PATENTLY FEMALE

FROM AZT TO TV DINNERS,

STORIES OF WOMEN INVENTORS

AND THEIR BREAKTHROUGH IDEAS

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ETHLIE ANN VARE AND GREG PTACEK

FROM THE AUTHORS OF THE BESTSELLING *Mothers of Invention*

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From AZT to TV Dinners, Stories of Women Inventors and Their Breakthrough Ideas

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FOREWORD

You don't have to be an engineer or a mathematician or a scientist to be an inventor. To be an inventor you have to have certain creative talents: the talent to observe and the talent to conceive of a new idea. You have to be able to see a need, and you have to have a specific, concrete understanding of how to fill that need.

You can hire technicians and manufacturers to bring your idea to fruition. You don't have to know what materials will be used or what the manufacturing process will be. But you cannot go to these people and say to them, "Let's do this better." You have to know exactly what you want.

My first successful creations, Barbie and Ken, came from observing my own daughter playing with paper dolls. She always chose grown-up dolls, and I realized she was using the doll to project her own dreams of her future. I was convinced that if I could turn this play pattern with paper dolls into a three-dimensional doll, I could fill a very real need in the lives of little girls.

My next noteworthy creation was the Nearly Me breast prosthesis. This came from my personal experience of having to wear an artificial breast after my mastectomy. I was determined to design and market a totally new type of artificial breast, one that looked and felt natural and was sold by clerks who were trained to be sensitive and helpful.

With all my creations I have observed a need—a big, fat hole in the market—and insisted that my product be better than anything else in its field. And in all cases the characteristic of the product had to be completely and carefully defined by the creator, the person with the idea.

I don't personally hold a patent on Barbie, but I am the inventor of the Barbie doll. Not everybody can be an inventor or a designer or a creator. You have to be blessed with certain talents—and you have to use them.

—Ruth Handler

PREFACE

There is a certain kind of person, a person who likes mysteries, crossword puzzles . . . and baking. Who enjoys designing things, building things, and also sewing . . . who likes drawing, painting, playing a musical instrument. A person who likes quiet time and likes to listen but also looks forward to a lively debate. We have a name for that person: we call her a scientist.

No, science may not be fashionable. It may not seem glamorous. But it is all around us every day, and it makes our lives wonderful.

I was first drawn to science because it was logical. When I saw an educational film in high school that described water purification and sewage treatment (ugh!), I was impressed that it could be useful, as well. As a college freshman I chose five core courses because I thought each might be my major. I stuck with chemistry because I enjoyed working hard to figure things out. It wasn't always fun, but I liked the challenge. (It also is worth mentioning that a few Cs and Ds indicated less than a stellar career if I chose some of the other potential majors!)

My father always expected that if he paid my costs (minus what I earned in the summer) I would major in a useful subject, since one needed to earn a living. He didn't expect that I would get a master's degree, much less a Ph.D. But he appreciated that I was able to pay my way, and my high school instructor assured him that I could always teach.

Dad was a wise man who taught me anything I wanted to learn: pitching, throwing, catching, and batting a baseball; passing and drop-kicking a football; boxing. My grandmother ran the family lumber business, and she saw to it that I had a chance to learn to swim, ride horses, and play tennis. She was my mentor and companion in my formative years. I saw that a woman could do whatever she wanted if she was prepared to do it.

My grandmother taught me such lessons as "If you want jelly, pick berries" and "If you take the pay in advance, the job is much more tedious." She also marveled that she had seen technology progress from the horse and buggy to the automobile, airplanes, and space exploration and men on the moon. She wondered what else would happen. My mother taught me that an education was something to be valued and that life was fun.

I don't think of myself as an inventor. I don't make gadgets. I'm a chemist and drug researcher who knows the value of patenting one's discoveries when there is some indication of a biological activity associated with a desired therapeutic effect. I also know that you do this before the discoveries are of proven value. I learned this lesson from Dr. Trudy Elion. [For more on Gertrude Elion, see pages 91–93.]

A person who wants to discover and develop drugs needs to be able to withstand terrific highs and lows. With luck, you will enjoy some successes. But there is also frustration: only one out of ten thousand compounds has a chance of becoming a drug. The challenge is to stay fascinated by the science itself, to continue to learn new things throughout your career. By interacting with my colleagues I was able to learn the basics of biochemistry, pharmacology, toxicology, enzymology, immunology, virology, microbiology, and molecular biology. All of these enter into fine-tuning the potency, selectivity, toxic liability, and bioavalability of the chemical that will ultimately become a medicine prescribed by doctors.

It was fascinating and exciting to be part of the meteoric rise of 509U81—otherwise known as Compound S, or AZT. We all operated at warp speed making sure deadlines were met and that the people needed to perform next were ready to do their part. People really burned out! I was very nervous when it was time to administer the drug to people for the first time. It was extremely scary to think that you might hurt the people you want to help. When the compound went to market, all of us were proud and thrilled. The negative reception the drug received from some AIDS groups, along with the later court battles, made me and others of the inventors wonder how trying your darnedest to help people could be so misconstrued.

I still follow the press on HIV and worry that the disease is not yet conquered. But now I'm busy learning new science and having fun in a small company where everything you do has a visible effect. Inspire

Pharmaceuticals has the extraordinary record of having one issued U.S. patent and two Notices of Allowance since being established in the spring of 1995.

Like my grandmother, I can't wait to see what's going to happen next.

—Janet L. Rideout, Ph.D.

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Getting it written, unfortunately, is just as hard as it's always been.

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PATENTLY FEMALE

CONTENTS

INTRODUCTION

This volume serves, informally, as a sequel to the 1988 book *Mothers of Invention: From the Bra to the Bomb, Forgotten Women and Their Unforgettable Ideas.* In that collection, we tried to resurrect from the cracks of history the names and stories of remarkable women who changed the world—and were promptly ignored by it. Because while it's difficult for most people to name a woman inventor, that isn't for any lack of women inventors. It's for lack of press.

Of the first hundred patents ever issued in the industrialized world, one was to a woman: in 1635 Sarah Jerom received British Patent #87 for a machine that sliced timber. In 1715 American colonist Sybilla Masters received English Patent #401 for her corn mill. (Actually the paperwork was made out to Thomas Masters, for "a new Invencon found out by Sybilla, his wife.") The United States itself awarded its first patent to a woman in 1793, when Hannah Slater perfected her cotton sewing thread.

As far back as 1899, in a manual published by the U.S. Patent Office, one Fred Dieterich wrote, "That woman is rapidly coming to the front as an inventor is evidenced by the large increase in the number of patents being filed by them." Dieterich added, "It is an erroneous impression that women [merely] invent improvements on articles intended for their sex . . . they are constantly exercising their ingenuity in the direction of improving many devices which men only as a rule are supposed to."

He mentions some women inventors and even goes so far as to say, "As a rule, inventions the product of the fair sex [are] not the extreme chimerical or visionary kind too often the product of the inexperienced 'first time' male."

In other words, women's inventions are prevalent, they are practical, and they are profitable. Somehow, though, this information is the victim of a strange historical amnesia. Almost a century later, when we researched *Mothers of Invention,* we discovered to our dismay that there were no books about women inventors on the shelves. Nor were

there any mentions of women inventors in books written about inventors in general. The closest we came in our research was a chapter in the 1957 book *Inventors and Invention* by then-RCA patent director C. D. Tuska. The chapter was called "Age and Sex of Inventors."

"There are few women inventors," wrote Tuska. "I shall write little about the female inventors and, with natural caution, nothing about their ages. Most of our inventors are of the male sex. Why is the percentage of women so low? I'm sure I do not know, except the good Lord intended them to be mothers. They produce the inventors and help rear them, and that should be sufficient."

Somehow things went backward between 1899 and 1957. The good news is, it has improved since 1957. Things have improved even since *Mothers of Invention* was published. Since that time, historian Autumn Stanley released her exhaustively researched *Mothers and Daughters of Invention.* Anne L. Macdonald's *Feminine Ingenuity* traced women innovators' impact on the Industrial Age. Farag Moussa included international inventors in his book *Women Inventors.* Susan Casey's *Women Invent!* and Fred Amram's *From Indian Corn to Outer Space: Women Invent in America* provided a breezy overview of women's practical contributions to science and industry. Ann Fausto-Sterling and Hilary Rose's *Love, Power and Knowledge: Towards a Feminist Transformation of the Sciences* covered the sociological implications of innovative women.

When *Mothers of Invention* came out, there were no women in the National Inventors Hall of Fame. Since that time, we are happy to report, Gertrude Elion, the team of Elizabeth Hazen and Rachel Brown, Stephanie Kwolek, and Helen Murray Free have all seen their work acknowledged and honored there. Women have consistently won the Intellectual Property Owners' National Inventor of the Year Award as well as *Discover* magazine's Discover Award. Statistically, the number of U.S. patents granted in women's names (note: this does not include corporate "work for hire") increased from 1.5 percent in the 1950s, to 2.2 percent in 1977, to 5.6 percent in1988, to 8 percent in 1993.

Yet when the venerable Smithsonian Institution put out a picture book about inventors for young readers in 1996, it somehow overlooked all the contributions by women that the above-named historians and authors have worked so hard to recognize. *Newsweek* magazine's millennial special, "2000: The Power of Invention,"

managed to acknowledge exactly two inventions by women: Stephanie Kwolek's Kevlar and Marion Donovan's disposable diaper. It is as if a default setting is being returned to, again and again.

Why is Cyrus McCormick's reaper remembered but not Ann Harned Manning's? Isaac Singer's sewing machine but not Helen Blanchard's? Everyone knows Jonas Salk gave us polio vaccine—how many know that Janet Rideout gave us AZT? Why do people credit Ray Kroc with establishing fast food but never mention that Kate Gleason built the first tract housing? Why do we all know that George Eastman invented the Brownie camera but not that Josephine Cochran invented the dishwasher? That Willis Carrier invented the air conditioner but not that Teri Pall invented the cordless phone?

Names like Colt (guns), Otis (elevators), and Yale (locks) are in the common lexicon, but not Jones (Amanda—vacuum canning), Anderson (Mary—windshield wipers), and Harger (Hannah—the screen door). What would life be like without Mary Phelps "Caresse Crosby" Jacob's bra, Melitta Bentz's drip coffee, or Grace Murray Hopper's user-friendly computer software?

More than a decade after the publication of *Mothers of Invention*, the record still needs to be set straight. Besides, women have been busy inventing new things. Today we can even see the phenomenon of women inventors building on the work of other women inventors. There is a direct line of progress from Hedy Lamarr's frequency-hopping idea to Teri Pall's cordless phone to Randice Altschul's disposable card phone. And look at the relentless battle to cure AIDS: Janet Rideout patented AZT, which was the only treatment until M. Katharine Holloway and Chen Zhao's teams introduced protease inhibitors. Suzanne Ildstad's facilitator-cell technology may one day replace Gertrude Elion's lifesaving immunosuppressant treatment.

Mothers of Invention focused a spotlight on a piece of history that had been locked and forgotten in the attic. Rewardingly, since that time the book has been used in classrooms and women's studies programs across the country. We've also had the privilege of meeting students in our annual lecture series who say the women they read about in *Mothers of Invention* inspired them to pursue studies and careers in science and technology.

In the introduction to our 1988 volume, we speculated that "it is possible to patent your lab-grown AIDS vaccine, as well as the steps

required to produce it, and the special hypodermic needed to administer it." At the time that was all the stuff of future fantasy. In this book you will not only meet Janet Rideout, who patented AZT, but Janine Jagger, who patented the virus-proof needles.

We can only guess what predictions made in *Patently Female* will be realized in the next book we write.

—Ethlie Ann Vare and Greg Ptacek

CHAPTER 1

Practicalities

Of necessity, women have long been inventors. The earliest recorded history treated women inventors as deities. The anonymous women gatherers who first cultivated their crops are mythologized by the ancient Greeks as goddess Pallas Athena, "founder of the plow and the plowman's toil." Similarly, China's Se Ling-she, a demigod and wife of Emperor Hwang-te, is credited with discovering silk around 3000 B.C. Queen Semiramis of Assyria is said to have designed the system of canals, causeways, and bridges that made possible the Hanging Gardens of Babylon.

With the advent of the industrial revolution, women began turning their inventive energies toward machinery. Indeed, the first patent granted to a woman in the United States—English Patent #401, awarded to Sybilla Masters in 1715—was for a machine for "cleaning and curing Indian corn." By the early 1800s women were inventing all sorts of practical things. The young nation was still largely rural, so the products of women's imaginations often focused on agriculture. Among the most significant of these were the cotton gin, discussed later in the chapter, and the grain harvester or reaper, which is attributed to Ann Harned Manning in 1843. Later, Cyrus McCormick would become famous when he made further improvements to the machine.

Toward the end of the nineteenth century, women's inventions reflected their new urbanized environments. In 1881 Mary Walton