Note from the Authors

We're excited to present this work to you. A little about us – we both come from the technology sector. Both of us have degrees in computer science and worked in the software development industry for the first 20 years of our respective careers, moving from developers to managers to, ultimately, business owners together. We worked together as partners from 2001 to 2004 and then went our separate ways, although we always kept in touch. The partnership worked and it's a little bit of kismet that we're here together again bringing you this book.

(From Jake) I started angel investing in 2014 and made my blockchain startup investment in 2015. From those 15 angel investments made, I've had four exits and hold one investment that turned into a decacorn. I've worked with two VC accelerator firms, as well as being a strategic advisor for a private equity firm and an advisor to several venture-backed startups. Although I'm a technologist, my passion has always been investing. I bought my first mutual fund at the age of 15, my first stock at the age of 17, and started trading options at 22. It was in 2016 that I bought my first bitcoin for roughly \$475, and that led me to thinking a lot about this new industry. I love crypto, because it's the intersection of tech and finance and I knew it was time. I had the notion to start a crypto hedge fund in 2017, ultimately leading to Tradecraft Capital, which I soft piloted in 2018 and then opened to private investors in 2019. It has been quite a ride. I'm proud of what we've accomplished and prouder to share this work with you. I hope you enjoy it.

(From James) My story starts the same as Jake's but takes a few different turns. It's true that I'm a computer scientist. As a programmer I enjoyed the challenge of developing complex applications and, although my early career was during the rise of the Internet, I really was so focused on my work that I missed the bigger picture as it was unfolding.

I missed the forest for the trees, if you will. It was in 2012 while I was growing a Software-as-a-Service company that my lead architect came to me and said, “Jim, I’m going to start bitcoin mining.” I thought he was nuts and was embarking on a fool’s errand, and I thought no more of it. Then, in 2016, Jake told me about bitcoin. I didn’t really understand it and when I saw the outlandish price of \$674 a coin, I was clear that I missed the window, told Jake he too was nuts, and ignored the whole crypto thing. Boy, was I wrong.

After an exit in 2017 I thought to myself, maybe *I’m* nuts. From there, my journey began. After a few years of traveling from Dubai to Toronto, New York to San Francisco, and everywhere in between, digesting every piece of information I could find, I became convinced. I became an early investor in Tradecraft and was thrilled when Jake asked me to be an advisor and help him shape the *Age of Autonomy*[®] thesis. I knew he was on to something. I also knew that many people were participating in this ecosystem without a real understanding of it or, worse, were ignoring it just as I had. It was then that I made it my goal to educate as many people as I could so that they didn’t let this opportunity pass them by. I began with the concept of *Crypto Decrypted* as a way to educate, which ultimately turned into a monthly blog, and never looked back. I suppose that is what led us here, and why I’m so excited to share this with you. It’s been an amazing ride – but from our view, we’re still at the very beginning of one of the most exciting technological breakthroughs the world has ever seen.

Our goal is to take a different point of view about crypto and digital assets. Most books talk about the technology of blockchain, but lean heavily into the investment potential of bitcoin and digital assets. Similarly, it seems the majority of articles written focus on tokens or coins and their price. They contain headlines like “bitcoin is up \$10,000 this year” or “bitcoin fell to \$20,000 from its peak of \$68,000.” While we certainly want to highlight the investment potential that digital assets can be, we also want to be sure you understand the technology and innovation that’s occurred over the past few decades and the profound impact this will have on society. We’re now able to do something we couldn’t do before, and that’s why blockchain technology is important. That’s ultimately why any blockchain-based digital asset has any value at all.

The purpose of this book is to explain the technological innovation that’s occurred and to try and unpack the *what*, *how*, and *why*

from a technology viewpoint. Just as the Internet was the backbone of the Age of Telecommunications, blockchain technology is the backbone of a new wave. We hope that after reading this book you'll have a much better understanding of what digital assets are, what crypto and blockchain tech is, and why this breakthrough is so important.

Crypto is a wild ride. The volatility – the change and impact of that change – occurs at breakneck speed. Many events over the past few years have destroyed value and investment by bad actors. Some events have destroyed value because we are still in an experimental phase and the technology is not yet mature. This happens during any technological revolution, as we're in the early stages of this technology adoption cycle. The vision of what we see as possible doesn't yet match what we can actually achieve. But it will.

After reading this book, we hope you have a better understanding of what's going on and why it's so revolutionary.

We hope you enjoy this book; moreover, we hope that by the time you're done with it, you have the same wonder and excitement about this new age that we do. Enjoy!

From our Legal Team

The discussions and content in this book is for informational purposes only. You should not construe any such information as legal, tax, investment, financial, or other advice. Nothing contained in this book constitutes a solicitation, recommendation, endorsement, or offer by its authors or publishers to buy or sell any particular investments, securities, or assets.

All discussion and content in this book is information of a general nature based on the author's current views, and does not address the circumstances of any particular individual or entity or their investment portfolio. Nothing in this book constitutes professional or financial advice, nor does any information in this book constitute a comprehensive or complete statement of the matters discussed. The author is not your fiduciary and you are not an investment advisory client of the author. You alone assume the sole responsibility of evaluating the merits and risks associated with the use of any information in this book before making any decisions based on such information. You should consult with your personal investment advisers before making any investment decisions.

Introduction

The world of decentralized finance, cryptocurrencies, and blockchains has changed dramatically since I wrote my first book, *Crypto Asset Investing in the Age of Autonomy*, in 2019. When I was researching and writing that book, you could still buy a bitcoin for less than \$11,000, and most people had never heard of an NFT, much less the metaverse. The years since then have seen exponential growth in crypto projects, fans, and naysayers. My fund has expanded as well and this time I'm collaborating with my business partner, James Diorio, to bring you something a little bit different.

For those of you who are familiar with *Crypto Asset Investing in the Age of Autonomy*, we will touch on these concepts and also some of the fundamentals for the first-time reader. That book, however, was primarily about establishing the foundational thesis and providing a general broad perspective about how to build a crypto portfolio. We've written this book with a slightly different goal, particularly that of understanding – we noticed that there are plenty of books that discuss *how*, but often without real context of the *why*. To that end, this work will provide investors as well as the curious amateur with an in-depth understanding of blockchain, crypto, and emerging digital assets like NFTs and, importantly, *why* they are so important (the breakthrough). We will also clear up common misconceptions about blockchain and crypto (the myths) and, ultimately, walk the reader through the essentials of making crypto a profitable and reliable instrument in savings, retirement planning, and active and passive investing activities (the foundations for investing).

It's easy to mistake bitcoin and other digital assets as just another new investment opportunity. Yes, it is that – but it's so much more. It's really the beginning of an entirely new economic infrastructure and technological foundation. We are eager to share not only our knowledge of this emerging technology and economy, but a vision of how it can be used to improve people's lives.

These benefits are not just about making crypto millionaires. What if a Venezuelan struggling with a 2,719% inflation rate could put money into a cryptocurrency account to protect themselves from hyperinflation? Or a musician could sell a fraction of a digital music file and receive royalties every time their song was resold?

Wishful thinking? Not at all. It already exists. The technology is there, and the marketplace is already forming around it. And those are just two examples of a fascinating new world that blockchain makes possible. After reading this book you will understand the innovation, properties, and promise of crypto in all of its many manifestations.

Is investing in crypto scary? Yes. But what's scarier is continuing to use financial infrastructure that requires trust to complete a transaction. If you have to trust a bank or a counterparty to complete a transaction, you're taking on invisible risk that you no longer need to. When people get a taste of being able to use public financial infrastructure that is trustless, that doesn't require trust to complete a transaction, they're never going to want to go back to trust-required financial infrastructure. Just ask anyone from Lehman Brothers to Bear Stearns to MF Global to the Cyprus Bank to BlockFi to FTX to Celsius. Investors and customers alike all either had to go through a bankruptcy process or are currently in line with a bankruptcy process to try and get their pennies on a dollar.

Once crypto and blockchain technology is really understood by the public, everyone is going to want to use trust-minimized, peer-to-peer public financial infrastructure to complete their economic transactions – that's what this whole crypto revolution is about. Removing counterparty risk. Removing the middleman. Removing the guy you have to trust with your money. Let's end this and build an economy that's transparent and can grow on sound money principles. That's what this is all about.

We've written this book to provide both serious investors and the curious amateur with an in-depth understanding of crypto foundations and emerging assets like NFTs and to clear up common misconceptions about crypto. Most of all, the book walks the reader through the essentials of making crypto a profitable and reliable instrument in savings, retirement planning, and active and passive investing activities.

We will provide factual, informed, razor-sharp analysis of blockchain and cryptocurrency and other crypto assets and explore their value to the investor and the economy at large. We will acknowledge where risks

lie, how to get started safely, and will debunk the unfounded myths around crypto. We'll look at crypto history, its place in the economy, unpack the fundamentals of this technology and, drawing on facts, lay out the details you can use. No pom-poms. No gibberish. No jargon.

A word about style. As two of us are writing this, you, as the reader, will get well-rounded insights. We each have had our own experiences and you'll find storytelling throughout. So, when you see a reference to a personal experience it might be Jake, it might be James. For readability we don't distinguish who the writer is, because that's not what is important. What *is* important is that the concepts have been delivered in a way that makes sense to you, and that both of us are of a common thought process on the content you'll find inside.

We'll tell you why these financial innovations matter to the world and to you. We'll share a huge basket of developing opportunities as this new world of money evolves. Now, let's go!

PART I

THE PRIMER

In Part One of this book, we cover the basics of the technology and innovation of blockchain, tokens, smart contracts, smart contract platforms, and digital assets. We aim to give you a basic understanding, a primer into the world of digital assets. Once you have a better understanding of the technology and innovation of digital assets you will be better equipped to understand the breakthrough, follow the debunking of the myths, and you'll see why investing in them is something every investor should consider.

1

What's the Big Deal About Blockchain?

Everyone is talking about crypto, the colloquial term for digital assets. Love it or hate it, it seems to be on everyone's lips. The fact is that crypto is now mainstream. From Main Street to Wall Street, your street to our street, everyone has an opinion. We would often go present to different groups, ranging from trade shows to investor summits, and even as little as three years ago people looked at us like we were aliens. Truly – aliens bringing some unfathomable concept and, clearly, not of this Earth. Things have changed quite a bit over the past few years.

Bitcoin is the most popular and well-known of the crypto assets built on a blockchain. Yet Bitcoin is only one of thousands of crypto networks, applications, and protocols empowered through blockchain technology. Stories of teens driving Lamborghinis, or businesspeople who invested, then lost, all of their bitcoin by throwing away their wallet accidentally or forgetting a password permeated throughout. Riches were made and riches were lost, and everyone seemed to know about this volatile new asset. During this process, crypto has become somewhat of a dirty word. There is *so much baggage* around it that it's hard to actually cut through the noise and, with all the hype about making money, we see that the fundamentals and foundations of this amazing technology are generally overlooked and misunderstood. So let's start by understanding that blockchain technology is a breakthrough.

Blockchain, recently made possible through decades of computer science and mathematical innovations, enables computers in different locations to access, verify, and share their data. By doing so, blockchain technology overcomes one of the biggest computer software challenges of all time: how to share information quickly and reliably among separate, unaffiliated entities without the involvement of a centralized gatekeeper. This is known as the Byzantine Generals Problem and is discussed thoroughly in Chapter 12.

The breakthrough in solving this problem cannot be overstated, as it allows peers to transact business without an overlord. That may seem rather ho-hum to you, but consider the simple act of handing your friend a 20-dollar bill. You don't need to go to a bank or get permission; you can just do it. Well, before blockchain the only way to digitally exchange something was to go through that central third party. Now, you can just do it directly – like handing your friend a 20-dollar bill. Four unique characteristics make blockchain revolutionary. Blockchain is:

1. Decentralized: No central authority controls transactions occurring over the network.
2. Immutable: Posted transactions are there forever and can never be deleted or changed by anyone.
3. Transparent: Every transaction on the blockchain is public record and can be viewed by anyone on the network.
4. Authenticated with cryptography: Blockchains use complex mathematical codes to store and transmit data to ensure the legitimacy of each transaction and participant, just like an old-school signature. Every participant in the cryptoverse, via their crypto wallet, has a unique digital signature that's impossible to forge.

These features of blockchain position this technology as the biggest technological disruptor since the Internet. Blockchain, however, unlike many technology breakthroughs, is actualized by and empowers those who use it. As Vitalik Buterin, co-founder of Ethereum, said, “Whereas most technologies tend to automate workers on the periphery doing menial tasks, blockchains automate away the center. Instead of putting the taxi driver out of a job, blockchain puts Uber out of a job and lets the taxi drivers work with the customer directly.” This is what we mean by peer-to-peer. To start giving this context let's look at Bitcoin, which is a blockchain that is a worldwide peer-to-peer financial network.