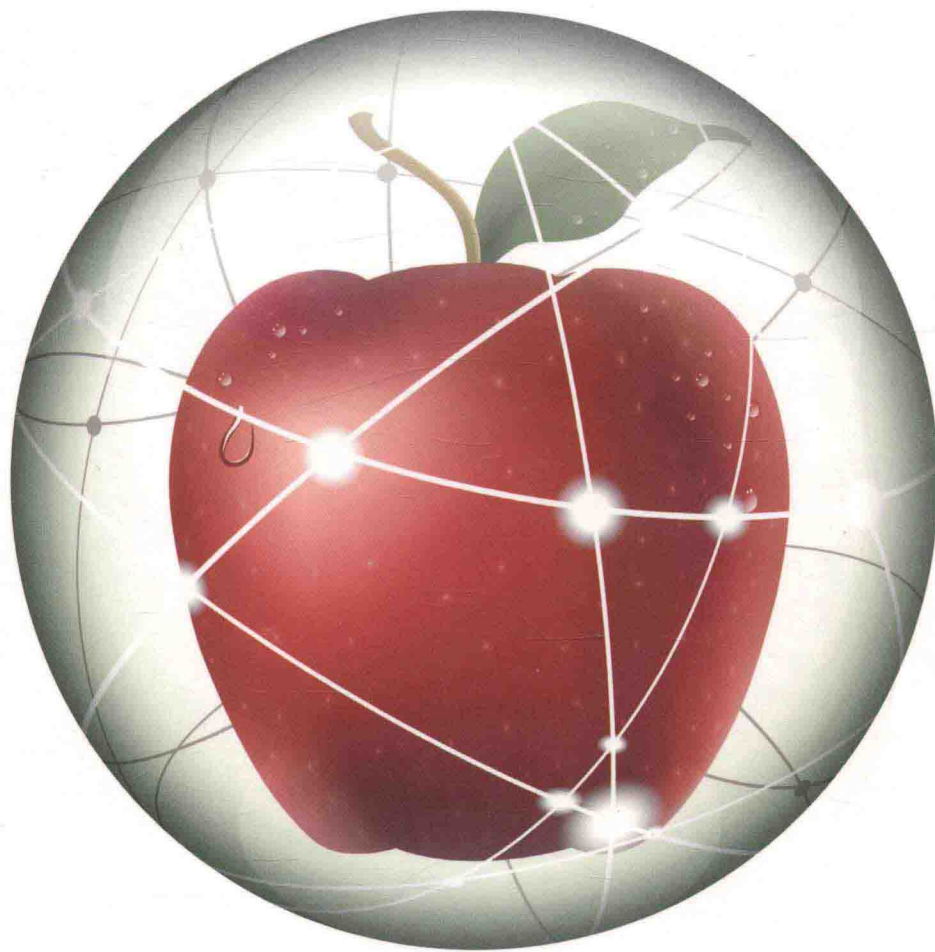


CULINOLOGY[®]

THE INTERSECTION OF CULINARY ART AND FOOD SCIENCE



RESEARCH CHEFS ASSOCIATION

EDITOR: J. JEFFREY COUSMINER

WILEY

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*"The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates.
The great teacher inspires."*

— WILLIAM ARTHUR WARD



We dedicate this book in memory of our inspirational predecessors:

GARY HOLLEMAN

WILLIAM "POPS" HAHNE

MICHELE BLOCK

JOHN MATCHUK, CRC

CRAIG "SKIP" JULIUS, CRC, CCS, CEC, CCP, CFE

for their passion and dedication to education in the field of food research and development, and their legacy of commitment to ensuring that Culinology® will continue to grow and thrive.

Foreword to *Culinology*[®]: *The Intersection of Culinary Art and Food Science*

When I started my career in the food and beverage industry in the 70s, I could not have imagined life as a research chef, food scientist, or manufacturer. Those options just did not exist in my world. And the term *Culinology*[®] would not be coined for several decades.

I backed into the field of *Culinology*[®] with a phone call from Chef Gary Barnette of the newly opened Casino Magic Hotel and Gaming Resort on the Gulf Coast of Mississippi. Gary was faced with a flood of hungry gamers all looking for regional favorites such as gumbo, jambalaya, and crawfish etouffée. With a cadre of chefs on the team, I was perplexed as to what Gary might need from me. He explained that his talented chefs hailed from Vegas and Atlantic City; none were familiar with Gulf Coast cuisine. That's where I came in. Gary needed Cajun and Creole food, and he wanted it yesterday. Being a businessman and needing a little extra money, I told him I would cook whatever he needed. Only then did I learn that he needed 600 gallons of each every four days.

I was a restaurateur and a fine dining chef, not a product development specialist. Everything I cooked came out of a sauté pan. My largest piece of cooking equipment was a five-gallon Groen kettle. But he wanted 1,800 pounds of multiple products every few days! And that's when I learned about food manufacturing as I was thrust into the emerging field of *Culinology*[®].

I was quickly introduced to local packers, and as things rolled along I began to develop 1,000-pound capacity, auger-driven kettles of cast iron. With direct heat to the metal, I could create authentic and traditional dark-and light-brown rouxs, which set us apart from other manufacturers. Before long, word spread about my little food manufacturing plant, and that's when Chef Tim Soufan of TGI Friday's called to see if I might consider working with him to create a special barbecue glaze for a Friday's menu promotion. I simply could not say no, and, with Chef Soufan's guidance, Jack Daniel's Glaze was born. That product ultimately built and solidified Chef John Folse & Company Manufacturing.

Realizing that I was now in product development, it was time to visit the chef oracle for advice and guidance. It was on the apron strings of world-renowned culinarian Warren Leruth, owner of LeRuth's fine dining in Gretna, that I first learned the terms *food science*, *R & D Chef*, *modified food starch*, and *flavor bases*. Chef Leruth had created many of the

foods and flavors for Popeyes, including their famous biscuits. He had worked with the L.J. Minor Corporation, Nestlé, and Outback Steakhouse among numerous others. At this time, most food products for volume feeding were created by food scientists. For the most part, chefs had not yet thrown their toques into the arena. I was mesmerized by Chef Leruth, who was a genius and a phenomenal storyteller.

He talked about Nicolas Appert, who answered Napoleon Bonaparte's challenge to create transportable, quality food for troops on the move. Chef Leruth talked about Louis Pasteur, the chemist and microbiologist, who developed the principles of pasteurization during the mid-1800s. He talked about John Mason, the Philadelphia tinsmith who invented and patented the Mason jar; Henri Nestlé, a pharmacist who helped develop condensed milk; Henry Heinz, founder of H. J. Heinz Company; and Clarence Birdseye, founder of the modern frozen food industry. We discussed names like J.L. Kraft, who revolutionized cheese production, and John Dorrance, who devised a method to condense soup and eventually bought out the Campbell's Soup Company. We even discovered we had a mutual friend, Louis Szathmary, who in just 10 years went from immigrant short-order cook to developer of frozen food products for Stouffer's and, later, NASA. As a lover of history, I was enthralled and found his document about stocks and coagulation by Marie-Antoine Carême fascinating.

As I got up to leave, Chef Leruth jotted a quick note, then sealed it in an envelope inscribed with my name. It was a gift that I was not to open until he was gone. Many years later, after eulogizing Chef Leruth at his funeral in November 2001, I opened the envelope to discover his secret recipe for his magnificent golden vanilla ice cream, which he had created as the base for his Chelsey's Frozen Custard company. It is one of the greatest gifts I have ever received. When I left Chef Leruth's company, my brain was spinning with thoughts and possibilities. That is how I spent my first day of school in volume food manufacturing.

In 1995, I acquired a small USDA food manufacturing plant in New Orleans. As I became more involved in food manufacturing, I met icons such as Ferdinand Metz of H. J. Heinz; Juerg Aeschbach, product developer for Albertsons and Wolfgang Puck Food Company; and John and Betsy Lattanza, who were also mentors. At that time, chefs really

had few resources to learn about the science of cooking. Thank goodness we did have Harold McGee's *On Food and Cooking*, which was published in 1984.

In 1994, I became president of the American Culinary Federation, the largest organization of professional chefs in the United States. It was a great time for chefs in America, and my goal as president was to better understand the diversity within the organization and the need for specialization in culinary education. I was proud to lead the movement to establish the African American Chefs Association within our ranks and the Women Chefs of America. At our annual convention in 1995, a small group of chefs involved in product development met to discuss the concept of their own association to meet the needs of the research chef community that was slowly growing.

Among the leaders of this group were Winston Riley (who headed the group and coined the word "Culinology"), Walter Zuromski, Jeff Cousminer, and our late colleagues Skip Julius, Bill "Pops" Hahne, and others who wanted their own organization. By 1996, the Research Chefs Association (RCA) hosted its first annual conference in Cleveland, Ohio. Finally, there was an organization representing that group of men and women who were filling a much-needed niche: culinary research and development for food manufacturing.

At one time, chefs and food scientists existed in two different worlds, knowing nothing of each other. Now, both were playing a role in the emerging American food movement. For chefs wanting to push their creative boundaries, the science behind the mystique of food was calling.

RCA focused on the scientific and technical curiosities of food products and was quickly and successfully generating tremendous interest on the culinary landscape. By 1999, the RCA touted a 500-chef membership, including me. In 2000, the RCA conference was held in New Orleans, and I was elected to the board of directors. I remember the excitement as Dan Sortwell, Skip Julius, Greg Grisanti, and Joe O'Connor were awarded the very first Certified Research Chef certificates. It was a great day!

Research chefs, or those desiring to become research and development chefs, found a home within this emerging association. Culinology®, the marriage of culinary arts and food science, was born, and the first Culinology® class for chefs

was held at Rutgers University in 2001. Jeff Cousminer and his education committee were working feverishly to expand Culinology® curricula, first in continuing education programs and then in undergraduate degree programs throughout the country. How could one possibly forget the roar of applause at our conference in 2003 when Donald Moss earned the first bachelor's degree in Culinology® from the University of Nebraska-Lincoln?

Soon, four-year degrees in Culinology® were available at colleges across the country, including Clemson University, Rutgers University/Mercer County Community College, the University of Massachusetts-Amherst, Louisiana State University/Nicholls State University, Southwest Minnesota State, and more. And then Culinology® education went global, when in 2011 the first international bachelor's degree program in Culinology® was launched at Taylor's University in Kuala Lumpur, Malaysia.

Imagine how proud I was to become national president of the RCA in 2005. Our marketing campaigns created a buzz throughout the industry, and RCA members were taking the stage at annual conferences from the National Restaurant Association to the International Hotel/Motel Show. Our membership growth was constant, and our strategic partnerships were strong. Our educational programs and certifications continued to become the reason for belonging to RCA. I am so proud to have been in a position to see Culinology® become a sought-after industry standard with more and more national and international food companies seeking Culinologists in their kitchens, thereby growing the value of this unique brand. Our national headquarters was set up in Atlanta, and alliances with the Institute of Food Technologists were established.

Now, within the ranks of RCA, *the* book on the subject has been written! And what better way to mark the 20th anniversary of the Association than with the publication of *Culinology®: The Intersection of Culinary Art and Food Science*. I am ecstatic to see it become a reality under Jeff Cousminer's vision. Congratulations to everyone who has made this long anticipated book a reality, and to Jeff for inspiring others to achieve culinary research greatness as well.

—CHEF JOHN FOLSE

Preface: So What the Heck Is Culinology[®], Anyway?

J. Jeffrey Cousminer, Past President, Research Chefs Association; R&D Manager, Stonewall Kitchen
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As chefs, the foods we handle every day have deep scientific underpinnings. But approaching the whole subject of food science can be scary to people who equate it with long-forgotten and even intimidating high-school chemistry.

Yet once a chef gains the kitchen skills necessary to work through the most challenging meal service periods and create awesome signature dishes, what's next? For successful chefs who really want to push their creative boundaries, the science behind the mystique of food is calling. The next challenge is exploring the origins, the make-up, and the scientific and technical curiosities of the foods we devote ourselves to every day. Enter Culinology[®].

Simply put, Culinology[®] helps us understand how and why things happen to food during the preparation and cooking process, and once learned, how we can manipulate them to our advantage. Have you ever picked up a jar of commercial mayonnaise, looked at the ingredient statement on the label, and wondered why it was different from the mayonnaise you might make in your kitchen? Well, each ingredient in the jar is necessary for a commercial product to enter and survive in the mass marketplace. And this is true for more than mayonnaise. Today's supermarket shelves are lined with products carefully developed to satisfy the savvy tastes of our food-obsessed nation while maintaining high standards of quality, safety, stability, and affordability.

Today, the public wants and expects their favorite foods to be available everywhere, from the finest restaurants to supermarket shelves. But how does this happen? How does a chef who has mastered the most creative restaurant menu items take one of them and reproduce it to meet the demands of a mass-market launch? How is restaurant food transformed into a mass-produced item while maintaining quality and authenticity but without incurring staggering costs? How do the culinary skills of the chef and the food science experimentations of the product developer work together to create delicious food that won't perish before it reaches the consumer? *The answers are found in the study of Culinology[®].*

Culinology[®] blends the underlying principles of food science and technology with the chef's skilled art of culinary creativity and originality to satisfy public tastes in the marketplace.

Culinology[®]: The Intersection of Culinary Art and Food Science, by the Research Chefs Association, is designed to help professional chefs (as well as culinary students and product developers) approach the science behind the foods they are developing in their labs and test kitchens, and learn how to apply Culinology[®] to the challenging and rewarding career of new product development (NPD).

The trained Culinology[®] professional plays an important role in the development of a food item from concept to mass-market launch. Let's return to the example of mayonnaise.

Chefs find it fairly easy to make mayonnaise in a restaurant setting: Blend together egg yolks, vinegar or lemon juice, sugar, salt, and a touch of mustard, and then slowly drizzle in a generous measure of vegetable oil while whisking rapidly; very soon, the mixture starts turning lighter and thicker and shinier and . . . *voilà*: mayonnaise! In comparison, look again at the ingredient statement on the label of a jar of commercial mayonnaise. Why is there a difference between the two?

The difference is that in the much larger scale of the new product development world, additional considerations must be taken into account, such as safety, shelf life, nutritional value, and ingredient and production costs. A lot is riding on these decisions. The Culinology[®] professional understands the full cost of developing a product from start to finish and the risks entailed if the product fails.

For example, let's say you want to develop a better version of commercial mayonnaise. This book will help you identify and explore questions such as these *before* you begin:

- What is different about this better mayonnaise that will make it competitive (and successful) in the marketplace?
- Will it be a standard mayonnaise (containing eggs, full fat, etc.), or will it be a specialty product that may not

- meet the government's *standard of identity* for mayonnaise (and will therefore require special labeling)?
- Will any of the ingredients require call-outs on the label for allergens (eggs or soy), vegan (egg-free), or other label claims (low fat, reduced sodium, good source of omega-3 fatty acids, organic, GMO-free)?
 - Will it be packaged in glass or plastic? pails? jars? pouches? tubes?
 - Will it be available in multiple sizes: large bulk packages, gallons, quarts, pints, single-serve squeeze packs?
 - Will it be marketed to industrial accounts to be used as an ingredient in another manufacturer's products, or to foodservice—that is, the restaurant trade—or to retail supermarkets or specialty stores? Or all of the above?
 - How will you ensure shelf stability and safety?
 - Will the new product run on standard machinery, or will it require capital investment in new equipment?
 - How will you tell when you've achieved your objectives (sensory, health or other benefits, preference over market leaders, profitability, and so on), and how can you predict success in the marketplace?

- Once the product is launched, how will you measure its success, and how can you ensure continuing success?

And that is only the beginning!

Through the study and application of Culinology®, more food scientists are exploring culinary arts and more chefs are studying food science with the common goal of giving consumers the best possible foods while ensuring product profitability. This book will help you begin thinking like a Culinology® professional by explaining what it takes to bring a product to market.

Culinology® is a shift in how we think about food and food production. No longer must food science and culinary arts work in isolation; they have formed a symbiotic marriage, mutually dependent and interactive, mutually strengthening and reinforcing. By studying the science behind the food, you can become a Culinology® professional: a leader in the development of a new wave of exciting, crave-worthy, nutritious, safe, and profitable food products. Welcome to your future!

Welcome to Culinology®!

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RESEARCH CHEFS ASSOCIATION:

Defining the Future of Food®

Headquartered in Atlanta, Georgia, the Research Chefs Association (RCA) is a not-for-profit organization dedicated to the education and professional growth of individuals engaged in food product development. RCA was founded in 1995 (and incorporated in 1996) by a small group of research chefs hoping to learn from and share with other like-minded professionals facing common challenges in the development of new food products at the commercial level.

Today, the organization boasts 2000+ members including chefs, food scientists, food technologists, writers, nutritionists, academicians, researchers, consultants, sales and marketing professionals, suppliers, co-packers, distributors, and students. Its mission: Empower the food community to enhance food experiences through Culinology®, a fast-growing approach to food product development that requires a deep understanding of culinary arts as well as food science.

Having pioneered the discipline, RCA is the premier authority on the practice of Culinology® and owns the registered trademark. Today, more than a dozen RCA-approved undergraduate Culinology® degree programs in the United States and Malaysia offer well-rounded, interdisciplinary curricula that focus on culinary arts and food science but also incorporate other aspects of food product development, including business management, nutrition, processing technology, and government regulations, to name a few.

The Research Chefs Association also offers a robust certification program that certifies qualified candidates as Certified Research Chefs (CRC®) or Certified Culinary Scientists (CCS®), which, together with the Culinology® degree programs, provides the food industry with today's most valued product developers in the world. Culinology® graduates and RCA-certified professionals are sought by employers because they guide innovation in this dynamic industry, offering unique credentials and powerful, value-added skills that are truly Defining the Future of Food®.

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Lastly, we are all indebted to Winston Riley, the man who laid the foundation for the Research Chefs Association, brought together the early adopters, set forth its goals, created its infrastructure, and set in motion the groundswell of support and recognition that brought us to where we are today. Oh, and by the way, he invented the term *Culinology*®. Thank you, Winston!

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The Business of New Product Development and the Role of the Culinology® Professional

Mark Crowell, CRC®, Principal Culinologist, CuliNex, LLC

Barb Stuckey, Executive Vice President, Mattson

● Introduction: Why Is New Product Development Important?

New product development is fraught with difficulty, cost, and high rates of failure. Why do companies pursue it? Would it not be simpler to do the minimal amount of development necessary to stay in business? Or simpler still, wouldn't it be easier to coast along with existing products?

Both options would certainly be simpler, but the company would not be profitable for long. Food companies must grow to make money and survive. As John Maynard Keynes put it so succinctly in *A Treatise on Money*, "The engine which drives Enterprise is not Thrift, but Profit."¹

Developing new food products is one of the major ways a food company can build profits. It is estimated that only one new product idea in 58 actually makes it through the development process and yields a successful new product.² Yet some companies realize a whopping 50 percent of their sales and 40 percent of their profits from products on the market five years or less, according to Robert Cooper, professor of marketing and technology management at McMaster University in Ontario.³

Five dominant forces drive the need for new food product development:

1. Life Cycle

- Nearly all products have life cycles. They enter the marketplace, flourish for a time, then die and must be replaced. A very few defy the odds and seem to stay in

the market indefinitely: Kellogg's Corn Flakes®, Spam®, Kool-Aid®. But they are the exceptions.

2. Stakeholders' Expectation of Growth and Profit

- A company's management may adopt a policy of aggressive growth to satisfy long-range business goals and repay investors or stakeholders. New products are seen as a way to achieve these growth goals.

3. Changing Consumers

- Consumer populations may change due to immigration, demographic shifts, and a host of other means of social evolution. These changes may require the development of new products more suited to the makeup of the new marketplace.

4. Technology Advancement

- New technology may enable development of new food products more suited to the lifestyles of current consumers. It may also offer increased assurances of food safety, higher food quality, or greater efficiency in production.

5. Evolution in Regulations or Public Health

- Changes in government legislation, health programs, agricultural policy, or agricultural support programs may dictate (or support) the development of new food products.

● Sources of Growth

Most companies exist to generate profit. Senior management, under the direction of the owners or the shareholders, follows a corporate business plan that sets out specific financial and growth objectives.

Food companies can achieve growth in a limited number of ways:

1. *Expanding into New Markets*

Many companies that launch a product in California decide they next want to tackle the New York market because coastal consumers tend to be similar in attitudes, behavior, and product preference. This can be expensive for products with short shelf lives due to the need for distribution in refrigerated or freezer trucks. Extremely perishable fresh products may last only a few days, making cross-country distribution impossible under any conditions. A distribution system and its cost may limit expansion. Export markets present their own unique risks.

2. *Growing Market Share*

One of the most logical places to find customers for a new product is to grab them from a competitor. This means of growth is about trying to achieve market penetration and share within existing markets by slugging it out with competitors. Large sums of money are required for advertising and promotion, buying shelf space (slotting allowances), and funding sampling programs.

3. *Developing Targeted New Products*

New products can contribute to growth and profitability. For example, as the baby boomer population ages, a food company may decide to develop new products that offer benefits that appeal to aging seniors.

At the same time, another company may decide that aging baby boomers moving into retirement (and, hence, fixed incomes) may no longer be able to afford their products (or services—for example, dining in expensive restaurants). Their new approach may focus on developing products to target the younger generation of consumers—for example, the Millennials (those who came of age in 2000 and are at the beginning of their prime earning years).

Either of these new consumer targets could provide a huge profit opportunity. There are, however, associated costs with each, to be explained later in this chapter.

New products can also help a company differentiate its offerings, reducing the need to compete on price, which often occurs when competitors enter an existing market and drive profit margins down.

4. *Cost Containment*

Reducing expenses and overhead costs is also a common practice during a company's growth phase. Methods of reducing expenses include reducing staff, implementing an energy conservation program, improving process efficiency, adopting a waste management program, streamlining procurement, negotiating better prices, and adopting a process and quality control program (to reduce losses through overfill, waste, and product returns). These thrift measures may help companies' profitability but are of limited value to growth. Companies may own food or beverage manufacturing plants that cost hundreds of thousands—if not millions—of dollars to build, purchase, or lease. These plants often carry mortgages or rental payments. As a

result, it behooves companies to make sure these fixed assets operate at full capacity. An underutilized plant is a drain on resources because it costs money to maintain whether it is producing a low or high volume of goods. The more goods it cranks out (maximizing throughput), the more income the company can make to pay for its operation and maintenance.

So companies usually decide to develop new products that can be manufactured in their existing plants. If these products can be produced during the off (or slow) season, this makes new product development even more attractive, as there is incentive to spread production evenly throughout the year. This keeps trained workers continuously employed, reduces plant overhead, provides a steadier cash flow, and benefits the community (provides jobs, raises the standard of living, increases discretionary spending, and improves the tax base). A plant operating year-round is more profitable than one that is idle part of the year, and a plant operating at full capacity is usually more profitable than one operating at reduced capacity.

● The Food Industry

The U.S. food processing industry is often taken for granted. Except in times of crisis, such as a national food poisoning outbreak (like the salmonella-contaminated peanut case in 2009), it has become a feature of the economic landscape so unremarkable as to be nearly invisible.

The food industry may appear unremarkable for many reasons. Many processed food products that were wildly innovative when originally developed many years ago (canned foods, frozen foods, etc.) are now so familiar in this high-tech age that they are viewed as humdrum. Another reason may be that the food industry runs so incredibly efficiently. In fact, in the latter part of the late twentieth and early twenty-first centuries, the food production, distribution, and retailing systems were optimized to the point where cereal seemed to sprout from the shelves of Safeway, Kroger, and Wal-Mart, meat and poultry came from the deli or fresh meats counter, and produce grew itself into plastic trays in the produce section. We became completely separated from where our food actually came from.

Food processing used to be closely linked to agriculture or domestic household activities. Many processing industries were originally part of farm operations (such as butter- and cheese-making) or were based on domestic kitchen skills (pickling, canning, baking). Modern food processing is more like that of other mass-manufactured products (such as cell phones, clothing, and cars) than the local crafts of the recent past. The chasm between farming and processing is widening.

Some operations employed by food processors, such as flour milling, are indeed ancient in their origins, but the methods and equipment in use today bear little resemblance to ancient gristmills. Most of today's food processing technologies are the result of modern scientific discoveries and decades, if not centuries, of technological refinement.

● Food Development Today

The food marketplace is a constantly changing organism; it is never static. Several factors contribute to this dynamism. Today's consumers are bombarded with food media. With round-the-clock cable network food programs, splashy food magazines and cookbooks, morning and evening news programs showcasing cooking, and the celebrity status of big-name chefs, the average U.S. consumer is now savvier about food than ever. For many people, food preparation has gone from daily drudgery to a medium for creative expression, relaxation, and entertainment.

As a reaction to the evolving food culture, consumers now have more choices than ever. With the ability to buy food via warehouse stores, mail-order catalogs, convenience stores, ethnic groceries, specialty food stores, farmer's markets, the telephone, the Internet, and increasingly, directly from farmers, consumer buying habits are changing. Because of this, the traditional supermarket has had to adapt. For example, some grocery stores, such as Whole Foods, have become a collection of food boutiques surrounding the traditional center-store aisles of staples. An abundance of restaurants, cafés, fast food outlets, service delis, gourmet bakeries, smoothie bars, fresh juice stands, and store-made sushi and pizza are all available at a wide range of supermarkets (or "hypermarkets" as some of the larger stores like to call themselves). These operations give consumers many ready-to-eat, prepared food options where they used to just purchase food for cooking or reheating at home.

The consumer has a strong influence on the food and beverage marketplaces. But who *is* the consumer?

The profile of consumers in any marketplace, particularly the retail marketplace, is constantly changing. The result is a change in buying habits. Many factors cause this. Population movement brings changes in the ethnic background of neighborhoods, and with these shifts come consumers with different food needs. Populations, and thus neighborhoods, age. Formerly vibrant city neighborhoods may decline due to economic downturns. Empty downtown city neighborhoods may enjoy a rebirth as a fashionable area for young professionals. Most geographic market areas are in a constant state of flux with respect to the ethnic makeup, incomes, education, and lifestyles of their consumers. As both consumers and marketplaces change, food manufacturers serving those market sectors must respond to those changes quickly.

This fluidity in the marketplace must be accepted by the food processor as a challenge (and a never-ending source of work for Culinology® professionals!). No single product can answer all the demands of consumers all of the time. New products are needed to satisfy emerging market niches, new lifestyle trends, and changing demographics. The subtle and not-so-subtle changes in the marketplace can be a great motivator for product development.

Another major factor driving the marketplace is competition. A competitor can launch a new and improved product into the marketplace at any time. This can instigate a reaction

from any company whose sales might suffer from the new product. This retaliatory action may involve new pricing strategies, promotional activities, or the development of new products to combat the competitor's intrusions.

● Product Life Cycles

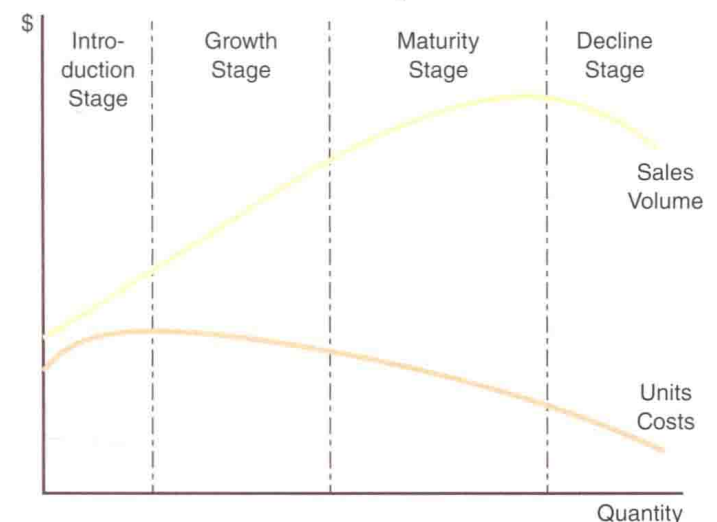
Every product has a life cycle. When first introduced, new product volumes are low. It takes time to build a business. Volume grows as consumers buy, are satisfied, and make repeat purchases. In time, competitors enter the market, which eventually becomes saturated; sales volume levels off and gradually declines as consumers grow bored with or switch to other products.

A product life cycle has five phases:⁴

The Stages of a Typical New Product Life Cycle

1. New product development
 - very expensive
 - no sales revenue
 - research and development costs
2. Market introduction
 - high cost (retail slotting fees)
 - low sales volume
 - no known competition; competitive manufacturers watch for acceptance/segment growth
 - continued research and development costs
 - demand must be created
 - customers must be prompted to try the product
3. Growth
 - significant increase in sales volume
 - costs reduced due to economies of scale
 - growth of profitability
 - increased public awareness
 - increased competition, with a few new players entering the market
 - margins sacrificed to allow lower pricing to maximize market share (for trade deals, trial coupons, etc.)

FIGURE 1.1 Product life cycles.



Source: Mark Crowell, CRC®.