

Introduction

In the spring of 2013, I accepted the post as executive chef of Graze Vegetarian, a new, plant-based restaurant opening in Vancouver, British Columbia. Creation of a solely plant-based menu that would have broad appeal and yet be creatively interesting was our primary goal. As part of that, we decided plant-based, dairy-free cheese, or cheese analog, would have a place on the menu. Not satisfied by what was available in the market at the time, I began searching for compelling recipes or methods on the internet.

Much of what I found were recipes that involved a nut or seed component blended with nutritional yeast, water, salt, and some sort of acid, usually lemon juice or apple cider vinegar. Some included miso, others onion and garlic powder, an attempt to capture an umami sensation. These cheesy spreads were tasty but more relevant as dips than cheese. Other recipes involved cooking similar-type mixtures with agar agar or kappa carrageenan and sometimes incorporating a starch. These methods ostensibly create firm cheeses, as agar agar and kappa carrageenan are strong binders that yield a semi-firm set in the final product.

Then there were the recipes including some level of fermentation using a rejuvelac. Rejuvelac is a fermented liquid made from sprouted grains, very often wheat berries. This fluid is rich in microbes (bacteria and some yeasts) and works effectively as a culturing agent. A mixture of blended nuts or seeds is fermented with the addition of some rejuvelac and then drained and shaped and “aged” or, in some cases, then cooked with agar agar or kappa carrageenan and sometimes mixed with coconut oil to create a cultured semi-firm cheese of sorts. What these particular recipes often demonstrated was an incomplete understanding of what role the fermentation component was playing, and in some recipes that I found,

the culturing agent was added when the mixture was at too high a temperature. Nonetheless, I began my own experiments informed by this background.

My initial cultured cheeses were primarily in either the ricotta or chèvre style (meaning fresh, young, soft) and employed rejuvelac, sauerkraut brine, kombucha, or probiotic capsules. The results, while interesting and able to create tasty cheese-like results, always seemed limited to one note with respect to acidity and flavor, and in the case of using probiotic capsules, highly inconsistent. As I began to think more about what cheesemaking itself is, I was fortunate to have a young chef, Katie Luebke, apply to stage with me at Graze.

Katie, already working full-time as a cook at another restaurant, had heard that I was doing a lot of fermentation and culturing and making plant-based cheeses. She had a serious interest in culturing processes herself, and spent two days a week for nearly six months in the Graze kitchen helping me carry out a variety of experiments testing mediums, cultures, aging processes, archiving the cheese and taking notes—so many notes.

We explored the recipes and methods available to us from the plant-based realm and found that most recipes had insufficient method and explanation for



Above: *Almond Feta Test*, Graze, 2014.



Right: *Almond, cashew, and Brazil nut/coconut milk cheeses on aging boards, ready for inspection at Graze.*



Curd tests, Graze, 2014.

how and why particular ingredients were selected. In our naïve experiments, we were able to identify aspects we wanted to understand better, and we had some interesting and sometimes unintentional outcomes (accidents) that demonstrated there was so much more to know. What was abundantly clear was that fermentation and culturing were going to be integral to what I wanted to do.

I wanted a deeper understanding of the role of fermentation within cheesemaking, and I wanted to make products that could feel satisfying from both flavor and textural perspectives. Thus, I turned to studying traditional dairy cheesemaking methods. Developed over centuries, dairy methods reveal the evolution of a craft from accident to scientific and intentional.

In the course of reading and researching, I began thinking of cheese as a concept. Any particular cheese within the traditional, dairy cheesemaking (and here I am

Cheeses at Graze, 2015.



focused on the craft of cheesemaking and not the dairy industry as a whole) context is an end product, the result of several processes, beginning with the use of microbes and or digestive enzymes that begin the transformational process. Although all foods that begin with raw materials become the end product through a series of processes, there is something essential about the act of fermentation, the use of microbes, in relation to desired outcomes in cheesemaking.

For instance, you cannot simply mimic a blue cheese by adding color or sharp flavor. The recognizable aroma and flavor of blue cheese is inherently a result of the metabolic action of the *P. roqueforti* mold on the dairy medium along with other microbes. Similarly, to make a hard cheese, simply adding agar agar or kappa carrageenan or other setting agents is not sufficient. They retain moisture, whereas in true hard cheeses, there is low moisture content, a result of the time and processes required to remove moisture from a cheese, which then leads to a densification of the cheese curd.

Understanding cheese this way, as a concept, invigorated my desire to test and refine my own approach to cultured plant-based cheesemaking. It also made

me really want to comprehend what the various microbes do and why what they do is important. I wanted to understand the microbes as living agents, not as “probiotics” or some other blanket term that renders their agency invisible or, at best, neutralizes them as being just another ingredient.

After Katie and I began pursuing this understanding through further tests, we had a number of happy surprises, a few unexpected results, and, of course, some things that didn’t quite work out as desired. And I developed an appreciation for a type of food that I had never had much attachment to previously. Our effort resulted in production of a few consistent “types” of plant-based cheese that Graze then sold at the Vancouver Farmers Market in 2015.

With the closure of Graze Vegetarian in November of 2015, I continued pursuit of my research and interest in making cultured plant-based cheese, deciding that I would eventually launch my own plant-based, vegan cheese brand. I landed on the name Blue Heron, which represents my love of the British Columbia west coast (unceded lands), and my long-standing admiration of the great blue heron. In early 2016, I reconnected with a former Graze guest, Colin Medhurst, at an event at which I was sampling some of my cheeses. From there, it quickly turned into a business partnership, and I have discovered a brother in Colin.

Colin viewing
Blue Heron storefront
design plans, 2018.





*Cheese board for Colin's
Wedding, September 2019.*

I have learned many things over the past few years. The most significant are that this is an exploration driven by endless curiosity and that I remain a novice with an insatiable desire to learn. Things that I have written or taught or thought or practiced have changed, evolved. Making cheese and working with cultures means committing to learning constantly, practicing patience, and studying the smallest details. This is something I hope to be doing for a very long time.

This book is an invitation to the seriously interested and actively curious in cheesemaking, hopeful to participate with me in an exploration and development of cheese, to participate with the now many others seeking to expand the idea of cheesemaking itself, to choose patience, observation, and time over speed and instant gratification. It is an invitation to deeper understanding and, therefore, more care. More care about making food. More care about where food comes from. More care about how we feed ourselves and share with others. More care about our impact on this planet. Making food, and cheese, is ultimately the way I choose to express love.



1

ON HISTORY AND DEFINITIONS

Cheese. Creamy, sharp, firm, tangy, pungent, mild, aromatic—the sensory adjectives are plentiful. The textures and redolent aromas of this cultured food have inspired a romantic obsession. There are thousands of varieties of cheese, all cultured from goat’s milk, cow’s milk, sheep’s milk, buffalo milk. In principle it is a simple food. Rarely made up of more than ingredients—a medium (historically, animal milk of some kind), salt, enzymes, microbial cultures—cheese maintains an almost primitive hold on the human palate.

Cheese is one of the oldest of modern foods. Humans across nearly every culture have developed some form of animal milk into this cultured and (sometimes) aged foodstuff. Cheese craft has thousands of years of history behind it, with some estimates that cheesemaking with animal milk has been happening for about 4,000 years. Cheese is the outcome of an accident of circumstance (lack of refrigeration for preserving milk) and organisms (bacteria and molds). Cheese is a by-product of fermentation, culturing, and time (aging). Early versions of cheese would have been soured curd, loose, soft, not shaped, and eaten as a subsistence food by nomadic peoples. Evolving from this early product of accident, thousands of varieties of cheese have been created and hundreds of localized, artisan practices. There is not one dairy cheese that defines all dairy cheeses.

Like all forms of fermentation and culturing, cheesemaking evolved as a means of preserving food for the long months after the harvest when food was sparse. Now, along with many fermented and cultured food practices such as sauerkraut, kimchi, tempeh, beer, and wine, cheesemaking has become one of a growing number of do-it-yourself pursuits of ardent foodies. In recent years, a number of books have been written with this pursuit in mind, including *The Cheesemaker’s Apprentice* by Sasha Davies and *Basic Cheesemaking* by Gianacis Caldwell. Cheesemaking kits for the home user are readily available online and in boutique food shops, allowing folks to explore making their own ricotta, cream cheese, burrata, mozzarella, and others.

Cheese and cheesemaking are continually evolving, and the latest area of development is plant-based, dairy-free alternatives. Understanding why this pursuit has gained traction is relevant. As plant-based and vegan eating and lifestyle choices in general have moved from the periphery of most cultures to the mainstream of many—especially in some of North America and Western Europe—and is growing rapidly in other places, forsaking cheese is often seen as the last barrier to overcome. Three primary areas of concern inform this dietary shift to embracing plant-based/plant-forward eating and lifestyle choices, particularly in the West: environmental, personal health, and animal welfare/animal rights. As evidence mounts for the benefits of, at the very least, minimizing as

much as possible our consumption of animal products for both personal health, environmental, and ethical reasons, a growing market is seeking alternatives to favorite items. This has included a surge in alternatives to cheese and other dairy foods such as butter and yogurt.

In many ways, Miyoko Schinner's book *Artisan Vegan Cheese* set the stage for the direction of the evolution, advancing the idea of plant-based, dairy-free cheese beyond cheesy flavored pâtés and spreads, which have primarily filled the void for those avoiding dairy cheese. Putting forward recipes that involve some degree of culturing (probiotic or rejuvelac application) and flavor outcomes that are at least somewhat familiar, this book has inspired many home foodie and prospective artisan plant-based cheesemakers alike.

*Blue Heron Herbed
Coconut Kefir cheese.*

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A claim that processes such as these produce some form of cheese is seen as controversial, particularly by ardent dairy cheese lovers and many in the dairy cheesemaking industry. This controversy is not necessarily unfounded or even irrelevant. To understand a little of why there is controversy around the growing vegan, dairy-free cheesemaking sector using the beloved word “cheese,” and even around the premise underlying this book, it is important to know how the traditional sector understands what constitutes cheese.

The Codex Alimentarius of the Food and Agriculture Organization of the United Nations is a set of standards regarding different foods that is accepted internationally. These standards assist producers and trading nations alike in terms of providing definitions and guidelines that allow a common understanding to form. The Codex, then, is a set of “international food standards, guidelines and codes of practice that contribute to the safety, quality, and fairness of (the) international food trade.” According to the Codex:

Cheese is the ripened or unripened soft, semi-hard, hard, or extra-hard product, which may be coated, and in which the whey protein/casein ratio does not exceed that of milk, obtained by: (a) coagulating wholly or partly the protein of milk, skimmed milk, partly skimmed milk, cream, whey cream or buttermilk, or any combination of these materials, through the action of rennet or other suitable coagulating agents, and by partially draining the whey resulting from the coagulation, while respecting the principle that cheese-making results in a concentration of milk protein (in particular, the casein portion), and that consequently, the protein content of the cheese will be distinctly higher than the protein level of the blend of the above milk materials from which the cheese was made; and/or (b) processing techniques involving coagulation of the protein of milk and/or products obtained from milk which give an end-product with similar physical, chemical and organoleptic characteristics as the product defined under (a).²

For a complete list of the cheese standards outlined by the Codex, visit fao.org. Even without this formal definition, many ardent cheese lovers and makers alike do balk at the notion that a plant-based dairy-free cheese could be made and be legitimately understood as cheese.

Indeed, my company, Blue Heron, received an industry stimulated complaint from the Canadian Food Inspection Agency in January of 2019, and in

2015, Zengarry, another Canadian vegan cheesemaking company, also met with regulatory challenge regarding the use of the word “cheese.” The underlying basis for regulatory complaints about the use of the word “cheese,” aside from the political, is that there are complex standards of identity for each type of dairy cheese and that the processes employed in non-dairy cheesemaking do not meet these standards. Underpinning all of it is the notion that animal milk alone can become cheese, regardless of process employed.

In contrast to clearly established standards of identity for (commercial) dairy cheesemakers, the vegan dairy-free sector lacks any coherent standards of identity, lacks ubiquitous practices and methods, and even an understanding of just what vegan cheese is. At best, the term “vegan cheese” refers, colloquially, to a product that is simply dairy-free, animal-product-free, and is generally made to physically resemble, either in form or via packaging, dairy-cheese products.

It is expected that as the methodology and practices in the plant-based cheese sector continue to evolve, the sector will develop its own standards of identity, and possibly even push the boundaries of dairy cheesemaking within a regulatory context.

To that end, after considerable and loud pushback by our supporters and efforts on our part to ensure that we would be compliant with the current regulatory framework, Blue Heron received approval from the CFIA to use the word “cheese” provided we precede it with “100% dairy-free, plant-based.” While not a ruling that can be ubiquitously applied to others in our sector, it serves as evidence that despite emotional attachments to the notion, the boundaries of what constitutes cheese are shifting, albeit slowly.

Although the majority of mass produced plant-based cheeses are of the non-cultured variety, (for instance, Daiya, Chao, Earth Island, Violife, Parmela), the number of companies focusing on cultured vegan cheeses is growing rapidly. Miyoko’s Creamery is the largest and most recognizable brand in this arena, but notable participants such as New Roots (Switzerland), Happy Cheeze (Germany), Cashewbert (Germany), Artisa (Tasmania, Australia), Blue Heron (Canada), Nuts for Cheese (Canada), The Cultured Nut (Canada), La Fauxmagerie (Canada), Zengarry (Canada), Wandering Deli (Canada), Reine (USA), Blöde Ku (USA), Rebel Cheese (USA), Cheezhound (USA), Conscious Cultures (USA), Living Food BCN (Spain) are a cross-section of companies from the very small to medium-sized companies applying various aspects of fermentation and culturing processes in an effort to create products that have more depth, flavor, and cheese-like qualities than the analogs, which are primarily combinations of starches, proteins, and seasoning or flavoring.

Certainly, these efforts open the door for those advancing the culturing of non-dairy mediums, and other companies or projects such as Perfect Day and Impossible Foods are poised on the horizon to disrupt the dairy industry further with the production of non-animal derived casein and whey proteins for use in making non-dairy cheeses. What cheese is and what vegan cheese is will continue to be volubly and actively challenged in the coming years. It is my intention with this book to offer up on a small and practical scale insight into what informs some of this discourse, allowing the user-reader to understand and to participate in the development of cultured plant-based cheesemaking as a legitimate evolution of cheesemaking itself.

Exploring a small sampling of approaches to making plant-based cheeses from non-cultured processes to more involved culturing and aging processes, this book intends to help the user recognize and understand the differences between non-cultured and cultured cheeses via hands-on exercises. This is primarily a methodology book, with recipes intended to highlight core principles and processes. Since the first edition of this book was published, I have had the opportunity to re-evaluate some of the original processes and methods based on reader feedback, the content in the classes I teach, and my own ongoing research. Subsequently, I have made amendments to several processes and methods, added new information, more photos, and, significantly, there are three new chapters.

There are many fascinating things about culturing and fermentation, and the principles learned in this book do not apply only to cultured vegan cheesemaking, so I have also included easy, basic methods for making live cultured vegan yogurt and cultured butter.

I have added a chapter on using molds in vegan cheesemaking. While not as comprehensive or as robust as a parallel section in a dairy cheesemaking book, this chapter is a good introduction to how molds work in cheesemaking and why they are used. Additionally, I provide a couple of relatively simple methods for making a vegan blue cheese and a vegan white mold or bloomy rind cheese. The objective of the chapter is to help the reader become familiar with and understand what molds are, why they are used in cheesemaking, and how to work with them toward a successful outcome.

Finally, with all the focus on methodology in the early chapters of this book and given how often I am asked by Blue Heron clients, readers, and students, “what can I do with this?” I have also added a recipe chapter. This includes recipes demonstrating easy ways to use cultured and non-cultured cheeses. Recipes such as Artichoke and Spinach Dip, Pear Tarte Tatin, Herb, Potato, Mushroom, and Asparagus Galette will give you a framework for building out your own creativity.

This book invites the curious reader to try their hand at a few of their own plant-based cheesemaking experiments and to find ways of expanding their personal understanding of what cheese is. As readers explore making and using cultures, they have an opportunity to experiment with creating cheeses to suit their own preferences, to understand how the culturing process works (and sometimes fails), and to become familiar with a practice that has its roots in thousands of years of human history and food preservation.

Cheese, a Product and a Process

Traditional cheese or “true cheese” as the New England Cheese Making Supply company calls it, is generally defined by the consolidation of milk proteins

Selection of Blue Heron Creamery cheeses. Vegan cheesemaking is rapidly evolving both in homes and commercially. Advances in knowledge and technology will see this sector expand further into the mainstream.

CREDIT: YUSHIIN LABO



(caseins) with calcium and enzymes (rennet), followed by the development of acidity using lactic acid forming bacteria, which converts the sugars of the dairy to lactic acid, followed by the modification of protein during the aging process, resulting in different textures and flavors.

Earlier, I referred to the United Nations Codex Alimentarius definition, or, rather, standard for identifying cheese. When articulating how I understand cheese and therefore how I perceive the differences between cultured vegan cheese and non-cultured cheese-like products, I turn to this definition that emphasizes the process employed in making cheese, not the end product, in determining what cheese is.

It may seem difficult to see how I find my definition of plant-based cheese within these strict confines, but in opening up the traditional and official definition of cheese, I am choosing to understand and evaluate cheese as a concept. That is, I have elected to pull apart the Codex definition and focus on process components: coagulation of a protein rich medium (in my case nut, seed, and other bases), acidification of the medium with a lactic acid forming bacterial culture, and the use of aging methods to develop different characteristics.

As with “true cheese” in the Codex definition, I do not consider the use of thickening agents, oils, emulsifying agents, or umami rich ingredients such as nutritional yeast, in a recipe-based process to make something that is cheese. These products I understand to be “cheeze” or cheese analogs, and though entirely tasty results are found with this approach, the approach itself is devoid of what is integral to the “true cheese” process, which relies on flavor and texture evolving from microbes metabolizing. I do include some recipes in this vein because they are easy to make, yield tasty results, and serve as a good way to compare the difference in flavor and texture between cultured and non-cultured cheeses.

My approach with respect to the cultured vegan cheeses mirrors the “true cheese” definition insofar as I focus on the use of microbes (and their subsequent enzymes) to metabolize carbohydrates (sugars) and coagulate proteins to create flavor and texture. In conjunction, I employ a variety of aging (affinaging) techniques that help develop different characteristics for my cheeses. Central to my focus in this realm is the use of minimal ingredients and the avoidance of unnecessary fats, starches, proteins. The methods I highlight in this book allow the reader to develop a very intimate relationship with their own culturing experiments at home and thus an opportunity to witness up close the amazing things that microbes can do in the creation of food.

However, there is a middle area of vegan cheesemaking that has been developing for some time, a crossover between strict culturing and aging processes only (this takes more time) and the quicker cheeze/analog processes. In

this undefined realm, many makers use some combination of a fermented or cultured base (e.g., cultured cashew), which is then combined with other ingredients such as carrageenan, agar agar, miso, coconut oil, sometimes starches, and other seasoning or flavoring elements. These products are often aged for a short duration, usually two to four weeks. A potential complication of this crossover approach is that because the microbes are not metabolizing all of the components at the same time, you will not achieve the same kind of textural changes as with a culturing only process. Additionally, if oils are used, they risk trapping microbes and inhibiting their metabolic processes. Aside from a maker's comfort with this crossover process, there is the fact that products made in this manner take less time to make than their cultured only cousins and usually have more depth of flavor and texture than the non-cultured products.

I do not expect to unravel all of the necessary scientific elements of this claim within this book, but I do hope that the boundaries of definition I provide are helpful for the reader in understanding how I define cheese, the approach I am taking, and that it is possible and likely that a more comprehensive, formal definition of vegan plant-based cheese will eventually be developed. I invite the home-based reader-user to reconsider the possibilities of cheese, to think outside the confines of formal definition, and to allow the progress of recipes and methods to reveal the possibility that advanced plant-based cheesemaking could indeed be an evolution of the cheesemaking process itself.

Further, in presenting the three approaches to vegan cheesemaking (non-cultured, cultured, and crossover), I also seek to provide an overview of plant-based cheese methods and styles. While not exhaustive, it will give you a sense of how vegan cheesemaking has been and is evolving and offer you many options to choose from for the fun of your own home-based experimenting!

*Art of Plant-based
Cheesemaking course
student cheese tasting,
2018, at Bluhouse Market
& Cafe, Deep Cove, North
Vancouver.*



In contrast to the long history of dairy-based cheesemaking, which like so many of humankind's food preserving methods started out as a bit of an accident, plant-based cheesemaking began with intention. As cheese is often the last hurdle for those desiring to pursue a fully plant-based lifestyle, it comes as no surprise that many, many people have set about to explore a variety of means of creating the flavor and texture that so many people miss.

Until relatively recently (thirty years), there has been very little available in the way of formal culinary education in this realm and even less so with respect to culturing and fermentation. In the absence of formal culinary education with a vegan plant-based focus, community and homes have been the source of the development of plant-based cuisine knowledge and early recipe developments. People seeking solutions not offered on the market have brought about a robust DIY culture in vegan communities.

Vegan plant-based cheese has evolved through the commitment to do-it-yourself practices in the vegan community. This embrace of DIY in vegan circles, inherent to the culture, is a result in part of there being limited access to so many different types of food (processed/prepared) and lack of good quality options in restaurants. Vegans and plant-based folks from around the world have become adept at finding solutions and becoming creative in their experimental pursuit of plant-derived foods. This essentially empirical approach has led to increased intentional development of vegan cheese methods and to the widespread sharing of knowledge developed at the individual level.

Terminology: Cheese Versus Cheeze

Dairy cheesemaking has its own nomenclature and classification system largely defined by the process and culture used to make the cheese. Surface ripened, washed rind, cave aged, cheddaring, et cetera, are all related to processes that affect specific outcomes. Soft, semi-soft, and hard cheeses are descriptors that imply specific characteristics, which are applied to identify cheese styles. In many cases, multiple categories apply to one kind of cheese.

Currently there is no official or formal classification system or common nomenclature for identifying plant-based cheeses by either style or method. For the purposes of guiding you through this book I will use an informal classification system organized, first, according to whether the cheese is cultured or not, and second, according to either texture or process. These are very loose and broad categories that have no formal standing.

The basic categories I put forward are non-cultured cheezes, cultured cheeses, and crossover cheeses. When I use the word "cheeze," I am referring to recipes that do not use cultures or aging processes. When I use the traditional term

“cheese,” I am referring to recipes that are cultured, aged, or otherwise mirror some elements of traditional cheesemaking. The cultured and aged cheeses range from simple fresh cheeses to more advanced cheeses and processes that bring us closer to bridging the gap between dairy and plant-based cheesemaking. When I use “crossover,” I am referring to cheeses that employ some culturing method along with added ingredients such as coconut oil, miso, starches, and emulsifiers.

Cheeze, Cheese, Crossover Methods: Definitions and Boundaries

Cheese analogs, or cheeze, are not cultured. These products generally aim to capture something familiar or nostalgic for folks missing dairy cheese. Whether it be a cheesy flavor, a stretchy or meltable consistency, or a sharp density, these characteristics are achieved (or attempted) through the use of multiple ingredients without engaging in culturing or aging processes that do the primary work in the creation of dairy cheeses (after the milk production by the animals themselves, of course). The terms “cashew cheeze” or “nut cheeze” arose a few years ago in relation to this style of product, and these terms have become nearly synonymous with the (mainstream) idea of vegan plant-based cheese, meaning many people now assume that vegan cheese is always or almost always cashew or nut based because cashews were one of the first and most widely used ingredients for this purpose.

However, this style of cheese can be and often is made with a combination of many ingredients other than cashews. Ingredients common in these types of analogs are agar agar, kappa carrageenan, modified tapioca starch, tapioca starch, potato starch, pea protein, other plant proteins, nutritional yeast, miso, apple cider vinegar, lemon juice, lactic acid powder, coconut or other oil, proteins for structure, starches for stretchiness/meltability, acids for tanginess/sharpness, umami rich compounds for that cheesy flavor, and a fat for a creamy mouthfeel. Another feature of this style of cheeze (and even cultured vegan cheese) is the tendency to add distinctive flavors through the addition of herbs, spices, fruits, something that is less common in the traditional dairy cheesemaking realm.

With dozens if not hundreds of recipes existing on the internet for a quick cheeze-like substance to be used in ravioli, lasagne, salads, and so on, cashew cheeze/nut cheeze has almost become comfortably mainstream. Chefs at non-plant-based restaurants are increasingly trying some version or other, increasing the quality and range of vegan plant-based options on restaurant menus.

While non-cultured cheeze recipes tend to focus heavily on the use of cashews, the use, in either a creamy paste or milk form, of sunflower and pumpkin seeds, chickpeas, tofu, and white beans have become more prominent as a

starting base. Depending on the style of the cheese being made, you can use varying amounts of the different components (the base, oils, proteins, starches, umami, acid) to make a product that is firmer, softer, creamier, and so forth. In this manner, this method is much more in line with cooking and using traditional style recipes, though it is still important to understand the individual ingredients with respect to what they do and how they work.

These cheeses can be heated and then shaped or made as uncooked preparations (without the agar agar or other thickening agent). To a small extent they can be air dried to remove moisture but generally have a shorter shelf life due to the fact that non-cultured cheeses lack the acidity and protective enzymes produced through the microbial metabolizing of carbohydrate by lactic acid forming bacteria that occurs during fermenting and culturing processes.

This user-friendly analog is highly adaptable and relatively low risk for the home user. It allows for broad experimentation and multiple applications, from sauces to thicker preparations, and without additional ingredients, aside from cashews (or other nut/seed/legume of choice) and filtered water, also serves as a base medium for culturing processes that can be used in some cultured cheeses. I think of these as the gateway plant-based cheeses, and with its generally broad appeal, cashew cheese/nut cheese at least allows the skeptic to consider the possibility of non-dairy cheese. Recipes detailing different versions, soft, semi-soft, semi-firm, are provided further on.

With cultured cheese we begin to explore in greater depth the realm and effect of microbes in culturing and fermentation. In traditional cheesemaking, a variety of bacteria, yeasts, and molds are employed to create different flavors, aromas, and textures. In many dairy cheese processes, different species of lactic acid forming bacteria (LAB) are added in early stages. The bacteria then metabolize the sugars, producing lactic acid and other enzymes, which then break down the proteins, causing coagulation into a curd. In dairy cheesemaking, this coagulation process is often aided by the addition of other digestive enzymes (calf rennet or microbial rennet), and flavor enhancing enzymes (lipases).

Other bacteria are or can be added later on in addition to the initial culture for ripening or developing flavor and texture in different directions. Yeasts and molds are employed for their metabolic activity as well, though they do not produce lactic acid. They have significant impact on flavor and texture outcomes and are very obviously present in cheeses such as brie, camembert, cambazola, gorgonzola, stilton, morbier, and many others. The knowledge within this sector of what these microbes do is considerable, and it is a valuable place to seek information. Essentially, much of the craft of traditional cheesemaking is microbiology.

Cultured vegan cheesemaking is very much in its infancy. Miyoko's book *Artisan Vegan Cheese* popularized the concept by introducing the application of rejuvelac, a microbially rich solution made from sprouted grain (most often wheat berries), to a plant-based medium.

The first edition of my book furthered work in this arena in its discussions of rejuvelac, water kefir, coconut kefir, and probiotics, and others such as Thomas's blog *Full of Plants* and Cashewbert with their e-book *A Guide to Vegan Cheese* continue to broaden the scope of publicly available, user friendly information out there for the vegan cheesemaker.

However, that said, the diversity of culture types, their limited availability (inconsistent availability in different countries), and the lack of in-depth research by food scientists and others with respect to how traditional cultures behave on the diversity of plant mediums means that the complexity of flavors, textures, aromas, and styles of vegan cheeses are still largely underexplored. Hopefully, as companies such as Dupont, which makes Danisco cheese cultures, finally begin to turn their attention to making culture sets specifically for plant-based culturing, there will be an increase in the number and diversity of microbes and in the understanding of their behavior on plant-mediums and it will result in an expansion of what is possible in vegan cheesemaking.

I knew from the beginning of my engagement with vegan cheesemaking that the use of microbes was essential, but over the last few years, it has become apparent to me that what may be possible in vegan cheesemaking is only just beginning to be understood. In my research, development, and production work for Blue Heron and in the courses I teach, increasingly my emphasis is on understanding the behavior of the microbes we use in order to find conditions for them that lead to best outcomes. These microbes, after all, are living organisms and not simply another ingredient.

Unofficially, that is, not within the confines of a formal food science laboratory, I have tested the use of several traditional starter cultures and discovered so much more depth of flavor and textural changes than rejuvelac alone can offer and, without question, substantially better outcomes than from probiotic capsules. It is also clear to me that much more research needs to be done in terms of identifying enzymes that will break down a wide range of plant proteins, because in plant-based cheesemaking we are working with a larger number of types of proteins than in dairy cheesemaking.

So, knowing that research in this area of cultured vegan cheese is active, ongoing, and changing, my intention in this book is to offer information that is understandable and relatively easy for the home user and small scale experimenter to work with. This book in no way provides the depth of knowledge required

by a commercial producer, and those reading it with that in mind should be prepared to do considerably more work of their own. It is a measure of my knowledge and experience to date and is not all encompassing or the final stop in this evolution of a new craft and is specifically designed for folks who wish to enhance their home-based food adventures.

In order to be fully plant-based, I focus on the use of rejuvelac, water kefir, coconut kefir, and some other lactic acid microbial starters that can be grown at home or easily found. Importantly, I no longer recommend the use of probiotic capsules for culturing. Probiotics are primarily a product of the wellness industry and are not a classification of bacteria. Capsules, powders, and other probiotic products are designed for human consumption, and the microbes they contain are related to the kinds of microbes that are found within the human gut biome. While some of these products are related to the same microbes that do optimal culturing of food, they are often inconsistent in their performance, and outcomes can vary from low acidity to too much acidity, and flavor-wise they usually produce flat flavor because not all of the species of bacteria in these products are lactic acid forming, which is necessary for a lactic acid culturing process. The other starter cultures produce better flavor and texture results and provide the user a more direct understanding of the relationship of microbes and variables (conditions) to cheesemaking outcomes.

New in this second edition is the introduction of blue mold, *P. roqueforti*, and white molds, a couple of types, for use in making a blue cheese and a brie- or camembert-type cheese. Molds are more complex to work with and do require more diligence with respect to maintaining food safety conditions and inhibition or prevention of jumping of spores as they grow, but it is possible to make blue and white mold ripened vegan cheeses at home. Blue mold is the mold responsible for the sharp piquancy, pungency, and creaminess of dairy cheeses like stilton, gorgonzola, cambazola. White molds are those that create the mushroomy, earthy qualities associated with camembert and brie and form the white mold rind that grows on them.

It is worth reiterating that the focus of this book is methodology. Instead of dozens of vegan cheese recipes, this book gives you an understanding of how the materials we use work, how microbes behave, and some key principles and concepts that allow us to make vegan cheese, and this will result in your being able to be more creative at home.

2. Joint FAO/WHO Codex Alimentarius Commission. "Codex General Standard For Cheese, Codex Standard 283-1978." *Codex Alimentarius*. Food and Agriculture Organization of the United Nations.