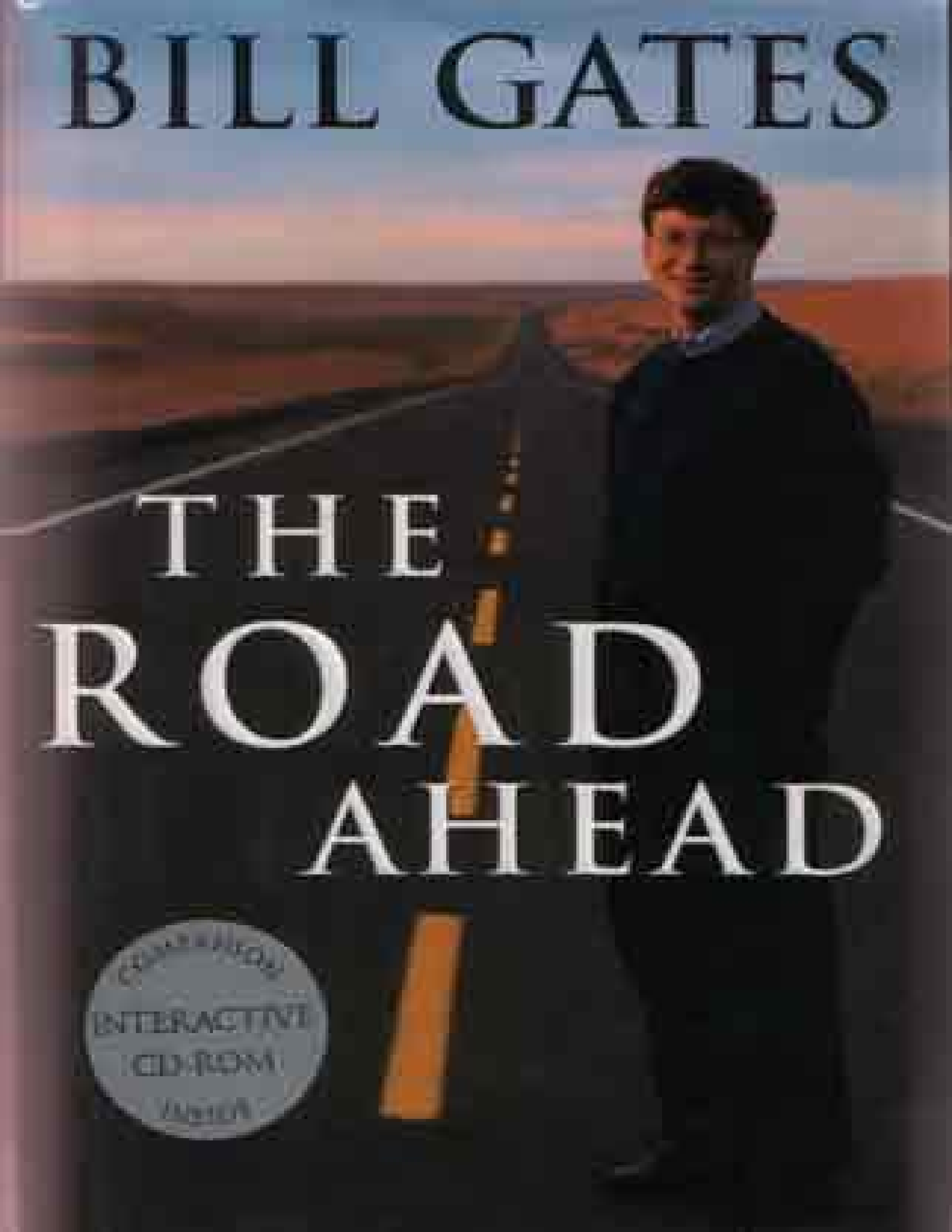


BILL GATES

A photograph of Bill Gates standing on a two-lane road that stretches into the distance. The scene is set at sunset or sunrise, with a warm, orange and blue sky. Bill Gates is wearing a dark sweater and a collared shirt. The road has a dashed yellow center line and white edge lines.

THE ROAD AHEAD

COMING SOON
INTERACTIVE
CD-ROM
VERSION

The Road Ahead

by Bill Gates

with Nathon Myhrvold

and Peter Rinearson

To my parents

ACKNOWLEDGMENTS

Bringing a major software project to market can require the combined talents of hundreds of people. Not quite that many helped me with this book, but I certainly couldn't have done it alone. If I've inadvertently left someone out below, I'm really sorry, and thank you too.

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FOREWORD

The past twenty years have been an incredible adventure for me. It started on a day when, as a college sophomore, I stood in Harvard Square with my friend Paul Allen and pored over the description of a kit computer in *Popular Electronics* magazine. As we read excitedly about the first truly personal computer, Paul and I didn't know exactly how it would be used, but we were sure it would change us and the world of computing. We were right. The personal-computer revolution happened and it has affected millions of lives. It has led us to places we had barely imagined.

We are all beginning another great journey. We aren't sure where this one will lead us either, but again I am certain this revolution will touch even more lives and take us all farther. The major changes coming will be in the way people communicate with each other. The benefits and problems arising from this upcoming communications revolution will be much greater than those brought about by the PC revolution.

There is never a reliable map for unexplored territory, but we can

learn important lessons from the creation and evolution of the \$120-billion personal-computer industry. The PC—its evolving hardware, business applications, on-line systems, Internet connections, electronic mail, multi-media titles, authoring tools, and games—is the foundation for the next revolution.

During the PC industry's infancy, the mass media paid little attention to what was going on in the brand-new business. Those of us who were enthralled by computers and the possibilities they promised were unnoticed outside our own circles and definitely not considered trendy.

But this next journey, to the so-called information highway, is the topic of endless newspaper and magazine articles, television and radio broadcasts, conferences, and rampant speculation. There has been an unbelievable amount of interest in this subject during the last few years, both inside and outside the computer industry. The interest is not confined only to

developed countries, and it goes well beyond even the very large numbers of personal-computer users.

Thousands of informed and uninformed people are now speculating publicly about the information highway. The amount of misunderstanding about the technology and its possible pitfalls surprises me. Some people think the highway—also called the network—is simply today's Internet or the delivery of 500 simultaneous channels of television. Others hope or fear it will create computers as smart as human beings. Those developments will come, but they are not the highway.

The revolution in communications is just beginning. It will take place over several decades, and will be driven by new "applications"—new tools, often meeting currently unforeseen needs. During the next few years, major decisions will have to be made by governments, companies, and individuals. These decisions will have an impact on the way the highway will roll out and how much benefit those deciding will realize. It is crucial that a broad set of people—not just technologists or those who happen to be in the computer industry—participate in the debate about how this technology should be shaped. If that can be done, the highway will serve the purposes users want. Then it will gain broad acceptance and become a reality.

I'm writing this book now as part of my contribution to the debate and, although it's a tall order, I hope it can serve as a travel guide for the forthcoming journey. I do this with some trepidation. We've all smiled at predictions from the past that look silly today. You can flip through old *Popular Science* magazines and read about conveniences to come, such as the family helicopter and nuclear power "too cheap to meter." History is full of now ironic examples—the Oxford professor who in 1878 dismissed the electric light as a gimmick; the commissioner of U.S. patents who in 1899 asked that his office be abolished because "everything that can be invented has been invented." This is meant to be a serious book, although ten years from now it may not appear that way. What I've said that turned out to be right will be considered obvious and what was wrong will be humorous.

I believe the course of the creation of the highway will mirror, in many ways, the history of the personal-computer industry. I'm including a bit of

my history—yes, I too talk about the house—and that of computing in general, to help explain some concepts and lessons from the past. Anyone expecting an autobiography or a treatise on what it's like to have been as lucky as I have been will be disappointed. Perhaps when I've retired I will get around to writing that book. This book looks primarily to the future.

Anyone hoping for a technological treatise will be disappointed, too. Everyone will be touched by the information highway, and everyone ought to be able to understand its implications. That's why my goal from the very beginning was to write a book that as many people as possible could understand.

The process of thinking about and writing *The Road Ahead* took longer than I expected. Indeed, estimating the time it would take proved to be as difficult as projecting the development schedule of a major software project. Even with able help from Peter Rinearson and Nathan Myhrvold, this book was a major undertaking. The only part that was easy was the cover photo by Annie Leibovitz, which we finished well ahead of schedule. I enjoy writing speeches and had thought writing a book would be like writing them. I innocently imagined writing a chapter would be the equivalent of writing a speech. The fallacy in my thinking was similar to the one software developers often run into a program ten times as long is about one hundred times more complicated to write. I should have known better. To complete the book, I had to take time off and isolate myself in my summer cabin with my PC.

And here it is. I hope it stimulates understanding, debate, and creative ideas about how we can take advantage of all that's sure to be happening in the decade ahead.

**THE
ROAD
AHEAD**

1

A REVOLUTION

BEGINS

I wrote my first software program when I was thirteen years old. It was for playing tic-tac-toe. The computer I was using was huge and cumbersome and slow and absolutely compelling.

Letting a bunch of teenagers loose on a computer was the idea of the Mothers' Club at Lakeside, the private school I attended. The mothers decided that the proceeds from a rummage sale should be used to install a terminal and buy computer time for students. Letting students use a computer in the late 1960s was a pretty amazing choice at the time in Seattle—and one I'll always be grateful for.

This computer terminal didn't have a screen. To play, we typed in our moves on a typewriter-style keyboard and then sat around until the results came chug-chugging out of a loud printing device on paper. Then we'd rush over to take a look and see who'd won or decide our next move. A game of tic-tac-toe, which would take thirty seconds with a pencil and paper, might consume most of a lunch period. But who cared? There was just something neat about the machine.

I realized later part of the appeal was that here was an enormous, expensive, grown-up machine and we, the kids, could control it. We were too young to drive or to do any of the other fun-seeming adult activities, but we could give this big machine orders and it would always obey. Computers are great because when you're working with them you get immediate results that let you know if your program works. It's feedback you don't get from many other things. That was the beginning of my fascination with software. The feedback from simple programs is particularly unambiguous. And to this day it still thrills me to know that if I can get the program right it will always work perfectly, every time, just the way I told it to.