Mushroom

A Global History

Cynthia D. Bertelsen

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Contents

Introduction: The Importance of Being Mushroom

On the contrary, it [the mushroom] is a human subject. Many are the quaint fantasies which have been interwoven by man into its lore, and thus its history is almost his history. It starts with Adam and Eve, and it will continue after the ultimate man has looked his last on a dying world. It embraces not only our first ancestors, but such diverse characters as Judas Iscariot and the devil, Pliny and Erasmus Darwin, the fairies and witches, and Baron Munchausen and Sir John Mandeville.

R. T. Rolfe and F. W. Rolfe, *Romance of the Fungus World* (1925)

The French philosopher Voltaire (1694–1778) once quipped, 'A dish of mushrooms changed the destiny of Europe.' He was referring to the repercussions stemming from the death of the Habsburg king Charles VI, who ate death cap mushrooms (*Amanita phalloides*). The subsequent War of the Austrian Succession (1740–48), which developed into a global war (in the American colonies it was called King George's War), absorbing in the process the War of Jenkins' Ear between the British and Spanish in the Caribbean, affected people as far away as India. All because of mushrooms: those 'toadstools'.

The history of the mushroom is quite a tale; one ringing with murder and accidental death, hunger and gluttony, sickness

Ceps, also known as porcini, in a French market.

and health, religion and war. It is a story filled with theories and literature, and tinged with mystery and magic. Writers, poets and artists have ascribed to mushrooms the very messiness and rottenness of life itself. For a long time people either loved or loathed them. Now, mushrooms embody the ideal of local-foods thrift and a renewed 'back-to-the-land' movement.

The taint of poisoning permeates mushroom lore and history, but this is not the only reason for their bad reputation within certain cultures. Several interesting trajectories weave through this saga. The patterns of mushroom consumption

in many regions of the world suggest that a deep divide existed between people when it came to eating the fungi.

The eighteenth-century mycologist William Delisle Hay commented on the 'fungiphobia' of his fellow Englishmen, who considered most mushrooms to be poisonous 'toadstools', regardless of their actual edibility. Well-respected mycophilic amateur R. Gordon Wasson (1898–1986) took Hay's concept and coined the terms 'mycophobic' and 'mycophilic' to describe cultures that either loved or loathed fungi. These terms predominate in the literature of modern mycology – the study of fungi. In the West, a rather Manichaean mindset predominated: people were either mycophilic (mushroom-loving) or mycophobic (mushroom-fearing). In the East, most cultures regarded mushrooms through a mycophilic lens.

West and East are now meeting, thanks in part to French haute cuisine and the demand it generated for mushrooms.

Early woodblock print of mushrooms from the early German herbal *Ortus sanitatis* (1471).

Agaricus species, showing size differences and gills.

Entrepreneurs worldwide are now jumping on the band-wagon and pushing mushroom cultivation, regardless of climate and geography. Long cultivated and revered in the East, wild mushrooms now turn up in many a kitchen in the West.

It's hard to imagine another form of earthly life that has affected human beings as much as the kingdom Fungi. Seeking the taste and perceived medicinal benefits of mushrooms, human beings followed a path from superstition to science, from foraging to farming, from medieval old wives' tales to modern clinical trials, and from food eaten to ward off starvation to haute cuisine. In other words, the three Cs – cuisine, cultivation and canning – in large measure drove the twentieth-century shift from mycophobia to mycophilia, at least in the West.

In recent decades there has been a growing awareness of the vital role that mushrooms and other fungi can play in the lives of humans, meaning that the story of the mushroom has just begun, in spite of its ancient origins. In the developed world,

many species of mushroom are still considered specialty foods, linked in part to the influence of French haute cuisine. In the developing world, however, mushrooms are used as provender in times of hunger and as cures for illness; they also promise a better future for poor farmers and their families, who might commercially cultivate them in order to meet world demand.

Mushrooms possess valuable medicinal qualities that can help to boost the immune system of the human body. The remarkable mind-altering effects of certain species may assist terminally ill patients by relieving anxiety at the end of their lives. And, of course, many groups of people from ancient times to the present have used these 'magic mushrooms' for religious and spiritual purposes.

In addition, in the case of the environment, mushrooms can be thought of as nature's recycling 'experts', spawning high hopes for bioremediation – removing pollutants through growing micro-organisms – in polluted landscapes.

Why have some cultures, such as those of Russia, Poland and Asia, been mycophilic, while others, like the British and Americans, are mycophobic? The French philosopher Denis Diderot wrote that mushrooms 'are not really good but to be sent back to the dung heap where they are born'. This book examines this question, exploring how some human populations may either call them 'food of the Gods' – as did the Roman emperor Nero – or shun all mushrooms as 'Devil's food'.

Mycophobic and Mycophilic Geography*

Traditionally Mycophobic areas	Traditionally Mycophilic exceptions
Britain, United States and English Canada	France, Russia, Poland, Czech Republic and Slovakia, Italy, Austria, Switzerland, Hungary, Bavaria
India, Pakistan	China, Japan, North and South Korea, Aboriginal Australia
Middle East	Iran
Spain	Basques and Catalans
Hispanic Mexico and South America	Indigenous populations
Africa	Isolated population pockets in parts of West and East Africa
Scandinavian countries	Sweden, Denmark
Caribbean	Haiti

* Adapted from *The Complete Mushroom Hunter* (2010), by Gary Lincoff

1
Anatomy of the Mushroom

Buried in the murky shadows of history, the origins of the English word for 'mushroom' may never be known. That's not to say that experts haven't tried to pin it down, however. 'Mushroom' likely took shape from the Latin word *muscus* or mossy place; bog, morass, swamp, peat. In French, *mousse* means 'moss', which is likely where the word *mousseron* (the small white mushrooms of the common fairy ring) derives. The word was first written down in a fifteenth-century manuscript, *Alphita: A Medico-botanical Glossary*, according to the venerated *Oxford English Dictionary* (*OED*). The modern English word for 'mycology', or the study of fungi, has ancient origins as well, coming from the Greek word *mykos*, meaning 'fungi'. Again according to the *OED*, the word first appeared in print in 1836, in *The English Flora* by the naturalist Miles Joseph Berkeley (1803–1889). Earlier than this, however, Pliny the Elder wrote in his *Natural History* (*c.* AD 77–9): 'The generative principle of the mushroom is in the slime and the fermenting juices of the damp earth, or of the roots of most of the glandiferous trees.'

Whatever the origin of the mushroom's name may be, they have long been associated with mucus-like matter. A reading of many of early herbals – books detailing the characteristics

and medicinal uses of plants – reveals that authors focused primarily on the 'slymy softnesse' of many types of fungi. In the early twentieth century R. Gordon Wasson and his wife, Valentina, concluded through etymological research that the English term 'mushroom' had indeed come from the French word *mousseron*.

Most mycophilic cultural groups invented numerous titles for the mushrooms surrounding them. But, as William Delisle Hay observed,

> It is a striking instance of the confused popular notions of fungi in England that hardly any species have or ever had colloquial English names. They are all 'toadstools'.

The first written use of the word 'toadstool' to refer to mushrooms occurred in 1398, in a work published posthumously by Bartholomaeus Anglicus. English isn't the only language

Agaricus campestris, the common field mushroom.

in which mushrooms have been maligned by derogatory monikers, however. In French, there's 'eggs-of-the-devil', 'devil's paintbrush' and 'toad's bread'. The Dutch called all mushrooms *paddestoel* (toadstool), close enough to the Norwegian *paddehatt* and Danish *paddehat* (toad's hat). Coming out of the dark forests of northern Germanic Europe and spreading with the migration of the Celts to the British Isles, an association grew up between mushrooms and witchcraft; a pervasive belief that seems to have sealed the fate of mushrooms for centuries.

What is a Mushroom?

Mushrooms are fungi, like the yeasts that raise our bread and ferment our beer or ale, and also ruin our bread with mould and mildew our showers and bathtubs. Now classified as entities separate to plants and animals, in the scientific scheme of things, mushrooms belong to the kingdom Fungi.

Fungi lack chloroplasts, cells of green pigment that allow plants, with their autotrophic or self-sustaining nature, to absorb energy from the sun and to create their own food. Fungi, and therefore mushrooms, are thus incapable of photosynthesis. In other words, they are heterotrophic ('other feeding') organisms and use pre-formed organic compounds as energy sources; in a reverse of the eating pattern of animals, fungi produce exoenzymes or extracellular enzymes, which allow them first to digest nutrients and then to ingest them (which explains their role as symbionts, or decomposers of dead wood and other materials). Like animals, fungi store their food as glycogen, a polysaccharide consisting of long polymer strands of glucose, much like beads strung in a necklace; quite unlike plants, which store theirs as starch. Recent

research suggests that, in terms of their DNA, fungi are more closely related to animals than to plants or protists (eukaryotic micro-organisms composed of cells with membrane-bound nuclei, unlike bacteria).

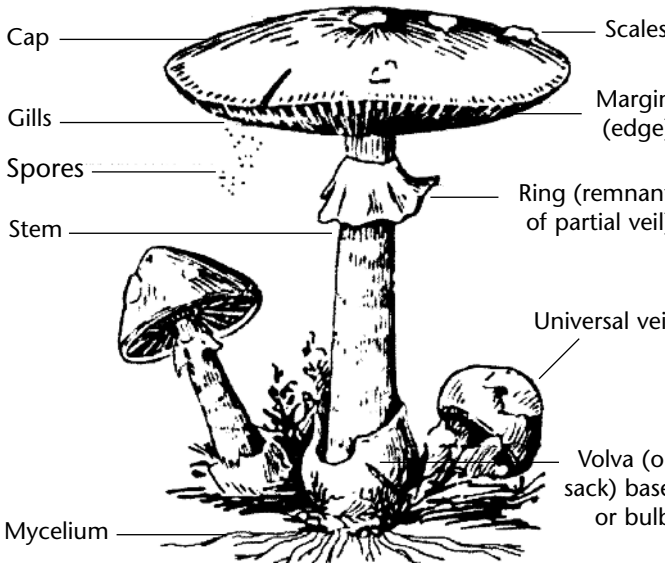
Mushrooms – technically called 'fruiting bodies' or 'sporocarps' – produce spores. Non-vascular in nature, mushrooms sprout from a mycelium, a cluster of tube-like structures called hyphae that form underground thread-like networks. Usually found intertwining under the leaves surrounding rotting tree trunks and in forest soil, mycelia absorb and metabolize nutrients, producing energy and yielding mushrooms.

Saprotrophic fungi and mycorrhizal fungi are of benefit to the world because they either decompose rotten material in forests (saprotrophic fungi; for example, morels), or form symbiotic relationships with plant roots (mycorrhizal fungi). So important are these relationships to healthy forests that when mushrooms or hyphae are damaged, the impact on the surrounding trees can be devastating.

Mushroom Anatomy

Many people think of mushrooms as having a cap and a stalk, but this description applies mostly to the order Agaricales (or 'gilled mushrooms'), of which the button mushroom (*Agaricus bisporus*) – the fungi one would most typically find in a supermarket – is a member. However, there is so much variety in appearance and structure in the mushroom world that the mind boggles, providing hikers with a veritable art gallery *en plein air*.

Mushrooms contain 80–90 per cent water. Made of a polysaccharide (long chains composed of glucose molecules) called chitin – the same material comprising the outer coating of



The anatomy of a mushroom.

insects and shellfish – the cell walls of raw mushrooms cannot be digested by humans; however, some fish, such as cod (*Gadus morhua*), appear to be able to digest chitin.

Developing inside the universal veil, not unlike a butterfly's cocoon or an egg, the growing mushroom ruptures this eggshell-like casing as it thrusts its way to the earth's surface. This process often leaves wart-like protuberances on the cap, as seen in some *Amanita* species. At the bottom of the stem lies the volva, also part of the universal veil. Halfway up the stem, the remains of the partial veil dangle, covering the spore-bearing surface in some genera such as *Amanita*, *Lepiota* and *Agaricus*. Other morphological highlights include the cap (*pileus*), gills and stem (*stipe*). Clamp connections, a hyphal structure unique to certain Basidiomycota (a category of fungi that includes large fruiting bodies like mushrooms, puffballs

Morel mushroom.

and shelf fungi), further assist in identification, but can only be seen under a microscope.

Caps provide additional information for identification: shape, size, margin, surface texture and colour. In the family Agaricaceae umbrella-shaped mushrooms carry spore-shedding gills underneath the cap. The Boletaceae family produces spores in a removable tube layer found on the underside of the cap. Contrary to some folk beliefs, the presence or absence of a pointed cap has nothing to do with whether or not the mushroom is poisonous.

Colour tends not to be a reliable identifier, since light and environmental conditions are constantly changing. Some

mushrooms also alter in colour when bruised or cut. Gill colour can help in identification, but spore colour is the most important factor in so doing. Spore prints on white paper provide the most reliable indicator of colour; the method of obtaining these involves placing a mushroom with a gilled cap gill side down on pieces of white and black paper, covering the mushroom with a glass and leaving it for a few hours. The colour of the mushroom's spores will fall onto the paper and become visible against the white sheet. Should the mushroom be poisonous, it may contain white basidiospores (spores), which would become visible on the black sheet.

Certain cultures believe that brightly coloured mushrooms are poisonous, and those which are more sombre in tone are not; this is proved a fallacy when one considers that several species from the Amanita family, such as the destroying angel, are almost sheer white. Some mushrooms glow in the dark, their bioluminescence due to fungal luciferins, chemicals

The mycelium of an oyster mushroom growing on coffee grounds.

inherent to their biology that result in a phenomenon called 'foxfire'. (The war journalist George Weller (1907–2002) once wrote to his wife, in a letter penned late at night, 'Darling, I am writing to you by the light of five mushrooms.')

Stems can also provide information useful in classification: the shape, surface texture, basal structure and rigidity or plasticity all vary from species to species. In shape they may resemble cauliflower, coral, slabs of beefsteak, sponges, umbrellas or icicles, making identification an even more complex endeavour.

And don't forget about size. Mushrooms can range from those the size of a pinhead (in the genera *Mycena* and *Marasmius*) to others such as Polypores, the bracket fungi which grow on trees, which can reach 180 cm (6 ft) or more in diameter.

Since there are between 200 and 250 types of mushrooms known to be edible and several highly poisonous ones among the thousands of mushroom species out there, the question of determining just what we put in our picking basket, and especially in our mouths, is crucial.

Classification, a Convoluted Morass

To prevent lethal poisoning, classifying mushrooms remains one of the most important tasks of mycologists. 'Keys', or guidebooks, provide tools useful for identification. It took a long time for modern identification 'keys' to evolve. As one of the first female mycologists, Mary Elizabeth Banning (1822–1903) of Hopkins Neck, Maryland, noted:

> The mycologist may liken himself to a pioneer wandering through a land filled with alternatively beautiful and

fantastic shapes. A land of delicate pencilings and glowing colors where mystery sits enthroned and wise men become its worshippers.

In the West, Aristotle (384–322 BC), Pliny the Elder (AD 23–79) and Dioscorides (*c.* AD 40–90) set the tone for most thinking about mushrooms and fungi until the eighteenth century. St Albertus Magnus, a thirteenth-century Dominican priest and bishop, considered that fungi and mushrooms were not plants in any sense and wrote, 'that is why they are generally brittle and owe their poisonous nature to the rotting dampness on which they grow'. Herbalists had engaged in very little original thought regarding mushrooms up to that point. Ordinary people developed many superstitions and beliefs about mushrooms, using their taste, colour, shape, habitat and/or other characteristics to form rustic classification schemes.

The first classifications developed from observations of mushrooms' shape and habitat. Ermolao Barbaro (Hermolaus Barbarus), a fifteenth-century Venetian botanist, proposed three groups into which fungi could be classified: *Fungi ovati*, *Fungi digitelli* and *Fungi spongiati*, or egg, finger and sponge. In China, a dichotomy was used, *chih–erh*, *chih* applying to those that grew on soft ground and *erh* to those that grew on wood. Six types of *chih* and the famous *mu erh* – or wood ear – appear in *Shên Nung Pên Tshao Ching* (also known as *The Divine Farmer's Herbal-root Classic*), attributed to an emperor who reigned around 2800 BC: Shen Nung, the father of Chinese medicine. Whether or not he wrote the book, its impact extended deeply into Chinese culture.

Jules-Charles de L'Ecluse (commonly known as Clusius; 1526–1609) became the first herbalist to look at fungi in any detail. In 1601 he published *Historia rariorum plantarum* (*Fungorum*

in Pannoniis observatorum brevis Historia), a unique book that included line drawings and descriptions of 105 fungi. He arranged the fungi into two groups: edible, with 21 genera; and poisonous, with 26 genera. The fungi he considered edible were morels, St George's mushroom (*Calocybe gambosa*), Caesar's mushroom (*Amanita caesarea*), parasol mushroom (*Macrolepiota procera*) and spine fungus (*Hericium coralloides*), among others. Poisonous species included Jew's ear or jelly ear fungus (*Auricularia auricula-judae*), birch polypore (*Piptoporus betulinus*) and stinkhorn (*Phallus impudicus*), as well as others which we now know not to be poisonous. Many of the drawings depict agarics, though Clusius had not grasped the difference between these and boletes, because he was unaware of the lack of gill plates in boletes.

John Gerard, in *The Herball, or Generall Historie of Plantes* (1597), borrowed heavily from Clusius and described several other species, though his descriptions were fraught with errors. Accentuating the English tendency toward mycophobia, he wrote:

> Many that do have plenty of both [birds and fish] do hunger after the earth's excrescences called mushrooms, whereof some are venomous, others not so noisome, and neither of them very wholesome meat.

In the eighteenth century, scholars wrangled over the nature and order of fungi. Although much of their travails were aimed simply at organizing the bewildering diversity of these mysterious life forms, one of the underlying motivations was naturally to determine which mushrooms and fungi could be eaten safely. The botanist Pier Antonio Micheli was the first to write about the cultivation of mushrooms in 1729: prior to that time, writers and others thought that

The Swedish mycologist and botanist Elias Magnus Fries.

mushrooms appeared thanks to divine miracles wrought by God, lightning bolts or spontaneous generation (as was Dioscorides' view).

The German naturalist Otto von Münchhausen (1716–1774) worked with puffball and smut spores. He believed that small animals dwelled in the mushrooms and that the fruiting bodies of fungi were not plants. Von Münchhausen's work influenced Carl Linnaeus, who claimed in 1775 that 'the order of fungi is still chaos, a scandal of art, no botanist knowing what is a species and what a variety.' What is tragic, at least for mushroom lovers, is that Linnaeus was a mycophobe. In *Flora lapponica* (1737), he claimed that in Sweden only foreigners ate mushrooms!

The work of the Dutch mycologist Christiaan Hendrik Persoon in the nineteenth century originated the nomenclature for fungi that is now in use and also led to the study of mycology, which shifted the focus from folklore and mythology to biology. Influenced by Persoon, Elias Fries, a Swedish mycologist, hit on the idea of using morphology, the study of form and structure, and especially spore colour, to classify mushrooms. He published *Systema Mycologicum* in 1832, setting the stage for future systems of classification. The Friesian method of classification was largely abandoned after 1900 with the publication of the more concise and useful system outlined in *Essai taxonomique des Hyménomycètes* by Narcisse Theophile Patouillard, but still provided useful key identifiers.

Jean-Jacques Paulet wrote the first book on edible mushrooms, *Traité des champignons* (1790–93), which was filled with glorious full-colour illustrations and techniques for classifying such mushrooms. A contemporary of Paulet's, Jean Baptiste François Bulliard, published *Histoire des champignons de la France* (1791–3), which was also filled with marvellous full-colour drawings. Joseph Roques' *Histoire de champignons comestibles et vénéneux* (1832) contained details about numerous mushrooms, complete with colour plates. Such a richness of information, presented in such a visually pleasing light, tempted more people in Europe to consider the world of fungi.

Alas, this view was not shared by the European colonizers of the nineteenth century and earlier. We might hope to find references to the indigenous peoples' use of mushrooms in the accounts of colonialists, explorers and missionaries, but this is not the case, not even in the writings of mushroom-loving French colonists. Take one example: true to his mycophobic English heritage, Charles Darwin, the great English scientist and formulator of the theory of evolution, ignored fungi. Although his diaries from aboard HMS *Beagle* (1831–6)

mention that in Tierra del Fuego, Chile, mushrooms comprised a major and nutritious element in the diet of the people living there, that's as far as he took the topic.

However, thanks to the work of modern ethnomycologists such as David Arora (b. 1952) and others, we now know that cultures like that of the highland Maya of Chiapas developed workable classification systems for mushrooms. These were based in large part on morphological characteristics of caps, stems, undersurfaces and gills. Many of the Mayan mushrooms resemble those found in North America. The Maya shared with Arora their versions of overall family names of mushrooms, even naming separate species differentiations. And in the Orinoco Delta of South America, according to the Venezuelan ethnomycologists Eglée and Stanford Zent and Teresa Iturriaga, the mycophobic Warao people 'classify all mushrooms as *hepu bure anahoro*: food of the vulture bush spirit'.

2
The Quiet Hunt: Mushroom Foraging

Before humans learned to cultivate mushrooms, the first step towards feasting on them was to forage. Foraging leads to cooking and eventually preservation, since fresh mushrooms spoil quickly after being picked. The ancient methods of foraging for mushrooms are rife with ritual, myth and folklore, and have become embedded in creation or origin myths, particularly those that have sexual undertones. Congolese pygmies, according an article published in *Eleusis* by G. Samorini in 1995, believed that 'the earth originated from a mushroom, "as from an egg" . . . the upper half rose and became the sky, the lower part became the earth.'

Some cultures relegate mushroom hunting to the poor, who find such fungi a nutritious and savoury addition to their meagre diets, as in the Bering Strait area of Russia and parts of Africa. In others, foraging for wild mushrooms offers tremendous economic compensation, since many highly prized mushrooms still cannot be cultivated with ease. Modern foragers in Nepal focus on morels and are able to make nearly six months' worth of salary during one morel season alone.

In Italy, France, Russia, Poland, Finland, the Czech Republic, Slovakia, Catalonia, Sweden and in various locations in Africa and Asia, however, 'the quiet hunt', as Russians like Mikhail

Gorbachev call it, consumes people. In the autumn, the countryside pulsates with people ambling about with large baskets slung over their shoulders, seeking jewels of the forest such as morels and chanterelles. Even in England, once schooling became mandatory, teachers would dismiss children from school early to help their mothers forage for foods such as apples and mushrooms.

Until the end of the fifteenth century, the only guides for European mushroom hunters were older, more experienced foragers, as well as a few passages offered by Pliny the Elder in his *Natural History* and the Roman philosopher Galen (*c.* AD 129–216). The first useful field guide came from the pen of Jean-Jacques Paulet, who was spurred to write his *Traité des champignons* (1790–93) in order to help less knowledgeable mushroom foragers. Paulet described the madness that infects these foragers, and laments that while they knew the risk of gathering and eating poisonous species, 'nevertheless they have not lost the taste'.

A traditional mushroom trug basket from Sussex.

There are many reasons for foraging. According to Arctic anthropologist Sveta Yamin-Pasternak, in the Bering Straits area of Russia mushrooms represent many things: the beginning of summer, people's longing for the taste of particular mushrooms, and a change in dietary variety after the long winters. Modern foragers preferring a vegetarian diet seek the meaty taste of mushrooms, as did earlier peoples who faced long Lenten fasts. Other foragers relish the adventure of exploring new forests and the excitement of revisiting fertile foraging grounds known only to them. Others still forage to augment their incomes.

Aside from a basket and a pair of sharp eyes, foragers need very little equipment beyond a knife for cutting stems. Other tools considered necessary for foraging included a widger – a traditional English tool with two sharp prongs on one end – for digging into the ground around the mushrooms; a basket, such as a Sussex trug, in which to keep all the different species separate; and 'wellies', or rubber boots, just in case the ground oozes mud and moisture. Instead of a knife, some foragers use 'thumbsticks', a strong double-pronged fork. This tool helps in avoiding snakes that might be lurking under the dry leaves and debris that serve as a home to the sprouting mushrooms. Some foragers find that using a black nylon mesh 'spore bag' works better to prevent damage to their harvests, and allows for spores and 'critters' to escape as they continued to forage. Others, in Romania, Bohemia and Hungary, take pride in their 'mushroom hats' made of felted mushrooms, which were much sought after by avid mushroomers. Truffle hunters require another tool, namely well-trained pigs or dogs, to sniff out those odiferous delicacies.

The rules of foraging tend to be few and simple: cut the mushroom off at the base, if possible; and the 'early bird

catches the worm': in other words, get up before dawn and make your way through the woods to a favourite spot, and wait there until the morning sun peeks through the trees. Modern foragers list a number of 'musts' that should be followed while out hunting, including such axioms as: 'An identification should be made with no less than size, colour, gill connectivity, environment, a cross section, bruising colour, odour, and a spore print.'

Although foraging – a seasonal activity usually associated with spring and autumn – may be strongly associated with Western cultures, mushroom hunting also plays a prominent role in the seasonal cycles of the year in the East. In Japan, centuries ago, the nobility hunted mushrooms in autumn while wearing elaborate clothing and following precise rules of conduct. Modern-day Japanese foragers revel in the autumn days when they can foray into red pine forests seeking rare *matsutakes*. Foragers in Nepal, belonging to such ethnic groups as the Bhotia, Thakali and Newar, seek wild edible mushrooms not for personal use but rather for sale in the international market, both as food and for medicinal purposes. They find mushrooms along paths usually taken for the purpose of collecting firewood or herding livestock. People belonging to the high-ranking Brahmin caste in India do not collect or forage mushrooms, because they 'grow in rotten and dirty places'.

In Africa, mushrooms have traditionally provided nourishment for many tribes. The explorer Henry Morton Stanley (1841–1904) wrote about mushroom foraging in his journal as he searched for David Livingstone, the elusive missionary doctor 'lost' in darkest Africa. Likely serving as a stop-gap to suppress hunger, mushrooms kept the bearers alive that accompanied his group, as one of his near-starved porters recounted to him:

Foraging for mushrooms requires minimal equipment.

> Each one of us then on reaching camp last night set out to hunt for mushrooms, out of which we made a gruel. That is what we had to eat last night for supper. This morning we have fasted, but we are going to hunt up mushrooms again.

Among the Bofi people of central Africa today, foraging for many foods, including mushrooms, allows fathers to be more heavily involved with childcare than are pastoralists or agriculturalists, because children often accompany their fathers in the hunt.

So culturally ingrained, and family oriented, was mushroom foraging in Russia and Poland in the nineteenth century that in the Polish national epic *Pan Tadeusz* (1834), the exiled poet Adam Mickiewicz remembered a mushroom hunting foray for saffron milk caps (*Lactarius deliciosus*):

> But all hunt for milk caps which, though not very tall
> And largely unsung, are the tastiest of all.

Russian novelist Vladimir Nabokov created an almost dream-like portrait of his mother's obsession with mushroom-picking in his memoir, *Speak, Memory* (1951):

> One of her greatest pleasures in summer was the very Russian sport of *hodit' po gribi* (looking for mushrooms). Fried in butter and thickened with sour cream her delicious finds appeared regularly on the dinner table. Not that the gustatory moment mattered much. Her main delight was in the quest.

For Nabokov, the ritual of mushroom foraging represented the soul of the Russian people. Many Russian surnames derive from the names for mushrooms, according to American mycologist David Arora: Bribov, Borovikov, Gruzdjov, Ryshikov and Opjonkin; a most interesting name, Griboyedev or 'Mr Mushroom-Eater', says it all! Russian-born Valentina Wasson, wife of the eminent amateur mycologist R. Gordon Wasson, wrote, 'When we were naughty, our mother would punish us by forbidding us to go mushrooming.' This would be the equivalent to forbidding an American child of today to watch TV or play video games.

Wasson added another anecdote, about the communist revolutionary Lenin's passion for mushrooms:

> But there was also Lenin, whose fanaticism brought endless woe on Russia and the world, but whose dedication to wild mushroom hunting during one brief spell shows him in a more winning light. His wife Nadezhda Krupskaja wrote in a letter in 1916 that he pretended to

> know nothing about wild mushrooms and to care less, but in fact he was seized at that time with a veritable passion for mushroom gathering.

Mushrooms were significant in Russian cuisine because of the number of fast days decreed by the Russian Orthodox Church. Either because of the incessant fast days or just because of poverty, mushrooms afforded people a hint of luxury when they could not eat meat.

Foraging took place far from the forests of Europe as well. Most American mushroom foragers belonged to various immigrant groups: Italians, Poles, Russians and Czechs. But there also existed a tradition of foraging prior to the great onslaught of immigrants entering the country. A cookbook written by the wife of General Robert E. Lee, Mary Randolph Custis (1808–1873), provides a clue as to the mushroom-picking habits of those 'native' to the country. Her book of housekeeping indicates that, contrary to the belief that Americans were mycophobic, they did in fact forage for mushrooms. Mrs Lee's recipe for 'Mushrooms *au Beurre*' begins with a telling comment: 'Cut the stems from some fine meadow mushrooms.' Native Americans also foraged for mushrooms, but chiefly for medicinal purposes.

William Delisle Hay summed up the early American attitude toward mushrooms by saying, 'No fad or hobby is esteemed so contemptible as that of "fungus-hunter" or "toadstool-eater".' Seeking more variety, the only course of action for the mushroom lover was to turn to wild edible mushrooms. Leaving behind well-founded fears of toxicity, adventurous 'mushroomers' happily took to the forests and other locations in quest of morsels of delight.

So what about toxicity? How did people come to recognize which mushrooms should be avoided and which

savoured? Most tests for toxicity relied on cooking the fungi, in the hope that any toxicity would be removed in the process, rather than scientific identification of specimens. This is why, as we have seen, identification via morphology and spore colour became very important.

The medical and mycological literature of the eighteenth and nineteenth centuries is full of accounts of unsuspecting foragers coming home with their prizes, only to find themselves hours or even minutes later laughing hysterically or bent over with intestinal pains, unable to move from chair to bed. So serious were cases of poisonings in France that in Paris, in 1754, the city fathers passed an ordinance prohibiting the sale of any mushrooms in the markets. Amended in 1808, the law allowed vendors to sell seven different species in the markets. Just to be safe, the *prefecture de police* established a centre for inspecting mushrooms in the central 'Les Halles' market of the city. Today wild mushrooms must still be regulated and inspected. A major insurance policy for mushroom hunters in France, other than knowledgeable cooks, is the mushroom-identification expertise of pharmacies like those in Bourg-en-Bresse and Aix-les-Thermes, where trained mycologists examine the mushrooms found by enthusiastic foragers. Chef Jacques Pépin recalled foraging for mushrooms and the need for double-checking the 'catch' in *The Apprentice: My Life in the Kitchen* (2004). He sought the *rosés*, 'prized white mushrooms with rosy gills that grew overnight in the field'.

Until around 1600, in southern France, it was primarily women who foraged for mushrooms. Nineteenth-century American cookbooks hint that mushroom gathering was mostly women's work there too. The trend toward scientific reasoning that then began gendered the act of foraging for mushrooms; since it was predominantly men that trained as

Chanterelles (*Cantharellus cibarius*).

professional mycologists, the role of women in this activity diminished. Sensing the need for accurate information, government offices began publishing 'keys' or guidebooks for identification. In 1885, the U.S. Department of Agriculture published a guide to twelve edible American mushrooms, saying that it would 'take some time to eradicate' the 'prejudice [that] has grown up concerning [mushrooms] in this country'. In spite of their knowledge, government officials still turned to experienced female foragers to confirm their conclusions.

Much later, in post-Second World War Germany, people collected mushrooms from the forest largely for subsistence reasons. A programme involving trained mushroom inspectors distributed publications containing watercolour illustrations of mushrooms in order to help people identify and avoid eating poisonous species. Nearly simultaneously, in Britain, the Ministry of Agriculture and Fisheries issued a similar book, *Edible and Poisonous Fungi* (1945).

Foraging for mushrooms rose in popularity even in mycophobic cultures in the late twentieth century, as people sought a sense of a return to the land and food free from the taint of industrial agriculture. This trend is especially apparent in the two most mycophobic of cultures: British and American.

The American musician, avant-gardist and amateur mycologist John Cage (1912–1992) knew so much about mushrooms that, aside from making them the subject of his short-short stories, he once won 5 million lire on an Italian game show because of his knowledge on the theme. In 1972 he was even featured in a short film by Jud Yalkut, *John Cage Mushroom Hunting in Stony Point*.

Two British-based chefs, Antonio Carluccio and Hugh Fearnley-Whittingstall, popularized the practice of mushroom foraging through their cookbooks and mushroom forays. The subtitle of Carluccio's *The Complete Mushroom Book* (2003) – 'The Quiet Hunt' – indicates the importance he places on foraging. Fearnley-Whittingstall's promotion of foraging in 2010, in his TV series *River Cottage*, resulted in a stampede into Epping Forest on the outskirts of London, and subsequent environmental destruction.

In France, *La cueillette*, a southwest French tradition, promotes the seasonal gathering of wild foods, including mushrooms. This hereditary practice of foraging passed down from generation to generation, until it became almost ritualistic in nature. Similar practices occurred in other regions of the country. So popular and rife with conflict is foraging in France that Article 547 of the *Code Civil* states that the owner of the land on which mushrooms grow also owns those mushrooms.

In the United States, the trend toward eating local foods gave new impetus to mushroom foragers. Mushroom expert

Camille Pissarro, *Women Gathering Mushrooms*, 1893, woodcut.

Gary Lincoff wrote *The Complete Mushroom Hunter* (2010) to help new foragers learn the ropes. Eugenia Bone, in the 2011 volume of her *Mycophilia*, expounded on the growing numbers of mushroom forays planned each year by local and regional mycological organizations and clubs. Wild mushrooms also started appearing at farmers' markets and in upscale gourmet food shops at this time. A plethora of new field guides appeared. Cookbooks featured many more mushroom recipes than those from the mid-twentieth century. However, since most of these books assume that cooks will be using cultivated mushrooms, very little information exists about the dangers of mushroom poisoning, unlike cookbooks of the nineteenth century, such as Eliza Leslie's *Directions for Cookery* (1837), which proposed that various tests should be undertaken to ensure that foraged mushrooms were safe.

The truth is that, when it comes to foraging for edible wild mushrooms, there is still a slight frisson of anxiety which cannot easily be shrugged off like a slippery fur stole. There are some sure bets in mushrooming, but only if the forager limits himself or herself to certain types available locally. John Thorne, an American food writer, put it best:

> All hunters put life at risk, but for mushroomers the moment of danger comes well after the quarry has been run to ground . . . Finding the mushroom is the initiation, but eating it is the test.

Nicholas Evans, the author of the popular novel *The Horse-Whisperer* (1996), ate some foraged mushrooms near Forres, Moray, in Scotland, which turned out to be poisonous webcaps (*Cortinarius rubellus*). He and his wife spent years waiting for kidney transplants.

Regardless of culture or historical period, the mushroom hunter's motto has always been 'If in doubt, throw it out.' But this was a hard thing for cooks to do before mushroom cultivation began in earnest, when foraging provided the only access to the delectable mushrooms of the forest and field.

> There are old mushroom hunters and bold mushroom hunters,
> but there are no old, bold mushroom hunters.

3
Take Ye Faire Mushrooms: Cooking

The roots of mycophobia and mycophilia appear in European cookbooks as early as the sixteenth century. This is apparent from the inclusion or exclusion of mushroom recipes by authors and the tone of voice used to describe them. Historical methods for cooking fresh mushrooms involved stewing, roasting, sautéing, grilling, blanching, baking and stuffing. Some cultures native to tropical forests will steam mushrooms or roast them in the ashes of cooking fires. Today cooks can add microwaving, deep-frying and grilling to their mushroom cooking repertoire. Mushrooms are usually paired in cooking with onions and aromatics, such as leeks, green onions/scallions, shallots and garlic; sweet peppers, nuts and dried fruits; wines such as Madeira, Marsala, sherry and those of the dry variety; thyme and other herbs and olive oil; in other words, gleanings from a pantry imbued more with French culinary traditions than any others.

Antiquity and the Middle Ages

Lost in the fog of prehistory, the earliest method for cooking freshly foraged mushrooms no doubt was to toss them into the hot ashes of a fire and bury them, or to thread them onto a stick and roast them over the flames. This method of cooking, with dry heat, would help to intensify the mushroom's flavour. Water and air loss during cooking cause mushrooms to shrink a great deal, since water accounts for 80–90 per cent of their total mass.

Roman aristocrats prepared their own mushrooms in silver dishes called *boleteria*, the cooking of such august morsels being too lofty for the likes of slaves and others, according to Pliny the Elder, who christened mushrooms 'dainty voluptuaries'. Diners used special amber knives to cut the mushrooms. The number and types of mushroom dishes offered at feasts

Death cap (*Amanita phalloides*).

Caesar's mushroom (*Amanita caesarea*).

and banquets told guests how their host perceived their social status and where they stood in the hierarchy. Mushrooms were so popular that the Roman empress Agrippina the Younger (*c.* AD 15–59) didn't hesitate to slip a bit of death cap (*Amanita phalloides*) in among the Caesar's mushrooms (*Amanita caesarea*) being served to her husband, Emperor Claudius, at a banquet so that he would die and leave her son, Nero, to hold power in Rome. Or at least, that's how the legend goes.

The most often cited cookbook of the Roman period, Apicius's *De re coquinaria* (first century AD), contains several recipes for mushrooms, including the following:

> Another Way of Cooking Mushrooms
> *Boletos aliter*
>
> Slice the mushroom stems, stew them as directed above and finish by covering them with eggs, adding pepper, lovage, a little honey, broth and oil to taste.

The premier sacker of Rome, Theodoric the Great, king of the Ostrogoths (AD 454–526), ate mushrooms, too; so did the Plantagenet king Richard II (*c.* 1367–1400). One of the earliest English recipes for mushrooms appears in *Forme of Cury* (*c.* 1390), compiled by Richard's master cooks. Although some authorities question the meaning of the word 'funges' and doubt it means 'mushroom', a recipe for it reads as follows:

> Funges
>
> Take funges and pare hem clene, and dyce hem; take leke and shrede hym small, and do hym to seeþ in gode broth. Colour it with safroun, and do þerinne powdour fort.

The fourteenth-century *Libro di Cucina* evokes a recipe with hints of preservation methods; the text instructed the cook to start with dry fungi and soak them in hot water. Flavoured with onions, herbs, 'sweet and strong spice', the recipe called for frying the mushrooms and then garnishing them with pulverized almonds before serving. An alternative treat was to 'put vinegar on and serve hot'.

The Renaissance

Cristoforo di Messisbugo, one of the first cookbook writers since Apicius (*fl.* AD first century) to discuss mushrooms, composed *Banchetti, Compositioni di vivande, et apparcchio generale*, a tome that was published posthumously in 1549. As chef for the Este family in Ferrara, Italy, Messisbugo included five recipes for mushrooms in his book. He intended it to be used as a dining manual: a guidebook for other cooks who worked for wealthy families.

Bartolomeo Scappi, the Roman author and chef to popes, wrote a widely quoted work, *The Opera of Bartolomeo Scappi* (*L'arte et prudenza d'un maestro cuoco*) in 1570, which was translated into English by Terence Scully in 2008. Scappi's *Opera* contains a recipe that alludes to foraging: 'Get those mushrooms.' He suggested they be put in a pan and cooked with oil, garlic, salt and pepper. Once they were cooked well, he instructed the cook to add 'beaten fine herbs and a few raisins', grind the stems and moisten everything with verjuice and 'saffron-tinged water'. In common with many recipes today, the mushrooms arrived at the table on top of toasted bread.

Scappi's literary predecessor, the papal librarian Platina (Bartolomeo Sacchi), ranted about mushrooms quite negatively in his *De honesta voluptate et valetudine* (On Right Pleasure and Good Health, *c.* 1465):

> Mushrooms are considered of cold and damp nature and for this reason have the force of poison . . . It is allowed in cooking, when it pleases the gluttonous, to use certain recipes. They have to be cooked with that juicy part of the stalk by which they cling to the earth, first in water with breadcrumbs and then with pears and the shoots and stems of pears.

Maestro Martino, another Renaissance chef, who wrote *Libro de arte coquinaria* (The Art of Cooking, *c.* 1465), provided recipes for both boiled and fire-roasted mushrooms. No indication existed of the kinds of mushrooms thus treated:

> Clean the mushrooms very well, and let them boil in water with two or three buttons of garlic and white bread. And this is done because they are poisonous by nature. Then

> remove them and drain the water so that they are dry, and then fry them in good oil or lard. And when they are cooked, place over them various spices.

Modern Italian cooking carries on the legacy of these classical and Renaissance writers. Interestingly enough, ethnographic studies indicate that many of the ancient cooking practices can still be found in isolated Italian villages, such as Castelmezzano in Basilicata, where the older women within the community fry field mushrooms with sweet green peppers. They prepare other mushrooms in the same way and also roast them with pork fat or fry them with cheese. Researchers found that, in October and November, foraged mushrooms contributed heavily to people's diets. These observations help to fill the gaps in our understanding about how mushrooms featured in the diets of people other than the wealthy, who were the main audience and recipients of the cookery recorded by most cookbook authors before the late eighteenth century.

France, A Special Case

For a long time French chefs cooked mushrooms with much more enthusiasm than did their British counterparts. And it is their influence that probably shifted the whole mycophobia crowd, slowly, toward mycophilia. The frequency of the appearance of mushrooms on the table and their association with haute cuisine, and hence the upper classes, ensured their popularity.

Aside from 'Mushroom Sauce' in the Catalan *Llibre de Sent Soví* (1324), one of the earliest written recipes using mush rooms came from a handbook supposedly compiled by an

The steps for preparing chicken with mushrooms, a French-influenced dish.

elderly husband for his young wife, *Le ménagier de Paris* (1393). The anonymous author included a recipe for mushroom pie that many modern medieval re-enactors take pride in preparing. In *Le cuisinier françois*, François Pierre de la Varenne (1615–1678) garnished his ragout of veal with mushrooms and truffles. He also used mushrooms as a liaison to bind ingredients together, and some credit him with inventing *duxelles*, although there is now evidence to suggest that the dish may have originated in Uzel, a town in the Côtes-du-Nord. Varenne's English contemporary, Robert May, put forth 'To Dress Mushrooms in the Italian Manner' in his *The*

Accomplisht Cook of 1660. May chided the French in his preface, claiming that they,

> by their Insinuations, not without enough of Ignorance, have bewitched some of the Gallants of our Nation with Epigram dishes, smoked rather than dressed, so strangely to captivate the Gusto, their Mushroomed Experiences for Sauce rather than Diet.

These French authors made clear the great importance of fungi for Lent and the meatless days dictated by the Church. In *Le cuisinier françois*, Varenne composed a separate section for dishes of just that type. Lenten dishes included *champignons*, *champignons frites* and *champignons à l'olinier*. Good Friday menus included equally complicated dishes such as *rissolles d'achis de champignons*, *carottes et pistaches bien nourries de beurre*, *servies chaudes*, *sucrées et avec fleur d'orange*. The same emphasis on mushrooms as fast-day food also surfaced in medieval Polish and Russian cooking.

In *Le nouveau cuisinier royal et bourgeois* (1712), François Massialot, chef at the royal court of the Duke of Orléans, the brother of Louis XIV, dished up a mushroom coulis. French chef Menon, in *Nouveau traité de la cuisine* (1739), added savoury diced mushrooms and onions to a white sauce and served it with carp. At Monticello, the plantation at which Thomas Jefferson lived, cooks used Menon's *La cuisiniere bourgeoise* (1746), with its dozens of recipes calling for mushrooms. And, in the nineteenth century, Antonin Carême and a few of his chef colleagues livened up Russian cooking both through their impact on court cuisine and in restaurants. Many members of the Russian nobility hired French chefs or sent promising peasant boys to France for culinary training.

Boeuf en croute, also known as Beef Wellington, with a layer of minced, sautéed mushrooms (*duxelles*) surrounding the beef.

Given that the French way with mushrooms permeated cooking eaten by the upper classes, and *la grande cuisine* in general, a late nineteenth-century trend emerged, documenting regional cuisines. In *Les bons plats de France – cuisine regionale* (1913) Marthe Daudet (also known as Pampille) rejects *la grande cuisine* in favour of the simpler cooking of the provinces. But she still mentions mushrooms on 26 occasions throughout the book. Contemporary chefs, including Joël Robuchon and Alain Ducasse, place mushrooms on very high pedestals still, in spite of how easy it is now to obtain what was once a scarce and seasonal product, due to streamlined cultivation methods and astute marketing strategies.

The English Manner

By 1747, when English cookbook author Hannah Glasse promoted mushroom cookery by publishing 110 recipes for mushrooms in *The Art of Cookery Made Plain and Easy*, the French influence had become quite clear. Even though the mycophobic English traditionally eschewed mushrooms – or 'toadstools', as they commonly called those fungi that popped up overnight, fully formed – French cooking became a fixed part of court life and trickled down to the aspiring middle class. Yet John Farley, in *The London Art of Cookery* (1783), persisted in maintaining the English mycophobic point of view and referred to mushrooms as 'treacherous gratifications'.

Glasse's book also enjoyed huge success in Britain's American colonies; booksellers constantly placed advertisements for it in the *Virginia Gazette* of Williamsburg, Virginia. Another cookbook often advertised in newspapers in colonial Virginia, Richard Briggs's *The English Art of Cookery* (1788), incorporated a number of mushroom recipes, some calling for fresh mushrooms, such as 'white mushroom sauce' and 'brown mushroom sauce'.

The French influence continued in Britain, appearing strongly in two of the country's most widely used cookbooks of the nineteenth century: Eliza Acton's *Modern Cookery for Private Families* (1845) and Mrs Beeton's *Book of Household Management* (1861). One year later a Frenchman, Charles Francatelli, once cook to Queen Victoria, included dozens of recipes utilizing mushrooms in *The Modern Cook* (1846). Cooking school maven Mrs A. B. Marshall (1855– 1905), the British equivalent to the American 'celebrity' cooks Mrs Lincoln and Fannie Farmer, included numerous French-inspired recipes for mushrooms in her cookbooks. Marshall's books sold

for many years after their initial publication and influenced English cookery profoundly, linking the nineteenth and twentieth centuries.

With the publication of Florence White's *Good Things in England* (1932), a portrait of the historic regional cooking of England appeared, based on recipes dating back to the fourteenth century. Only four recipes mentioned mushrooms in their titles, suggesting that mycophobia had prevailed in the past. After the austerity of the Second World War, Elizabeth David presented the British public with her enticing books, tempting the ration-weary with food they could only dream of, including mushrooms, but not too many: there were only eleven recipes for them in her two most popular books, *A Book of Mediterranean Food* (1950) and *French Provincial Cooking* (1960).

In her *Four Seasons Cookery Book* (1970) Margaret Costa, formerly Wine and Food Editor of the *Sunday Times Magazine*, included 26 recipes for mushrooms, claiming that

> I think that even the most pavement-bound town-dweller still cherishes a sort of folk memory of something never perhaps actually experienced – a vision of getting up early on a misty autumn morning to gather great baskets of mushrooms for breakfast.

In contrast, the reader of Mary Norwak's *The English Farmhouse Kitchen* (1975) will find only two recipes for mushrooms: mushroom pickle and dried mushrooms. Interestingly, Norwak places the recipe for pickle in the last chapter, 'Farm Cooking from Further Afield', attributing it to Russia.

By 1980, Elisabeth Ayrton, writing about traditional English cookery in *English Provincial Cooking*, included just one

recipe containing mushrooms: mushroom and potato carole, 'carole' meaning 'chest' or 'coffer', another word for 'crust'.

Russia and Beyond

Historically not all Englishmen regarded mushrooms with fear and loathing. Travellers such as Dr Robert Lyall, the Englishman who wrote *The Character of the Russians* (1823), took the time to record titbits about the Russian love affair with mushrooms. Lyall devoted some ink not only to identifying the mushrooms he encountered but also to how the Russians cooked them, an unusual state of affairs indeed:

> Mushrooms are eaten fried, boiled or pickled, while their season endures, by all classes . . . They are fried on hot ashes, or in a frying-pan; they are boiled alone; they are boiled with *shchi* or cabbage soup; they are roasted with butter alone, or oftener with butter and *smetana* or sour cream. They also enter into the composition of some puddings and pies. The latter are generally eaten with soup or with *shchi*.

In Poland and Russia, mushrooms entered into the culinary repertoire because they grew abundantly in the forests and served to make the endless meatless days and religious-based fasting more palatable. Polish cooks created *kotelty z gryzbow*, or mushroom cutlets, for Lent and other mushroom-rich dishes, such as the Polish national dish of *bigos*. In one Russian folktale, a crone figure named Baba Yaga, associated with the forest and healing powers of tree fungi, wished to cook a hedgehog with some mushrooms and parsley: the hedgehog talked her out of it.

The Russian poet Alexander Pushkin (1799–1837) wrote of mushroom pickles in *Eugene Onegin*: 'In winter mushroom pickles make.' Meatless and fasting days were so numerous that mushroom cookery ascended to a fine art. The following recipe from a sixteenth-century household management book, *The Domostroi*, showed what Russians turned to on Lenten fast days:

> On Saturdays and Sundays throughout Lent people put out . . . dried mushrooms; mushrooms fried in butter; pies stuffed with millet, *viziga*, and peas; carp stuffed with fish, millet, and *viziga*; fritters.

In a land where famine often lurked outside the door of both hovels and mansions alike, including mushrooms in the pantry was not only a nicety but also a necessity in the fight against starvation. Yet, in neighbouring Finland, the natives (with the exception perhaps of those living on the eastern borders of Russia) traditionally looked down upon all mushrooms as 'food fit only for cows'.

Onward to Asia

In non-European regions mushrooms were also a popular part of people's diets, but much of the information about preparation and cooking methods was never recorded, existing only in the heads of cooks, most of whom were illiterate. The elite tended not to preoccupy themselves with cooking, perhaps with the exception of the Chinese, who were so very unlike Europeans in that respect.

Once their curative powers had been uncovered, foods with medicinal benefits were held in high esteem by the aristocracy.

Wood ear fungus growing on a tree branch.

It wasn't long before perceptions of the mushroom in Asia became more favourable. Culinary literature from those areas is abundant but largely inaccessible to Westerners because of the lack of translations available. The first book from that part of the world to focus exclusively on the various properties of mushrooms appeared in China in AD 1245. Chen Jen-yu's *The Mycoflora* describes how to prepare eleven types of mushrooms, including the pine mushroom (*matsutake*). Two other treatises provide an indicator of early Chinese views on mushrooms: *Kuang Chün Phu* (Extensive Treatise on Fungi) by Phan Chih-Heng (*c.* 1550) and *Wu Chün Phu* (Mushrooms in the Wu Region) by Wu Lin (*c.* 1683), which are more or less contemporary with some of the signature works that were appearing in Europe in the sixteenth century, where mushrooms and other fungi had only just begun to have a presence in cookbooks with any regularity.

In China, a myriad of mushrooms found their way into dishes of all sorts, including fish recipes, often puzzling

Westerners, since they paired mushrooms more commonly with meat than with seafood. To this day, due to its reputed medicinal qualities, the Chinese regularly add wood ear (*Auricularia auricula*) to dishes because they believe it improves breathing, circulation and general well-being. In *The Mushroom Feast* (1975) Jane Grigson quotes Hisang Lin and Tsuifeng Lin, in their *Chinese Gastronomy* (1969) as saying that the wood ear was 'as appetizing as a piece of paper'. Fresh wood ear sports a crunchy texture and, for that reason, cooks take up the challenge of cooking it in ways that might make it more appetizing.

In Chinese cuisine, mushrooms or fungi such as the tree fungus symbolize deeply held cultural beliefs. Dr Huipeng Zuo, of Xian Jiaotong University, wrote:

> White Fungus Stew, an example from the Beijing cuisine of the Official Family, combines white tree fungus with black sea cucumber, orange mushrooms, a green vegetable and

Matsutakes for sale. These are highly sought-after and expensive in Japan and China.

white lotus seeds. A beautiful contrast in colours, this dish expresses two *yin* and *yang* opposites, black and white, and orange and green; both keep the dish in balance.

Other symbolism associated with mushrooms in China includes a dish from the north called stuffed black mushrooms (*Xiangu Roubing*; meaning 'a long and happy marriage'), which is usually featured in menus for wedding banquets. The umbrella-shaped black mushrooms, which are usually braised in Chinese cooking, denote 'protection and unity' for the family preparing and eating them.

Li Hua-nan, a government official in the 1750s, took an interest in how people ate in different locales. He made notes as he travelled from one area to another, recording what he saw. He noticed that cooks stewed pig trotters with mushrooms, likely in the Kiangsu–Chekiang region. The sinologist James Dyer Ball also kept count of several Chinese menus during his travels, which he included in his *Things Chinese: Being Notes on Various Subjects Connected with China* (1900), indicating that 'pekin mushrooms' appeared before him, as did 'winter mushrooms', 'cassia mushrooms' and possibly the cinnamon-scented *matsutake*.

Cooking mushrooms in Japan takes a simpler turn to that of Western cuisine, with cooks usually just grilling or adding mushrooms to soups and one-pot meals rather than applying fancy Western treatments such as stuffing mushrooms, or combining them with cream. Shiitake mushrooms predominate in the cooking of Japan and China, where they are called 'fragrant mushrooms' (*xiang gu*) or the 'monarch of mushrooms', the best being distinguished by a criss-cross pattern on their caps.

India boasts a cache of mushroom cookery, chiefly in the northern parts of the country near Kashmir. One dish,

Emperor's pilaf with black mushrooms, calls for morels (*gochian*) from the Kashmir region. Families serve this expensive dish at parties and wedding banquets, or for special company. Other dishes, such as mushroom curry (*dhingri kari*) or mushroom turnovers, which combine the fungi with curry powder – a legacy of the British 'patties' filled with vegetable, chicken and mutton – testify to the place of mushrooms in this country's cookery. However, throughout much of India mushrooms are considered to be 'poor man's meat'.

Africa and Latin America

In his journal *In Darkest Africa* (1891), Henry Morton Stanley reminisces about the mushrooms that were served in his camp as he sought David Livingstone: 'Our Nyanza people were provident and eked out our stores with mushrooms and wild fruit.' Marie L. Pickering, who wrote *Tropical Cookery Simplified* (1963) while stationed in Ghana with her husband (who managed the Marlu gold mine, which he had named after her), included in this book a recipe for 'Pigeon Pie' that required a 'small tin of mushrooms'. In South Africa, Rosanne Guggisberg, in her *Eating in Africa* (1958), proposed a recipe for 'Hunter's Terrines – but not for teetotalers'; among other ingredients, such as one pound of tender gazelle meat and one glass of brandy, she called for six ounces of mushrooms. A delicious recipe for beef cooked with mushrooms appeared in Elizabeth Jackson's *South of the Sahara: Traditional Cooking from the Lands of West Africa* (1999), while in Ethiopia, people call mushrooms 'hyena's umbrella': not at all complimentary!

A valuable source of information about cooking in the cultures of Africa and parts of Latin America, continents where few written historical records exist, comes from the

work of a small group of ethnomycologists, whose subject of study is how mushrooms have been used historically by humans. Most of the information they have gathered concerns the use of hallucinogenic mushrooms, however, they did pay some attention to the use of fungi in the cookery of these countries, which helps to give some indication as to how they were processed and cooked by people. In *Recipes from the Regional Cooks of Mexico* (1978), Diana Kennedy, 'ethnogastronome' and staunch preserver of traditional Mexican foodways, made an intriguing comment: 'The mushrooms of Mexico are a study in themselves.' She provided a number of recipes for mushrooms, including one where they were stewed in chilli sauce. Since fresh mushrooms must be cooked quite closely to the time of foraging or picking, in some areas like the Patamona in Guyana, South America, people steam fresh mushrooms in palm or other broad leaves close to campfires built adjacent to the foraging grounds. The cooks wipe the debris off the mushrooms, salt them lightly and then

Djon-djon mushrooms from Haiti.

wrap them in two or three layers of the leaves, thus creating a triangular package for steaming. Black on the outside from the cooking, the leaves hide delectable steamed mushrooms, which the eaters may salt again before using their fingers to eat the delicacies.

Not all mushrooms can be steamed in this manner, however. There is one type of mushroom, the *Macrocybe*, which must be boiled in 'several changes of water before eating', thus removing toxic elements.

Another unusual mushroom, the black mushroom (*djon-djon*) from Haiti, nestles in habitats primarily located in the northern regions of the country. When added to white rice, the mushrooms impart on it a black colour and unique flavour. Cooks add only the caps of dried *djon-djons* to the rice since they consider the stems inedible.

In Nigeria, Yoruba women make a popular dish that involves cutting up freshly foraged *Termitomyces robustus* mushrooms into pieces and then soak them in cold water laden with table salt. This practice was believed to rid the mushroom of insects and other undesirable organisms. After rinsing the soaked mushrooms, cooks use them in soups or turn them into a jerky-like consistency by drying and then combining them with soups and sauces.

The cleaning of mushrooms seems to have been an important part of the cooking process, no matter who was preparing them. As a mycophobic Englishman, J. Cook, wrote to the *London Magazine* in 1768:

> But if we must, and will indulge our palate in the use of these savoury, though hazardous vegetables, let them be well looked into, searched, and washed, and only prepare, or pickle those that have none, or fewest of these poisonous vermin upon them: To this end let the selected

Bowl of mushrooms ready for cooking.

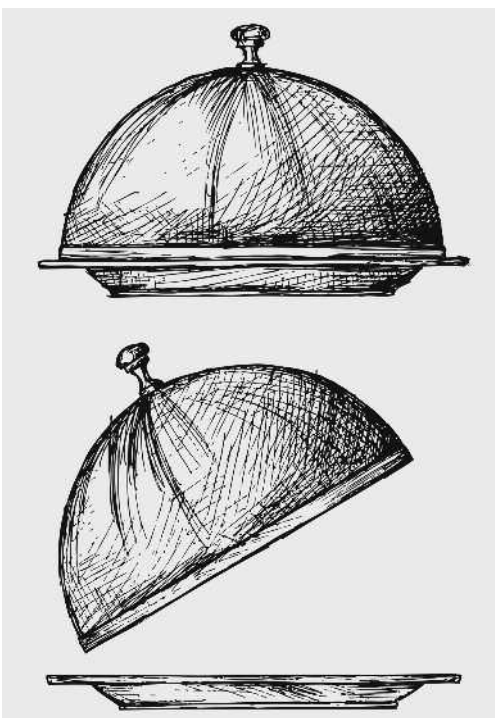
mushrooms be well soaked first in salt water, then washed with the same, several times shifted, to kill, or scour off, the invisible animalcular vipers lodged therein.

The American Way

There were no mushroom recipes featured in the first known American cookbook, *American Cookery* (1796) by Amelia Simmons. It wasn't until nearly 30 years later, when Mary Randolph, the doyenne of early American cookery (probably influenced by her cousin-by-marriage the Francophile Thomas

Jefferson) published *The Virginia Housewife* (1824), which included a recipe for stewed mushrooms, that the mushroom would make an appearance in the cookbooks of the nation.

By 1848, the American cookbook author Eliza Leslie, in her *Directions for Cookery, in its Various Branches*, suggested that turkey be accompanied by ham or tongue, served up with mushroom sauce on the side, and accompanied by stewed cranberries on the table. Fannie Farmer gave a recipe for chicken and mushroom croquettes in the oft-printed *Boston Cooking School Cook Book* (1897). Thanks to the efforts of chefs such as Charles Ranhofer (1836–1899) of the famed Delmonico's Restaurant in New York, mushrooms slowly



Serving dish for *champignons sous cloche*.

Campbell's cream of mushroom soup, an American tradition.

became associated with haute cuisine in the U.S. In *The Epicurean* (1893), Ranhofer included a recipe for 'mushrooms under glass' (*Champignons sous cloche*); an elaborate way to cook mushrooms which not only made them look stunning but which was also very popular. Fluted fresh mushrooms garnished many of his dishes, including those with fish.

Ironically, given the long history of mushroom cookery, the first cookbook in English devoted solely to cooking mushrooms appeared only in 1899: *One Hundred Mushroom Receipts* written by Kate Sargeant. Exactly 100 years later, Fred Kelso published the bibliography *For the Love of Fungus: A One Hundred*

Year Bibliography of Mushroom Cookery, 1899–1999, which listed nearly 100 books in English devoted solely to mushrooms.

Many cookbooks published in the late 1800s and early 1900s often reserved a place for cream of mushroom soups, the richness of which was appealing and often provided comfort at the beginning of both simple suppers and grand dinners. Campbell's cream of mushroom soup would deserve credit for keeping the mushroom at the forefront of the American culinary scene during its 'Dark Ages', the period spanning from 1930 to around 1970. 'Invented' in 1934, the soup soon also became the 'secret ingredient' in casserole recipes that were designed to encourage housewives to buy Campbell's products. Jokesters call the soup the 'Lutheran binder', recognizing its prowess as a sort of instant béchamel (or white) sauce. One thing is for sure, almost every community cookbook of that period contained recipes calling for cans of this ubiquitous soup! One recipe that pervaded was Campbell's tuna-noodle casserole. Another, the green bean casserole, became a classic dish found on many a dining table during Thanksgiving. The irony was that there had already been recipes in existence that used all the basic ingredients of the soup prior to the huge advertising onslaught carried out by Campbell's, which involved cookbooks and later televisions advertisements featuring the Campbell kids.

Yet despite the popularity afforded to the mushroom by Campbell's and also by a best-selling cookbook of the same period, *Mastering the Art of French Cooking* (1961) by Julia Child, which included dozens of mushroom recipes, it still had its opponents. In 1970 American food writer Craig Claiborne published *Classic French Cooking*, in which not a single recipe cited mushrooms, in spite of his culinary training at a French-influenced Swiss hotel school, where he would have undoubtedly used mushrooms in culinary

classes. Cultural bias still abounded in culinary literature and cookbooks in the U.S. Even by 2010, a Eurocentric cookbook on historical foodways made not a single mention of mushrooms.

And Irma Rombauer's classic *The Joy of Cooking* (1973), which boasted some 30 recipes for mushrooms, and which also included tips on foraging because only the button mushroom (*Agaricus bisporus*) had been available to shoppers at the time of publication, added just a few more recipes to its 2006 edition. But another important b arometer of change appeared in that edition of *Joy*: by that time, cooks could count on buying a number of cultivated mushrooms (cremini, oysters, portobellos, shiitake), and that later edition of *Joy* only briefly mentioned foraging chanterelles. *Joy* presents a concrete example of how mushroom cookery evolved in the United States.

The Tide Begins to Turn

By the 1980s and '90s, things began looking up for mushrooms in American and British cuisine. Not only was the commercial mushroom industry expanding (by increasing the number of species it could cultivate) but also chefs like Alice Waters and Jeremiah Tower, influenced by foraging guru Euell Gibbons (*Stalking the Wild Asparagus*, 1962) and by their travels in Europe, particularly France, experimented with mushrooms in various dishes. The American food writers Sheila Lukins and Julee Rosso gushed about mushrooms in *The Silver Palate Cookbook* (1983): 'This episode [eating foraged wild mushrooms] only convinced us that more and more people are becoming aware of the mushroom possibilities that await them in nearly every part of the country.' Other cooks across

the country indeed found mushrooms delectable. The Junior League of Denver published *Crème de Colorado* (1987), which contained thirteen recipes including mushrooms, most of which were inspired by French cuisine.

The growing awareness of local foods has, like a baker making cream puffs, injected steam into mushroom foraging in a big way. In Britain, TV chef Nigella Lawson promotes the use of mushrooms, as does Hugh Fearnley-Whittingstall. Even video gamers jumped on the bandwagon, inventing a cream of mushroom soup game, which is available to play online: an easy video rendition of how to make the soup from scratch, with the help of an insistent pointing finger.

In the 2000s, supermarkets across the U.S. and UK stock a variety of fresh mushrooms, though shiitake, buttons and portobellos predominate. Food Network chefs nonchalantly chop up hen-of-the-woods (*maitake*). Chefs in restaurants serve mushroom *crème brulée*. Chain eateries like TGI Friday's sell plates of stuffed mushrooms to clamouring customers. Cookbooks devoted entirely to mushrooms crop up in greater numbers, and food magazines publish article after article on mushroom foraging and cooking. From 'excrescences' to exquisiteness indeed!

The Elephant in the Room: Toxicity

When it comes to mushrooms, not all is sweet cream and porcini. The first written account of eating mushrooms in the West – in 450 BC from the pen of Greek playwright Euripides – concerned the death of a woman and her three children, after being poisoned by some mushrooms that the family had cooked and eaten after a day of foraging. (Some believe that Euripides was writing about his own family.)

All mushrooms contain agaritine, a phenylhydrazine, which breaks down into derivatives like 4-(hydroxymethyl) phenylhydrazine (HMPH) and 4-(hydroxymethyl) benzenediazonium ions (HMBD). These carcinogenic compounds damage the DNA of humans. Mycologists strongly urge the cooking of *all* mushrooms for this reason.

Not everyone pays attention, however. The *Larousse gastronomique* (2009) falsely stated that some species – like Caesar's mushroom (*Amanita caesarea*), shaggy mane (*Coprinus comatus*) and other cultivated mushrooms – can be eaten raw and that all others must be cooked. Meanwhile, influenced by the raw foods craze in vogue in twenty-first-century America, some young chefs in British Columbia served raw morels in a salad at a banquet. Seventy-seven guests came down with gastrointestinal distress, most 'worshipping at the ceramic shrine' and others spending the night in hospital in gut-wrenching agony.

Heat or digestive juices will often destroy some of the unexpected toxic compounds found in some mushrooms, morels and porcini being just two examples. Cooking mushrooms indeed helps to reduce certain toxins and other irritants that poison some people (also known as 'false poisoning' when the effects are not fatal). Another reason for cooking mushrooms lies in their structural composition. Humans find it difficult to digest the cell walls of raw mushrooms because it is composed of chitin, a cellulose derivative.

A clear-cut distinction crops up between safe and unsafe mushrooms, especially those that produce amatoxins. Eat a death cap (*Amanita phalloides*) and serious trouble ensues, even if it is boiled to death with a few pears thrown in, as the Roman author Pliny the Elder urged. Pliny's suggestion for cooking mushrooms with pears did little to allay fears of poisoning. Many folk beliefs perpetuated pure nonsense, such as this comment made by the influential astrological-herbalist

Nicholas Culpeper (1610–1654) in *A Physicall Directory*, which was reprinted as late as 1932:

> Mushrooms are under the dominion of Saturn and if any are poisoned by eating them, Wormwood as an herb of Mars cures him, because Mars is exalted in Capricorn, the House of Saturn; and this is done by sympathy.

According to Greek food historian Mariana Kavroulaki, a list of antidotes to mushroom poisoning used in ancient Greece included 'radish pulp, cabbage pulp and a drink made with honey, saltpetre and warm water'. Bartolomeo Scappi proposed another solution: 'Some put in garlic, which is thought to counteract poisons.' Another belief cautioned that using a silver spoon to stir mushrooms would indicate a poisonous intruder if the spoon changed colour. Lettice Bryan in *The Kentucky Housewife* (1839) urged cooks to rub something gold on the mushrooms. Yellowed gold signalled poison. In *Directions for Cookery* (1844), Eliza Leslie suggested boiling an onion in with the mushrooms; if it turned 'bluish black', a bad mushroom lurked in the pot. And in the East, in Laos, people believed that poisonous mushrooms turned rice red.

Truffles, *Huitlacoche* and *Kombucha*

Humans eat many fungi other than mushrooms, including truffles, *huitlacoche* (corn fungus), the yeast found in beer and *kombucha*. Pliny the Elder called truffles (white, *Tuber magnatum*, and black, *Tuber melanosporum*) 'callosities of the earth'. Centuries later the French culinary philosopher Jean Anthelme Brillat-Savarin, waxing lyrical in *The Physiology of Taste* (1825), likened them to 'black diamonds of the kitchen'. Found with the help

Huitlacoche, edible corn fungus.

of truffle-smelling pigs or dogs, mycorrhizal truffles tend to grow under oak trees. Even with the introduction of the Talon method of cultivation in France in 1808 – where growers sow acorns around truffle-producing oak trees – truffles still command insanely high prices in the world market, causing conflict and even death as people contest for truffle grounds. Chefs never heat white truffles, preferring instead to grate them onto foods such as pasta that take a back seat to the pungent taste of the fungus. Black truffles end up in risottos and also as garnishes for pasta, lardoned into meat and immortalized in such dishes as the Lyonnais *poulet demi-deuil*, 'chicken in half mourning', in which cooks insert slices of black truffles under the skin of the chicken breast.

In 1989, the James Beard Foundation, a U.S.-based organization whose aim it is to preserve the food heritage of the Americas, granted unheard-of status to *huitlacoche/cuitlacoche* (*Ustilago maydis*, a corn fungus): the Foundation held a dinner featuring the fungus, touting it as the Mexican truffle. Dating back to Aztec times, the fungus grows on ears of corn. Aztec

farmers inoculated the ears by scraping them and rubbing spores into the crevices. Native Americans considered the fungus a delicacy and used it as a filling for tortillas.

Another popular fungus, most commonly consumed in Russia, China and Japan, is *kombucha*. Served in Russia as *ajnyj grib* (literally 'tea mushroom'), it is not really a mushroom at all but, rather, the yeast cultures derived from fermented tea. Versions of this drink appear in China and Japan as well.

4
Preservation

Fresh mushrooms last but a few days at best, so people have devised ingenious ways to save and savour their 'catch'. Because of the fragility of most mushrooms, hunters feel an imperative to preserve them as soon as possible after harvest. Mushrooms thrive best after harvest in an ambient temperature of 34–8°F (1–3°C), and even then only for a few days. Ancient methods of preserving – smoking and drying – achieve the important goal of reducing the 80–90 per cent water content generally found in mushrooms to a level low enough to discourage the growth of harmful bacteria. Drying is still a method that is widely used.

Although modern gourmets regard mushrooms as delicacies, in many cultures throughout history their function was simply to increase the nutritional value of the meagre winter and spring diets of most people, rich or poor, in the northern hemisphere and elsewhere. The major impetus for preserving mushrooms came from the annual 'starving period' (winter), as well as from the meatless feast days, the seasonal nature of mushrooms, the short shelf-life of fungi in general, the difficulties in transporting them due to bruising and other damage that invites insect and bacterial infestation and the laws of economics: prices drop to their

Dried porcini.

lowest point when they are in season, usually September and October in the northern hemisphere.

Drying, smoking, pickling, salting and marinating are the traditional ways of saving a mushroom's essence. *Duxelles*, a French invention often attributed to the chef François Pierre de la Varenne, provides another historical example: finely chopped fresh mushrooms, sautéed in butter until the liquid evaporates, stay fresher for longer than newly picked mushrooms.

Mushroom essence and mushroom powder offer yet more ways to capture the *umami* (the meaty, savoury taste) of mushrooms. Ancient Romans ground up dried mushrooms and used them in *garum*, a sauce similar to the fish sauces now used in cooking in Southeast Asia. Mushroom powder also found its way into Roman gravies, sauces and soups, and was used as the seasoning for meat, poultry and fish. Modern cooks often make mushroom powder as a way of preserving their abundant harvests.

There's a haunting passage in Willa Cather's novel *My Antonia* (1918), about a Bohemian immigrant family named Shimerda, who carried prized dried mushrooms all the way from Europe to rural Nebraska. The anecdote illustrates the esteem in which many immigrants to the United States held mushrooms, likely because of their intimate knowledge of starvation. It suggests an underlying disdain for mushrooms on the part of many Americans:

> She threw the package into the stove, but I bit off a corner of one of the chips I held in my hand, and chewed it tentatively. I never forgot the strange taste; though it was many years before I knew that those little brown shavings, which the Shimerdas had brought so far and treasured so jealously, were dried mushrooms. They had been gathered, probably, in some deep Bohemian forest.

One means of preservation that took hold even in the mycophobic British kitchen was mushroom ketchup, or catsup. A glance at eighteenth-century cookbooks shows that recipes for this sauce began to pop up like, well, mushrooms. This phenomenon may have been related to the increasing English trade with China and familiarity with soy sauce. Hannah Glasse, in *The Art of Cookery Made Plain and Easy* (1747), and Maria Rundell, in *A New System of Domestic Cookery* (1807), both extolled the merits of mushroom ketchup.

Mary Randolph's *The Virginia Housewife* (1824) gave a recipe for the catsup: 'Take the flaps of the proper mushrooms from the stems, wash them, add some salt and crush them', advising that they be boiled twice, the second time to half the original volume. *A Quaker Woman's Cookbook* (1845) by Elizabeth Ellicott Lea provided cooks with mushroom recipes that included catsup and pickle as well as instructions

on how to stew and fry the fungi. Richard Briggs's *The English Art of Cookery* (1788), used widely in colonial America, suggested using mushrooms to make pickled mushroom sauce, mushroom powder and mushroom ketchup, as well as in sauces. He, like other authors, used the ketchup in many other dishes for added flavour.

In modern Japan, a mushroom relish served with white rice illustrates that the traditional process of preserving mushrooms by pickling is still common. Wood ears in China are mixed with soy nugget juice (*shih chih*) and clarified saltless soy bean paste (*chiang chhing*), according to H. T. Huang in *Fermentations and Food Science* (2000), and then seasoned with ginger and *fagara* (Szechuan pepper).

Other cultures continue to use the ancient method of drying to preserve their 'catch'. The Chinese dry a large number of mushrooms, including oyster, shiitake and jelly fungi, such as wood ear. The latter, which is virtually tasteless, increases five times in size when rehydrated and can be

Dried mushrooms for sale in China.

stored for up to a year without any ill effects. Jelly mushrooms are used in stir-fries and soups in China. The fungi absorb flavours from the dish in which they are cooked. The key reasons for the jelly's popularity centre on its crunchy texture and numerous alleged health benefits: it is thought to be beneficial to the cardiovascular system and in the treatment of certain cancers. Most of the dried mushrooms found in supermarkets and Asian markets in the West now come from China.

Unlike wood ear, most dried mushrooms do not reconstitute to quite the same size as when they are fresh, although the fairy ring mushroom (*Marasmius oreades*) does come close. Most cooks around the world use dried mushrooms as others use herbs and spices – as flavouring agents. Drying the enormous, elephant-ear-like *Termitomyces* species in sub-Saharan Africa results in a jerky-like food, not just a flavouring additive.

The Russians preserve their mushrooms by methods more numerous than the Chinese. Prior to their arrival in the

Pickled mushrooms, a popular Russian method for preserving mushrooms.

Bering Strait, the native Yupiit and Chukchi peoples called mushrooms 'devil's ears' and only began to eat and preserve the fungi once they learned the value of doing so from the Russians. 'Hot' and 'cold' pickling methods, as well as drying, summed up the ways that these groups handled the large number of mushrooms they foraged. For hot pickling, cooks poured a warm mixture of vinegar and spices over boiled mushrooms and stored them in a heatproof container. Cold pickling required the same process, except that the pickling mixture was allowed to cool before being poured over the mushrooms.

These methods follow techniques advocated by John Farley in *The London Art of Cookery* (1783) very closely:

> Use the close button mushrooms, rub them with a bit of flannel or tammy cloth, throw a little salt over them, and put them into a stewpan with a little lemon or vinegar, and a blade of mace, and a few cloves, and whole white pepper, keeping them well shaken; then keeping it on the fire until all the liquor is absorbed into the mushrooms again, then put as much white vinegar in your stewpan, sufficient to cover them, give it a warm, then put them into bottled or jars.

In Russia cooks add salt to mushrooms (often the edible *lamellar*) after first soaking them for two to three days in water. They then layer them with white onions in a wooden or glass container. The mushrooms do not 'cook' by heat but rather through the process of lacto-fermentation enabled by bacteria. This is nearly identical to the method used by the Irish food writer and chef Darina Allen, based on a recipe passed down by her family, for pickled mushrooms and mushroom ketchup.

Placing mushrooms in oil has been another common method of preservation. In a technique most popular in Calabria, Italy, cooks will often add the acid from vinegars and citrus fruits, such as lemons, to the oil.

Preservation methods have evolved along with technology. With the invention of the freezer and pressure canner, new processes were introduced to foragers that were much more economical and, as a result, very popular.

The first canned mushrooms were produced commercially in France, led by the efforts of Nicolas Appert, who, in 1810, had won a contest to provide a reliable food preservation method that would serve the armies of Napoleon. Later that same year, a French inventor, Philippe de Girard, perfected Appert's technique and applied it to inventing tin cans. His method was later patented by his British agent, Peter Durand. One of the most important benefits of canning became apparent during the American Civil War. The armed forces could provision their men better and more efficiently because it was easier to transport and store canned food for longer periods of time than fresh food. By 1883, the War Provisioning Office included canned mushrooms in their supply lists, as 'mushrooms, canned'. An article in the *New York Times* in 1880 described the French version of canned mushrooms, indicating that the canners packed the mushrooms in 1–1½ lb cans with olive oil, lemon juice and beef broth. The cans sold for 30–35 cents each. In *A New Daily Food: A Collection of Tried and Reliable Recipes* (1885), published by St Paul's Church in Morrisania, New York, a Mrs Krahnstover submitted two recipes for mushrooms, one for fresh and one for canned. Her instructions for the fresh mushrooms read, 'Cook them in the same way as canned.' This signals how, once it was possible to cultivate mushrooms, the technology of canning drove their consumption, which was already on

the increase due to the nineteenth-century vogue for French haute cuisine.

Nineteenth-century cookbooks, such as Sarah Tyson Heston Rorer's *Philadelphia Cook Book: A Manual of Home Economics* (1886), provided detailed instructions for using canned mushrooms. Rorer provided recipes for George Francis Atkinson's classic *Studies of American Fungi* (1911), including the wildly popular recipe for mushrooms in cream served under a large glass bell, *Champignon sous cloche*, as promoted by Charles Ranhofer at Delmonico's in New York. One of the less complicated recipes attempted to replicate one of the popular dishes of the day, fried oysters:

> Mock Oysters
> Trim the soft gill portion of *Pleurotus ostreatus* [oyster mushroom] into the shape of an oyster; dust with salt and pepper; dip in beaten egg, then in bread crumbs, and fry in smoking hot fat as you would an oyster, and serve at once. This is, perhaps, the best method of cooking this variety.

In 1903, a circular distributed by the U.S. Department of Agriculture stated that the country imported more than 2 million lb (*c.* 91,000 kg) of canned mushrooms from France annually. Mushroom magnates like Edward H. Jacob objected to the French canned mushrooms making their way into the United States, igniting tariff debates. Although there was a small industry in the U.S. in the 1930s, headed by mushroom growers such as Louis Lescarboura, who cultivated and canned button mushrooms and sold them as his Oxford Royal brand, and The Minnesota Valley Canning Company, which also canned the button mushroom under the brand 'Green Giant', Americans were still importing great numbers

of commercially canned mushrooms from Europe, particularly France. Even so, up until the 1990s, the only mushrooms that were commonly available were buttons, rubbery in texture and virtually tasteless (but definitely safe, with no threat of poison hovering over each mouthful).

Around the end of the nineteenth century, Pennsylvania, specifically Kennett Square, became a hotbed of mushroom cultivation because of numerous factors, including nearby markets and good transportation networks, especially the horse-and-buggy type that provided the manure needed for the compost. Companies such as Giorgio Foods in Temple, Pennsylvania, still provide both fresh and canned mushrooms, as well as frozen breaded mushrooms, to the American retail market.

Another technological development in preservation came with the invention of the freezer. Simply sautéing fresh mushrooms in butter, and then tossing them in a plastic bag, helped to preserve the fresh taste. Freezing fresh mushrooms results in a soggy product best used in soups and stews. However, according to the Mushroom Council in the U.S., it's best to use frozen sautéed mushrooms within a month; even the process of freezing has its limitations.

Solar dehydrating appears to offer a new twist on an old practice by using solar-powered dehydrators. But the old-fashioned method also works, so long as the drying environment avoids any hint of dampness. Jokingly, some people say the process can be as easy as placing mushrooms on the dashboard of a car parked in direct sunlight and letting nature take her course. Stringing up mushrooms to air-dry works, as does piling them on racks. Another method involves placing the mushrooms in a black box with tiny holes poked in it and leaving the box in sunlight. Some mushrooms, like shaggy manes (*Coprinus comatus*) do not dry well, turning instead into

a gooey black pool of liquid. Morels, black trumpets, wood ear, boletes and shiitake do dry well, to which generations of 'mushroomers' can attest.

Modern technology has also helped commercial producers to process and preserve mushrooms in other ways. Companies such as Havatec BC and Van Asseldonk Champignons in the Netherlands, for example, have worked together to design and engineer intricate machinery that sorts button mushrooms (*Agaricus bisporus*) by cap diameter, cuts their stems to a uniform length and packs them into plastic crates for wholesale.

Creamy mushrooms on toast.

5
Nutrition, Medicine and Religion

Mushrooms continue to mystify us even after centuries of their presence in literature. John Thorne, a twenty-first-century food writer, captures their somewhat mythical essence:

> The thing you seek has so much not been there – not under those leaves, not by that tree trunk, not in that small hollow – that when you finally come upon it, you expect it to be as ethereal as a ghost.

Given their peculiarity, both in their appearance and in how they suddenly seem to pop out overnight, it is not surprising that mushrooms carry about them a whiff of the magical and miraculous. It is perhaps no wonder, then, that in J.R.R. Tolkien's epic *Lord of the Rings* mythology, the preferred food of his hobbits was . . . mushrooms.

For many centuries, some people – most of whom were mycophobic – considered mushrooms to be nothing but water, lacking in any nutritional value at all. Others, chiefly in China and Japan, recognized the valuable medicinal qualities of mushrooms and essentially designed their cuisine around these powerhouses of the immune system. Still others discovered the remarkable mind-altering nature of certain mushrooms

and developed religious practices associated with ingesting these hallucinogenic fungi.

The Nutritional Value of Mushrooms

Ancient literature declared the nutritional value of mushrooms skimpy at best. This is unsurprising, considering that they consist of approximately 90 per cent water.

Studies on the nutritional properties of mushrooms began primarily in the nineteenth century, with the advent of interest in all forms of science at that time. Around 1880, authorities in Belgium discussed cultivating mushrooms to augment the protein intake of the poor. The father of British mycology, Reverend Miles Joseph Berkeley, wrote in 1861 – with some wonder – that brown bread and mushrooms (which were either dried or preserved in vinegar) comprised the diet of many people in Eastern Europe.

Mushrooms can vary widely in their nutritional content, depending upon species, habitat and substrate. Those growing on trees tend be lower in mineral content than those growing on the ground. Mushrooms also absorb heavy metals and radiation from their surroundings, as researchers discovered when studying the 1986 fallout at Chernobyl.

In general, however, mushrooms act as a rich resource for protein, potassium, riboflavin (vitamin B_2), niacin (vitamin B_3), pantothenate (vitamin B_5), vitamin D precursors (ergosterols), selenium and copper. They also contain a number of polysaccharides, important arbiters of immune function, which are principal players in medicinal claims related to mushrooms. The key to the nutritional prowess of mushrooms lies in the composition of their amino acid content. The concentration of protein in mushrooms varies from 1 to 4 per cent

of their weight when fresh, and 10 to 45 per cent of their weight when dry. Take chanterelles (*Cantharellus cibarius*) as an example: one of the most sought-after species of wild mushroom, they contain anywhere from 11 to 24 per cent protein. Although all the essential amino acids are found to be present in mushrooms, they also possess limiting acids – such as lysine, leucine, isoleucine and tryptophan – meaning that they must be consumed with other foods in order to ensure a complete intake of protein. The bioavailability (the amount of substance actually available to tissue) of mushroom protein is about two-thirds, primarily because of the chitin in the cell walls of mushrooms, which humans are unable to digest. Nutritionally, mushrooms fall somewhere between vegetables and legumes, meat and milk. To put all this in perspective, an average baked potato is around 3.9 per cent protein.

When early chroniclers attributed the survival of populations during war and famine to the nutritional effects of mushrooms, we must remember that in many cases they meant dried mushrooms, as well as fresh. Either way, the fact that mushrooms played an important role in human nutrition during times of both peace and war cannot be doubted. For example, in 1784, William Coxe wrote in *Travels into Poland, Russia, Sweden and Denmark* that wherever he went he saw 'a great abundance' of mushrooms in peasant cottages and markets, suggesting the vital importance of mushrooms in peasant diets. During the American Civil War amateur botanist Reverend M. A. Curtis related that he foreswore botany, except for edible mushrooms, 'from which I have gotten many a substantial and luxurious meal'. Even though some of the mushrooms in question, like the Czech *horyl* (from *hofeti,* 'to burn'), bothered the tongue and intestines even after three boilings, hunger drove people to eat them. Walter Philip

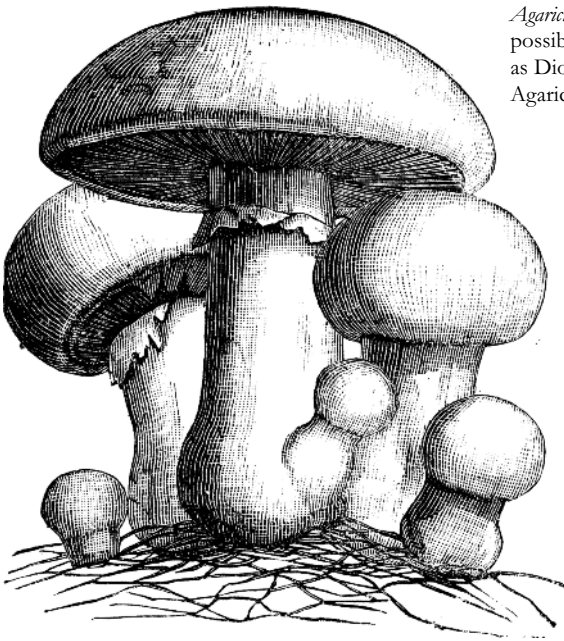
Kennedy Findlay, author of the delightful *Fungi: Folklore, Fiction, and Fact* (1982), wrote in *Wayside and Woodland Fungi* (1967) that 'during the Second World War, when appetizing foods were scarce, many English people learnt with interest from Poles and other European immigrants that many toadstools are not only edible but even delicious'.

More recently too people have relied on mushrooms for nutrition. In 1980 refugees fleeing from Mozambique to Malawi depended upon mushrooms during famines, according to K. Wilson in an article in 1989 about food provisioning among the refugees. An experiment conducted by P. Abbott in 1999 using human subjects in Malawi illustrated that mushrooms did indeed help people to survive. On a daily diet of 1.3 kilograms of dried leafy greens and/or wild edible fungi, families of four would receive enough nutrition to stay healthy during the two-week duration of the study. Mushrooms indeed provide more than just water.

Medicinal Mushrooms

Fungi in general, and mushrooms in particular, are constantly fighting pathogens (germs). Just think of penicillin and its fungal origin. Given the rotting material considered to be mushrooms' normal habitat, this might explain why they offer the medicinal benefits they do. Fungi secrete antibiotics, as well as exoenzymes that break down material that fungi manipulate for food. This heterotrophic ('other feeding') behaviour includes digestion of bacteria and other pathogens.

Western medicine tends to focus on trauma, while Asian medicine seeks balance, and uses foods that might function to help achieve that goal. Traditional Chinese medicine (TCM) utilizes more than 100 mushroom species in its pharmacopoeia



Agaricus campestris, possibly the same as Dioscorides' Agaricum.

and, as a result, Western practitioners are slowly beginning to realize that the health benefits of eating mushrooms are not to be sneezed at.

Recent research points to beta-glucans as the possible active ingredients in medicinal mushrooms. First discovered in the 1960s, these compounds modulate immune responses in the body via host cells and chemical messaging. Many controlled clinical trials examining patients' immune function have taken place in China and Japan, but only recently in the United States. In Korea, Japan and China, mushroom-derived products often appear as adjuvants in routine chemotherapy treatments. Although medical scientists realize that polysaccharides play an important role in immune function, the exact mechanism is not fully understood.

Phallus impudicus or common stinkhorn.

An old Chinese proverb states it clearly: 'Medicine and food have a common origin.' But mushrooms were not always eaten fresh for their medicinal properties. In many cases, healers created extracts, hot-water concentrates, powders, tinctures, teas and herbal mixtures. The purposes of these treatments covered a wide gamut of illnesses and conditions.

Archaeological evidence testifies to the presence of mushrooms and puffballs in ancient medicine. Found in 1991 in the Ötztal Alps, on the border between Austria and Italy, Ötzi the Iceman (*c.* 3000 BC) carried two types of polypore

Kuan-Yin, the Chinese goddess of healing and mercy.

fungi with him, hanging from a leather cord. One, birch fungus, no doubt acted as a medicine for the stomach ailment he suffered from, whipworm.

Thanks to the work of the English minister and naturalist Reverend William Houghton (1828–1895), mushroom scholars know a good deal about how mushrooms were regarded in classical literature; Houghton compiled numerous excerpts from classical literature referencing them. Hippocrates (*c.* 460–370 BC), Dioscorides, Pliny the Elder and Galen wrote briefly, and often disparagingly, about mushrooms. In *De Materia*

Medica (*c.* AD 40–90) Dioscorides said, 'either they are edible or they are poisonous, and come to be so on many occasions, for either they grow amongst rusty nails or rotten rags, or ye holes of serpents, or amongst trees properly bearing harmful fruits'. In spite of Dioscorides' negative attitude, he recommended Agaricum (*agarikon* in Greek) (*Laricifomes officinalis* or *Fomes officinalis*, syns. *Fomitopsis officinalis*, *Polyporus officinalis*) for a wide range of ailments. Patients took his version of agaric, called female agaric, in raisin wine. Pliny and Galen perpetuated Dioscorides' ideas and guided European thinkers and herbalists until around AD 1600. During the early Renaissance, a brisk trade in PseudoAgaricum (*Laricifomes sulphureus*) ensued. Quacks know no time limits.

Clusius published *Fungorum in Pannoniis Observatorum Brevis Historia* in 1601, which contained one of the first pictures of the stinkhorn mushroom (*Phallus impudicus*), a most impudent mushroom indeed. On the other side of the Channel, English herbalist John Gerard lifted Clusius' stinkhorn illustration and printed it upside down in his *The Herball* of 1633, likely to avoid offending the sensibilities of certain readers. A true mycophobe, Gerard spoke very disparagingly of mushrooms, calling them 'cold and damp', after Galen's comments, thus illustrating just how far-reaching were that ancient seer's words. For curing sore throats, Gerard promoted 'Jew's ear', or Judas's ear (*Auricularia*), a shelf fungus that grows on elder trees. (According to legend, people dubbed it Judas's ear because Judas had hanged himself on an elder tree.) Twenty years later, Nicholas Culpeper published his famous *The Complete Herbal* and described the use of mushrooms by Laplanders in 'moxa', a treatment that involved placing burning shelf mushrooms directly onto painful limbs. But, by then, mushrooms had almost completely disappeared from the European pharmacopoeia.

Reishi (*Ganoderma lucidum*), the 'mushroom of immortality'.

At the end of the nineteenth century, people still utilized Dioscorides' Agaricum as an ingredient in a remedy called Warburg's Tincture (*Antiperiodica Tinctura*), widely used for fevers during the Victorian era, particularly malaria. And as late as 1934, the *British Pharmaceutical Codex* included the tincture, its dosage being 0.2 to 2 grams. The Codex provided a recipe for this tincture, which includes warming herbs and spices, such as cinnamon and black pepper, with agaric powder.

Not least of the curative properties of mushrooms was the belief that some acted as aphrodisiacs. The association between mushrooms and fertility pervaded folklore in parts of the world other than Britain with its stinkhorn mushroom. The ancient Japanese court imbibed shiitake as an aphrodisiac and, in China, *Cordyceps sinensis* (now *Ophiocordyceps sinensis*) fulfilled the same function.

R. Gordon and Valentina Wasson wrote in *Russia, Mushrooms and History*:

> Czechs and Germans shared a faith in the aphrodisiacal virtues of the *phallus impudicus* and the hart's truffles . . . survives in men's memories in southern Bohemia . . . where the mushrooms are served with millet and the dish is called *kuba* or *manas*. The word *ntanas* means a lusty male, and he who eats of the dish is imbued with extra virility for the coming year.

In the New World, very few Native American groups ate mushrooms for nourishment or medicine, although they did exploit puffballs to staunch bleeding.

As previously mentioned, unlike the New World and Europe, little historical information exists about the use of mushrooms in Africa. The mycophobic British colonized many areas of Africa. And even when mycophilic cultures like that of France dominated native peoples, not much more historical information exists about mushroom use either. S. T. Chang and Keto E. Mshigeni, in *Mushrooms and Human Health* (2001), mourn the loss of indigenous knowledge due to the presence of the colonizers:

> Mushrooms were highly reassured by the ancients all over the world, who traditionally used them as a relish, as a tonic, and as medicine. But then, in Africa, foreign domination came. The traditional practices were looked down upon, treated with contempt, and branded as primitive. The gathering of wild mushrooms, as a result, was left to the humble, to the poor, and to the lowly, in rural village communities.

Cordyceps, caterpillars with mushrooms growing out of them, used as an aphrodisiac in parts of Asia.

Twentieth-century researchers, such as David Arora, seek out information about the indigenous usage of mushrooms in medicine and healing. For example, he found that in the former British colony of Ghana, people use Jew's ear fungus as a blood tonic.

In China, food often served as a medicine and no perceived difference existed between folk medicine and that used by the aristocracy. Chinese *Fuh Zheng* therapy made use of the *qi/chi* properties of mushrooms. TCM also recognized the importance of mushrooms early on. A Chinese emperor who reigned around 2800 BC, Shen Nung (also called the Divine Plowman/Farmer Emperor) became associated with a 'book' called *Herbal-root Classic*, which dates to around AD 200. Shen Nung discussed 365 different herbs and their properties, including *lingzhi* (*Ganoderma lucidum*; the 'mushroom of immortality', or *reishi*), which was linked to Kuan-Yin, the goddess of healing and mercy.

Psilocybin or 'magic mushrooms'.

A famous Chinese doctor, Gorin or Wu Rui, wrote *Materia Medica for Daily Use* (AD 1309), one of many herbals cataloging the Chinese pharmacopeia. A few hundred years later, Li Shizhen produced *Pen Ts'ao Kang Mu* (Compendium of Materia Medica), which discussed twenty mushroom species, including the caterpillar fungus (*Cordyceps sinensis* (now *Ophiocordyceps sinensis*). Black fungus (*mu-erh*, reputedly beneficial for longevity), and ceps, or boletus (*fu-ling*) both provided much of the curative elements in the Chinese pharmacopoeia. Asian folk medicine stipulates that shiitake (*Lentinula edodes*) 'activates blood', a reference to the immunological properties of this and other mushrooms. Healers prescribed it for just about

Amanita muscaria, or fly agaric.

everything, from colds and measles in children to stomachache and smallpox. In modern Japan, stories circulate of people eating eight shiitake mushrooms a day for a few weeks in order to lower blood pressure.

Although indicators point to mushrooms as forming a vital part of traditional medicine, one of the subjects facing proponents of fungi in medical therapy lies in the regulatory issues concerning dietary supplements, pharmaceuticals and nutriceuticals. However, because of the increasing global interest in medicinal mushrooms, there is now *The International Journal of Medicinal Mushrooms*, first published in 1999, which is taking some steps towards persuading the medical profession to integrate mushrooms into its treatment protocols. The ancients knew a thing or two about mushrooms and medicine, but the jury is still out on how we can incorporate mushrooms into medical practices today.

Mayan mushroom stones.

Hallucinogens and Entheogens

The use of psychedelic mushrooms (or entheogens) dates back much further than the 1960s, when many young people would consume them in their search for enlightenment and to escape from restrictive familial and cultural mores. No doubt humans found and ate these mushrooms – most containing active ingredients known as psilocybin and psilocin – far earlier than the first concrete evidence indicates.

Beginning with the discovery in 1933 of the prehistoric Tassili images in Algeria, which date to anywhere from around 10000 to 5000 BC, scholars realized that mushrooms played not only a culinary but also a spiritual role in the lives of humans. They figured in the religious practices of many early humans, as well as in some later groups. A mushroom effigy found in Mt Bégo, France, dated to 1800 BC, indicates as much, as do the Greek Eleusinian Mysteries (*c.* 1600–1100

R. Gordon Wasson with shaman Maria Sabina, 1956.

BC), spiritual initiation practices that endured until the advent of Christianity into Europe, which appear to have required the eating of psychedelic mushrooms or the drinking of beverages that contained them. Archaeologists found stones carved into the shape of mushrooms in the Mayan-influenced areas of Guatemala. The Vikings used fly agaric (*Amanita muscaria*) in certain ceremonies, while Siberian shamans did the same. The Greek philosophers Plato (*c.* 424–347 BC) and Socrates (*c.* 469–399 BC) alluded to the mental and spiritual effects of these mushrooms. Some modern writers attempted to tie the Santa Claus and flying reindeer myth to the use of fly agaric. Still others, like the cookery writers William Rubel and David Arora, have attempted to disprove the idea that fly agaric is always hallucinogenic.

In ancient Mexico, from around 1000 BC (according to the Mixtec Vienna Codex; AD 13–15 century), people used mind-altering mushrooms in religious ceremonies. Spanish

eyewitnesses, chiefly Roman Catholic priests, recorded their observations after the conquest of Mexico in 1519. Franciscan friar Bernardino de Sahagún (1499–1590) wrote in his *Historia General de las Cosas de la Nueva España* that the native peoples ate the mushrooms with honey, followed by cacao, and spent the night in visionary states: 'All such things they saw . . . And when the mushroom ceased, they conversed with one another, spoke of what they had seen in the vision.'

In *History of the Indians of New Spain* (1481), Diego Durán, a Dominican priest, wrote:

> from there they all went to eat raw mushrooms; on which food they all went out of their minds, much worse then if they had drunk a lot of wine. With the strength of those mushrooms, they saw visions and had revelations of the future.

Much later, the American botanist William Safford (1859–1926) wrongly suggested that peyote – not mushrooms –

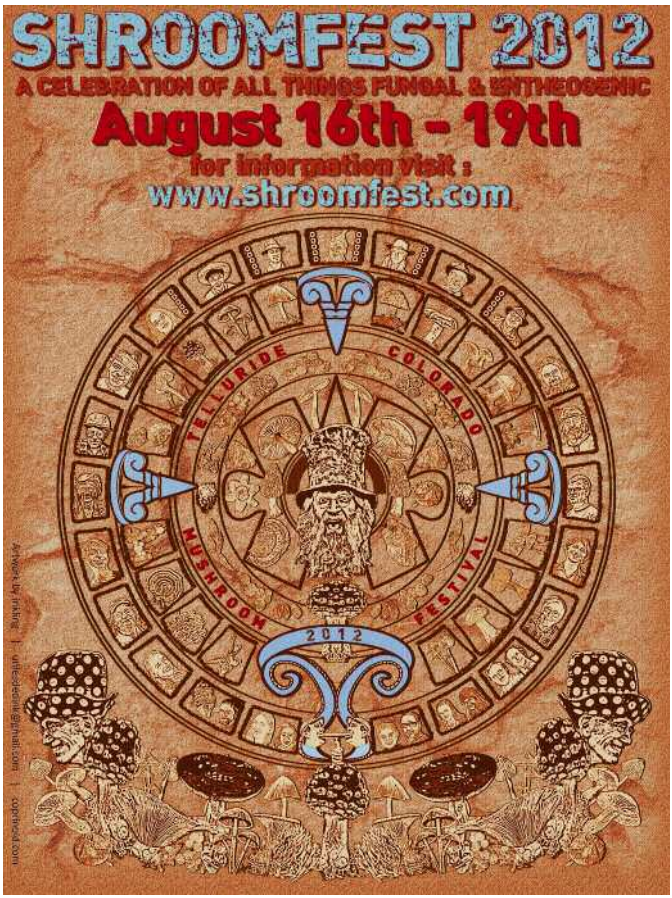
Mushroom mosaic from the Christian Basilica of Aquileia in northern Italy, dating to before AD 330.

was the hallucinogen used in Mexico. R. Gordon Wasson, an international banker with JPMorgan and an amateur mycologist, and his Russian-born wife, Valentina, devoted most of their lives to studying the use of psychedelic mushrooms in Mexico, with the help of Maria Sabina, a female shaman. Wasson also looked at soma, an intoxicating drink mentioned in ancient Indian Vedic texts, and wondered if it wasn't in fact a form of hallucinogenic mushroom, namely fly agaric. He published his highly controversial ideas in *Soma: Divine Mushroom of Immortality* (1968).

Wasson's work influenced several scholars to conclude that early Christianity might have been nothing more than a dressed-up mushroom cult. John A. Rush, in *The Mushroom in Christian Art* (2011), stated that the 'mushroom's meaning is its mind-altering effect and the potential insights and knowledge it brings'. Carl Ruck, in 'Solving the Eleusinian Mystery', a chapter in *The Road to Eleusis* (1978), claimed:

> The etymology of Mykenai, which was recognized in antiquity but has been repeatedly rejected by modern scholars, is correctly derived from *Mykene*, the bride of the mykes or mushroom.

Later observers also recorded their encounters with 'magic mushrooms'. After King Charles XII of Sweden's Great Northern War and the cataclysmic invasion of Russia in 1708, Swedish colonel Philip Johan von Strahlenberg spent twelve years as a prisoner of war in Siberia. He published *Russia, Siberia and Great Tartary* (1730) and detailed his experiences, including those with *mukhomer*, a local word for fly agaric. When used by native Siberians, *mukhomer* served both as a medicine and intoxicant. Von Strahlenberg wrote, 'When they make feast, they pour water upon some of these



Poster for Shroomfest 2012 in Telluride, Colorado.

Mushrooms and boil them. They then drink the Liquor, which intoxicates them.' The active ingredient passed into the urine, and so people who lacked access to the mushrooms stood around outside the tents waiting to collect the urine of intoxicated celebrants. They then drank the urine, and 'by this way they also get drunk'.

But it wasn't just in Western Europe or the Americas that certain mushrooms were associated with spiritual enlightenment. The Chinese philosopher Wang Chung (AD 27– 97) described the Taoist priests' use of consciousness-raising mushrooms:

> They dose themselves with the germ of gold and jade
> And eat the finest fruit of the purple polypore fungus
> By eating what is germinal, their bodies are lightened
> And they are capable of spiritual transcendence.

For a while, war drove modern research into the effects of hallucinogenic mushrooms. The Cold War raged about the same time that Wasson and his colleagues were studying these various psycho-active mushrooms. The Geschickter Fund, a front for the Central Intelligence Agency (CIA), funded one of Wasson's trips to Mexico. The military wanted to identify hallucinogens for use in psychological warfare. At the same time, physicians began experimenting with hallucinogens in curing cases of alcoholism and schizophrenia. Other efforts in studying the effects of psychedelics included the famous 'Good Friday Experiment'; a physician and doctoral student at Harvard's Divinity School, Walter Pahnke, designed a trial in 1962 to investigate whether or not taking psychedelic drugs elicited the same effects as 'mystical experiences'. Results indicated that the group taking psilocybin did experience something similar. Rick Doblin, a drug policy expert working for Harvard's Kennedy School of Government, followed up with the volunteers in the mid-1980s. He found that the experimental group experienced greater awareness and oneness with the world while the control group could barely remember the experiment.

The negative impact of over-zealous drug use in the 1960s led to restrictions on the growth and sale of psilocybin

mushrooms, as well as on research. In 2008 Ron Mann's film *Know Your Mushrooms: End Fungi-Phobia Now*, featuring the Telluride Mushroom Festival (also know as Shroomfest), sought again to raise awareness of the positive aspects of these hallucinogenic mushrooms, which result in renewed research into their mystical aspects. Scientists examined the possible use of extracts from them in the treatment of mental health issues such as post-traumatic stress and obsessive compulsive disorders, as well as treating anxiety in terminally ill patients.

6
Cultivation

Mushrooms were probably first cultivated in Asia – chiefly in China and Japan – where naturally growing shiitake mushrooms covered decaying logs. Observers noted that if they placed new logs among those that were already mushroom-rich, they would soon start fruiting with mushrooms as well. The modern mycologist Shu-Ting Chang found that Chinese literature first recorded the cultivation of mushrooms, most likely the wood ear, in around AD 600. An ancient Chinese botanist, Lu-chi, made the observation that each plant had its particular mosses and mushrooms. Jean-Baptiste-Gabriel-Alexandre Grosier included a passage on mushroom cultivation in China in his *De la Chine ou description générale de cet empire, rédigée d'après les mèmoires de la mission de Pé-kin* (1819), the entire text of an unpublished memorandum written in 1775 by a Père Cibot. In it Cibot remarked that the Chinese grew agarics on logs. The trees used for this purpose were elm, mulberry, willow, poplar, pine and chestnut; most of the mushrooms belonged to the Agaricus genus. Later came velvet foot (*Flammulina velutipes*), mentioned in around AD 800. According to the Chinese *Book of Agriculture* published in 1313, people first cultivated shiitake in AD 1000.

Pioppino mushrooms (*Agrocybe aegerita*), as grown by the Romans. These are growing in Spain.

In the West, Romans held mushrooms in great esteem and grew black poplar mushroom, called pioppino (*Agrocybe aegerita*) on poplar bark, all the while believing that they sprang up where lightning struck. Earlier, the ancient Greeks had used horse manure mixed with ashes to make substrate for growing mushrooms and laid out growing beds under fig trees. Dioscorides, an advocate of spontaneous generation, wrote about growing *pholiotes*, or candy cap mushrooms, as did Pliny, who believed that they sprang up from trees: *fungorum origo ex pituita arborum*. Nicander of Colophon, a Greek poet, grammarian and author of two treatises on poisons, explained in his *Georgics* (*c.* 29 BC) how edible mushrooms could be cultivated:

> Whenever you bury the trunk of a fig tree deep in dung, and keep it moist with constant streams of water, harmless mushrooms will grow on its lower parts.

Even though people continued Greek and Roman practices and cultivated mushrooms at the household level during the Italian Renaissance, it was the French who seriously undertook the task of cultivating mushrooms on a larger scale. An astute work by Olivier de Serres, *Le théâtre d'agriculture des champs* (1600), theorized how such a process could work. These first cultivated mushrooms were the ubiquitous white button mushrooms, called *champignons de Paris*, because the French grew them in caves and abandoned quarries around Paris.

A critical mass of scientific inquiry and publishing soon began and propelled France into mushroom growing. French doctor and botanist, Guy de la Brosse, in *De la nature, vertu et utilité des plantes* (1626), suggested that mushrooms grew from their 'suckers' and thus could be propagated that way. Nicolas de Bonnefons, in *Le jardinier françois* (1651), was the first to describe the cultivation of mushrooms. Using the dung of mules and donkeys, he grew *champignons de bois*, *champignons*

Portobellos (*Agaricus bisporus*).

Harvesting mushrooms from Paris caves, late 19th-century print.

de prez and *mousserons* (*Calocybe gambosa*). In *Les délices de la campagne* (1654), the sequel to *Le jardinier françois*, Bonnefons included several recipes for truffles, white mushrooms, *mousserons* and morels. In 1678, botanist Jean Marchant told the French Académie des Sciences in Paris about 'sowing' mycelium. Joseph Pitton de Tournefort published *Mémoires de l'académie des sciences, année 1707*, in which he summarized the mushroom-growing process. Sebastien Vaillant, in his *Botanicum parisiense* (1723), provided a conclusion about mushroom 'seeds':

> Within the cavity of these plants, towards the bottom, are contained many seeds heaped one upon another, cut on their superior surface somewhat like a triangle, broad underneath, where they are connected to a little tendon, and are whitish.

Like Guy de la Brosse, he named these features of the mushroom 'suckers'. With all of this scientific material providing instruction, commercial mushroom cultivation began in earnest in France around 1895 in the troglodyte caves of the Loire Valley, near Saumur.

The art of mushroom cultivation moved across the English channel from France to Britain, thanks in part to Richard Bradley's enthusiastic descriptions in *New Improvements of Planting and Gardening* (1726) and Scottish botanist Philip Miller's publication of *Gardener's Dictionary, containing the Methods of Cultivating and Improving the Kitchen Fruit and Flower Garden* (1731). A few years later, Bradley published *The Country Housewife and Lady's Director*, with recipes from a 'Gentleman named Garneau, whom I met in Brussels, and by Experience find them to be very good'. French cuisine predominated at the higher levels of English society, with translations of French cookbooks like those by the chef Menon abounding in English kitchens. Mushrooms became associated with the upper class, not the peasant class, as they were in Eastern Europe and Russia.

Paying homage to the Italian botanist Pier Antonio Micheli (1679–1737), to whom he attributed the first discovery of the 'seeds' of the mushroom, and who first grew mushrooms using grains as substrate, English minister Roger Pickering elaborated on the 'seeds' of mushrooms in a paper published in the *Philosophical Transactions of the Royal Society of London* (1743):

> Some warm rains enabled him to reduce his conjectures to a certainty; by which he not only discovered, that this mouldiness is a collection of little mushrooms adhering to each other by minute fibres, or, as the gardeners in other cases call them, runners, but he discovered and preserved the seed of mushrooms.

The Garden Mushroom: Its Nature and Cultivation (1779), by John Abercrombie, was the first book in English devoted completely to the cultivation of mushrooms, while English cookbook author Hannah Glasse had written of mushroom cultivation in the third edition of *The Art of Cookery Made Plain and Easy* (1748):

> Cover an old hot-bed three or four inches thick with fine garden mould, and cover that three or four inches thick with mouldy long muck, of a horse muck-kill, or old rotten stubble; when that bed has lain some time thus prepared, boil any mushrooms that are not fit for use, in water, and throw the water on your prepared bed; in a day or two after, you will have the best small mushrooms.

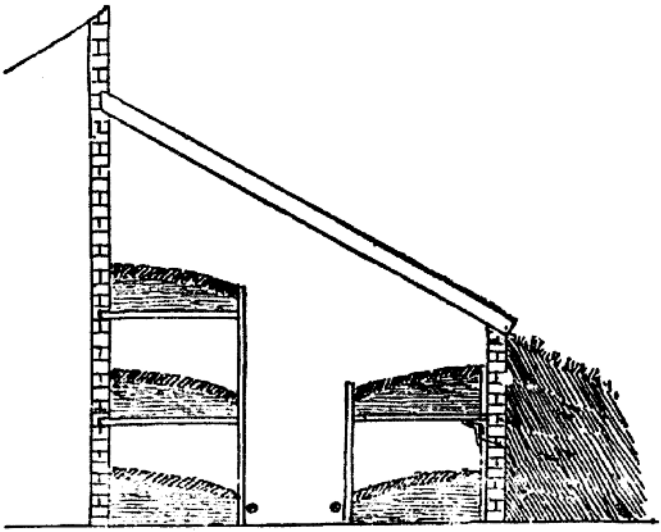
The Americans soon got into the game, possibly because Glasse's book enjoyed great popularity in the American colonies, and French cuisine became the cuisine of diplomacy, especially during the presidency of Thomas Jefferson, formerly the new nation's ambassador to France. In *The Vegetable Cultivator* (1839), John Rogers, the gardener at Richmond Palace, described how the English grew mushrooms on ridged beds and in mushroom houses. American farmer William Falconer's *Mushrooms: How to Grow Them, a Practical Treatise on Mushroom Culture for Pleasure and Profit* (1891) compiled the theories and advice found in the literature on the subject at the time.

Shiitake (*Lentinula edodes*) cultivated on logs.

Falconer saw the potential financial windfall for women to grow mushrooms:

> Mushrooms are a winter crop; they come when we need them most. The supply of eggs in the winter season is limited enough, and pin money often proportionately short; but with an insatiable market demand for mushrooms all winter long, at good prices, no farmer's wife need care whether hens lay eggs at Christmas or not.

Nineteenth-century scientists and men like Falconer continued to write copiously about mushroom cultivation, enthralled as they were with the new scientific and rationalist thought bursting out all over Europe and America. For it was thanks to the French and a two-pronged happenstance that led to a wearing away of mycophobia: canning and the commercial cultivation of mushrooms.



Early mushroom cultivation methods; mushroom beds.

Mushroom cultivation in the United States took firm root in Kennett Square, Pennsylvania. Two Quakers, Jacob Streyer and William Swayne, growing carnations via methods described by Falconer, decided to use the area underneath green house flowerbeds for growing mushrooms, thus utilizing the wasted space. The original spawn for their efforts came from Europe. By 1903, the United States had begun to produce its own pure culture spawn (growers had previously relied on English spawn). The American Spawn Company of St Paul, Minnesota, produced the first virgin spawn culture for sale, 'brick spawn', due to the efforts of Louis F. Lambert, a French mycologist. Edward H. Jacob, a colleague of Jacob Streyer in Kennett Square, Pennsylvania, developed his own spawn and soon exported it to England.

Not until 1914 did the industrialized cultivation of button mushrooms begin in the United States, centred in Kennett

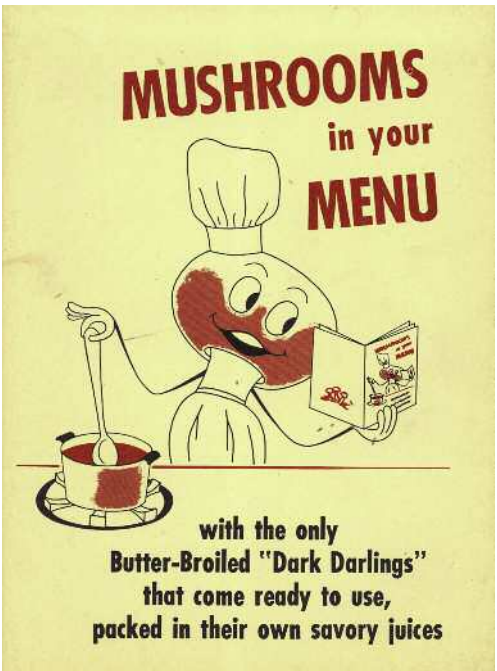
Square, where 85 per cent of all cultivated mushrooms grew. There was another reason why the industry caught on there: mushroom producers could count on a steady supply of fresh horse manure, swept up off the streets of neighbouring Philadelphia. Transportation hubs guaranteed good conditions for the fledgling industry. And authors such as Benjamin Duggar published books aimed at teaching people how to grow these morsels.

Jessup Whitehead stated in *The Steward's Handbook and Guide To Party Catering, Part First – Hotel Stewarding* (1903):

> I had frequently noticed on Boldt's bill of fare, even in the depths of winter, 'fresh mushrooms,' and this naturally led to inquiry. I found that there are four or five persons in Philadelphia who make a business of cultivating the delicious fungi, and that in addition quite a large number of private house holders grow them in their cellars.

The U.S. Department of Agriculture accelerated the maturation of the mushroom-growing industry, taking Edward Jacob's basic procedure for spawn production, resulting in a consistently reliable product. The first written documentation of cultivation came in an article by F. Kaufert, in a 1936 bulletin from a Minnesota agricultural extension experiment station. Seed companies like Carter & Co. from London also offered advice on how to grow mushrooms in fields, fuelled by dung and dirt.

Researchers at Pennsylvania State University's Mushroom Research Center, Dr James Sinden (in the 1930s) and Dr Leon Russell Kneebone (in the 1950s), discovered a number of techniques (use of spent compost as casing soil, the importance of carbon dioxide to mushroom growth, control of



B in B Mushrooms advertising booklet (1956).

mushroom pathogens) still used in the commercial production of mushrooms and mushroom spawn.

Tariff cuts endangered the mushroom industry, as did restrictions on the use of tin in cans, due to the outbreak of the Second World War. The American canned mushroom market gave way to the pressure of imported canned mushrooms. The growers in Kennett Square needed a new way to sell their mushrooms. And so they started marketing the idea of fresh mushrooms to a mycophobic society.

The American Mushroom Institute began, aided by Philip's Mushrooms, a Kennett Square mushroom company. The Mushroom Canning Company and Campbell's Soup Company became the top growers. In 1998, the company

Vlasic took over Campbell's mushroom operation and managed eight mushroom farms, becoming the largest producer in the United States.

In *Produce Business* magazine in 2002, a mushroom-merchandising action plan illustrated how marketers hoped to entice people into eating more specialty mushrooms like shiitake. Advertising emphasized the health and nutritional benefits of mushrooms, and tacked on suggestions for recipes, attractive displays at point of sale and bulk-purchase options. Playing on the desire of consumers for status – since mushrooms were perceived as a luxurious product – as well as health, the advertising messages worked. Campbell's mushroom soup TV commercials featured its animated Campbell Kids and stressed the cultivation of mushrooms.

By the time the twenty-first century dawned, most supermarkets across the United States featured eye-catching displays of fresh mushrooms, either in plastic-wrapped Styrofoam containers or bunched up inside clear plastic cases with tongs on the side for self-selection. Not exactly foraging, but still a way to 'pick' mushrooms.

In La Cave des Roches, in Bourré, France, producers now grow horse mushrooms, *pied bleu* mushrooms and medicinal mushrooms, the first to do so in France. Their *pied bleu* (Blue Foot or Blewit, *Lepista nuda*) mushrooms end up on plates as far away as Tokyo and New York. France Champignon, Europe's largest mushroom producer, now owned by the Bonduelle group, preserves mushrooms for export to numerous countries.

Beyond France and the United States, mushroom cultivation now takes place in more than 100 countries, including Iran, and is increasing at the phenomenal rate of 7 per cent each year. China and India began to take the lead in commercial mushroom production in the late twentieth century, and

some researchers expressed hope that farmers in Africa might take advantage of the growing mushroom craze in order to provide a more sizeable income for poorer families.

The Chinese mycologist Shu-Ting Chang promoted the possibility of mushroom farming in Africa. He travelled throughout Africa – chiefly Tanzania, Namibia, Malawi and Zimbabwe – presenting mushroom-farming training workshops. Pamphlets appeared in various countries, advocating the use of mushrooms in the diet, focusing on those species that grew locally and which were gathered by village elders.

The China Edible Fungi Association (CEFA), established in 1987 in Beijing, developed the Chinese mushroom industry into the largest in the world, with almost 11 million tons

Button mushroom (*Agaricus bisporus*) in packaging.

Woman growing mushrooms in Malawi.

of mushrooms being produced in 2003. Export revenues earned China more than $622 million dollars that year. Like India, China faces climatic restrictions in certain areas, but nonetheless mushroom growing is the sixth largest industry in the country, producing more than a quarter of all the world's mushroom production, according to Shu-Ting Chang in an article published in the *International Journal of Medicinal Mushrooms* in 2006.

India began to catch up, cultivating common mushrooms, with buttons, paddy straws and oysters being the most significant. The Indian government declared mushroom cultivation to be a major economic effort, producing 40,000 tons a year of buttons: with most exported to the United States and Europe on a seasonal basis. (India produces mushrooms on a seasonal basis because during the hottest times of the year, producers cannot maintain the environmental conditions necessary for proper mushroom cultivation.) Solan, a city in the mountainous state of Himachal Pradesh, dubs itself the 'mushroom city' of India. So important is growing mushrooms in India that the Directorate of Mushroom Research

Oyster mushroom cultivation in Asia using plastic sacks filled with spawn.

Oyster mushrooms (*Pleurotus ostreatus*).

Workers cleaning white mushrooms at the Lantian Food Industry Co. Ltd at Dayi county in Chengdu, Sichuan province.

was set up in 1987, with the assistance of Indian agricultural universities and other agencies.

Because of the increasing awareness of the medicinal value of mushrooms, including the white button mushroom, which contains retene, an agent that is instrumental in fighting tumour growth, growers continuously seek new methods to increase production.

The Future of Mushroom Cultivation

Scientists continue to search for ways to commercially grow a wide variety of mushrooms, such as porcini and chanterelles. Growers focus on Latin America and Africa as sites for cultivation, as well as Thailand and Iran. Mycologists K. E. Mshigeni and S. T. Chang examined the feasibility of mushroom cultivation in Africa, as a possible way for underdeveloped countries and poor farmers to make a better

Workers sorting white mushrooms at the Lantian Food Industry Co. Ltd.

living. African governments may expend funds on pine tree species that will support the growth of *matsutake*: *Pinus densiflora* (Japanese red pine), *P. thunbergii* (Japanese black pine), *P. pumila* (Siberian dwarf pine), *P. koraiensis* (Korean pine) and *P. taiwanensis* (Taiwan red pine). Highly revered in Japan, *matsutake* (*Tricholoma matsutake*) sold for $1,000 a kilo in 2000. The Institute of Ecology in Mexico studied more than 100 strains of oyster mushrooms, selecting the hardiest for commercialization. Popular cultivated mushrooms include shiitake, oyster, king oyster or royal trumpet, lion's mane, portobello, button, cinnamon cap and *maitake*. Morels cannot be easily cultivated; they still have to be 'hunted' or foraged. In many ways, the future will be anything but bleak for mushroom lovers.

Enoki (*Flammulina velutipes*).

7
A Mushrooming Future

For a number of reasons, mycophiles are beginning to outnumber mycophobes. A day doesn't go by when there's no more news about mushrooms and their purported powers. News stories and articles in magazines about mushrooms abound, scientific societies hold international conferences about fungi, botanists seek a complete genomic portrait of mushrooms, entrepreneurs offer mushroom-growing products online, economic development specialists suggest that mushroom farming might improve the lives of poor farmers – mostly women – in developing countries, medical specialists research the healing properties of mushrooms and environmentalists around the world hope for a role for mushrooms and other fungi in environmental clean-up. What a difference from the mycophobic past.

The importance of fungi, and hence mushrooms, in the world tended in the past to get very short shrift, as we have seen. The author of *The Grete Herball* (1526) expressed what most people thought until recently about fungi and mushrooms:

> They that be not deedly have a grosse gleymy [slimy] moisture that is dysobedyent to nature and dygestyon,

> and be peryllous and dredful to eat & therefore it is good to eschew them.

In *Acetaria, A Discourse of Sallets* (1699), botanist John Evelyn maligned mushrooms as 'malignant and noxious', although he acknowledged that many people craved them. Mrs Grieve's *A Modern Herbal* of the early 1900s summarized all the common knowledge of the day, warning readers of the dangers of eating mushrooms and attempting to apply markers like bad odours and smells to noxious fungi. But *A Modern Herbal* also reminded readers of the benefits of fungi:

> Yet all members of this great division of flowerless and chlorophyll-free plants are not harmful. Many of them perform useful and even beneficent functions, playing an important part in the welfare of humanity.

Attitudes changed over the centuries, as mycophobics slowly discovered that mushrooms could be tasty, safe and medicinally beneficial. Ironically, this occurred at a time when urban development, environmental pollution and other stressors began to lead to an increase in deforestation, which had a negative impact on wild mushrooms. With these changes came unforeseen consequences in regard to the environment.

Although several varieties of mushrooms can be commercially cultivated, the sheer popularity of wild mushrooms caused even greater numbers of people to seek them out in the wild. This turn of events led to fewer mushrooms and greater stress on the fragile forest environments where the fungi thrived. As John Getz, a forager in Washington State, said, 'The saturation level [of wild mushroom pickers in the Cascades] is just beyond comprehension'. Many pickers do

not treat the mycelium with care, ripping up mushrooms and tearing the network of threads underneath, ensuring that future crops will be less plentiful. The development of sure-fire cultivation techniques for wild mushrooms would put many pickers out of business. Some pickers blamed global warming for the decreasing number of mushrooms, but no one can discount the intricate relationship between these mushrooms and their environments.

Hundreds of fungal forays occurred annually once people in mycophobic cultures realized the bounty awaiting them in nearby forests and fields. Mushroom hunting in all parts of the globe probably began with 'a foray amongst the funguses' by the Woolhope Naturalists' Field Club of Hereford, England, in 1868, the first known official foray. In Mexico, mushroom picking diminished as urbanization drew people in from the countryside and conservation practices faded as indigenous knowledge faded away.

Other research, on forests and mycelium, reinforced the connection between mushrooms and trees. In 1992, researchers Myron Smith, James Anderson and Johann Bruhn wrote an article published in *Nature* stating that they had found a honey mushroom mycelium (*Armillaria bulbosa*) in Michigan that extended more than thirty acres. Studies showed that the fungus dated from anywhere between 1,500 and 10,000 years old. The size of this, and any mycelium, indicates just how pervasive they can be: one square inch of hyphae-rich mycelium contains enough cells so that if placed end to end they would measure eight miles. Vast mycelia like this one create life-giving soil from waste and debris. The Michigan fungus basically *was* the forest floor, with hordes of saprobic honey mushrooms appearing after soaking rains. Honey mushrooms, parasitic in nature, feed on dead or dying trees affected by insect infestation, logging or drought.

A crop of cultivated white button mushrooms.

Given the decomposing function of many mushrooms, one of the more exciting aspects of the growing knowledge about them and their capabilities lies in the belief that they might aid in bioremediation, or environmental clean-up, removing toxins and converting pollution into possibly edible material.

Paul Stamets in *Mycelium Running* (2005) claimed that fungi ruled the earth after meteorites had knocked out most life forms millions of years ago, replenishing the soil and making it possible for plant life to resume. The regenerative properties of mushrooms hold much promise for the future because they decompose many environmental pollutants. Some edible 'white rot' mushrooms, such as oysters, grow on substrates like gearbox oil from cars. These types of mushrooms help in denaturing hydrogen–carbon bonds in oil. In November 2007, the freighter *Cosco Busan* spilled 58,000

gallons of bunker fuel into San Francisco Bay. News media reported that 'Oyster-mushroom spawn donated by Stamets helped break down the oil in a novel remediation project established in Golden Gate State Park'. The final judgement isn't in yet on bioremediation, but investigators hope that cost-effective technology will emerge.

What this means for the environment is that mushrooms could function in the environmental clean up of toxic waste sites and other contaminated areas. In some cases, after mushrooms digest organic waste, it can be fed to cattle without any ill effects.

Bioprospecting, or the use of organic compounds in nature, is often associated with mushrooms and their medicinal properties, and may be another promising avenue for the future. Pharmaceuticals crafted from natural ingredients appeal to people preoccupied with pollutants, additives and preservatives in food and medicinal drugs. Mushrooms exert positive effects on diabetes, high blood pressure, hypercholesterolaemia (elevated blood cholesterol), and work well in anti-viral, anti-bacterial and anti-oxidant and free-radical scavenging by destroying molecules with unpaired electrons (free radicals) that cause tissue damage in a number of diseases such as cancer and heart disease. Their various immune-stimulating polysaccharides, or beta-glucans, and other active components present little to no cytotoxicity towards normal cells, while proving toxic to abnormal ones. Studies in China and Japan show promising results with certain types of mushrooms like *reishi* and shiitake in tumour-growth reduction, as do studies on mushrooms such as turkey tail (*Trametes versicolor*) by the National Institutes of Health in the United States. Because of the increasing global interest in medicinal mushrooms, *The International Journal of Medicinal Mushrooms* began publishing in 1999. The body of work in the journal indicated

that the medicinal aspects of mushrooms ought to be taken more seriously.

Another exciting possibility for mushrooms lies with mycopesticides, or the use of fungi to kill insect pests. Mushrooms, *Cordyceps* and *Metarhizium* in particular, produce pathogens helpful in controlling insect pests. After all, people have been killing flies for centuries with fly agaric. Mushrooms also might eventually serve as packaging material instead of Styrofoam, which takes thousands of years to break down.

Indicative of the tremendous interest in mushrooms, numerous magazines and mail-order companies have appeared. Websites such as Fungi Perfecti advertise forays and sell cultivation materials online. *Fungi* magazine contains a section geared toward children, with educational books and toys, while *Mushroom: The Journal of Wild Mushrooming* provides a forum for all things mushroom, from the latest research to recipes and stories about forays. In France, *Pyrénées Magazine* publishes a special issue, 'Champignons', each autumn, replete with coloured photographs of species safe to eat and sections devoted to showing the differences between edible and poisonous varieties.

And, of course, we'll have more and more cultivated edible mushrooms to choose from. The environmental/organic approach will demand a great deal of input from commercial mushroom growers.

Magical as mushrooms are, and have always been thought to have been, there is no crystal ball or magic potion to drink, foretelling their exact future in world affairs. In many ways, the story of mushrooms is really just beginning. It is unlikely, however, that humans will return to the days when people gave serious credence to the words of French philosopher Denis Diderot, who exclaimed that 'they are not really good

but to be sent back to the dung heap where they are born'. He obviously never ate fresh mushrooms sautéed in butter with a pinch of sea salt and a heavy sprinkling of pimenton, topped with finely chopped parsley.

How to Grow a Mushroom

Highly labour-intensive mushroom growing usually requires a complex four-month-long six-phase process, starting with 'planting' and ending in harvest. Depending upon the variety of mushroom, some stages may be longer or shorter than others. The following steps illustrate the cultivation of white button mushrooms, portobellos and crimini, all of which belong to the *Agaricus* genus. Cultivated mushrooms generally grow in darkness, in long rectangular cinderblock 'houses', which cut down on excess heat and production costs because growers can better regulate temperature and other conditions.

Phase One: Composted Substrate

Because they had seen them growing on melon composting piles, the originators of the mushroom-cultivation process recognized that mushrooms must feed on organic material, as they do in the wild. Called substrate, this material consists of straw-bedded horse-manure, hay, corn cobs, cotton and cocoa seed hulls, and gypsum. Chicken manure or other nitrogen supplements may be used. Agricultural by-products, these substrates give credence to claims for mushrooms being the new sustainable food. Growers check the mixture for temperature for three to four weeks, since the compost must be at approximately 71°C (160°F) for several days to ensure proper composition and aerobic fermentation. This

phase concentrates and preserves complex carbohydrates. After the process reaches the correct point for Phase Two to begin, the compost is chocolate brown in colour and smells of ammonia, toxic to mycelium.

Phase Two: Steam Pasteurization

In the early years of mushroom cultivation, growers injected spawn into cut-up blocks of dried manure. Rife with crawly insects, noxious weeds, unfriendly bacteria, invasive nematodes and other fungi, this untreated substrate stifled the growth of the spawn. Production was sporadic and unpredictable because of these substrate contaminants. Steam sterilization removes these nuisances, creating a welcoming environment for the spawn. This process spares good microbes that assist in the growth of the mushrooms. Phase Two pasteurizes compost and rids it of simple soluble sugars, and gaseous and soluble ammonia resulting from composting in Phase One. Good microbes in compost convert ammonia into protein, becoming food for the mushrooms. This part of Phase Two lasts anywhere from seven to eighteen days. Well-monitored temperature control also enhances microbial conversion of carbohydrate sources to substances usable by the fledgling mushrooms. This part of Phase Two lasts anywhere from seven to eighteen days.

Phase Three: Spawn and its Issues

One large mature mushroom produces billions of spores in a process called sporulation. These spores produce mycelium, which in turn inoculates materials like straw, wood chips, grooved dowels and sawdust in order to produce spawn. Mushroom growers often use sterilized grain as the medium for the transfer of spawn to the prepared compost. Spawn sometimes begins with nothing more than grain cooked with calcium carbonate and cooled after sterilization. The grain is then inoculated with mycelium. Using clean

and disinfected equipment, growers mix the mycelium-infused grain into the compost. Growers try to maintain temperatures between 24°C and 25°C (75°F and 77°F). This part of the process takes between two and three weeks. By the end of that time, visible threads of new mycelium appear like a thick white net in the composting substrate. This new mycelium, like any newborn organism, needs certain nutrients, provided in this case by microbes. Growers walk a fine line between giving mycelium its 'meat and potatoes', and preventing these supplements from feeding other fungi or microbes that grow faster than the mushrooms and might overpower the crop.

Phase Four: Casing, or Pushing the Envelope

When the time comes for the mycelium to switch from the vegetative stage to that of reproduction, growers cover the inoculated compost with 'casing', usually sphagnum peat moss. Other choices for casing include clay loam field soil, reclaimed weathered spent compost, or coir (coconut) fibres. Why casing the compost works is still not completely understood, but it clearly helps in conserving moisture for nestling mushrooms and their rhizomorphs, or thick patches of mycelia. These rhizomorphs provide water and essential nutrients to the growing mushrooms. One technique for increasing yield and reducing time needed for cropping comes from spawn-run compost at casing (CAC), produced by a process called casing inoculum (CI). This reduces expected harvest date by five to seven days. Mushrooms form on the surface of the casing, as well as in the compost.

Phase Five: Pinning, or Pre-harvest

Thanks to rhizomorphs formed in the casing, and adequate watering, small mushroom 'initials' begin poking out through the surface of the casing. Growers call these tiny protrusions 'primordial' or 'pins'. Little white globes poke up through the peat, like pins or tiny spaceman

heads. These turn into mushroom caps or 'fruiting bodies'. Once the pins appear, mushroom growth accelerates during the rapidly expanding stage (RES), when a mushroom doubles its size every 24 hours. Growers monitor air temperature and carbon dioxide levels during this phase to ensure that the pins push through the casing. An imbalance of fresh air and carbon dioxide retards this process.

Phase Six: Harvesting

Most growers harvest mushrooms in cycles called 'flushes' or 'breaks'. Each break lasts two to four days and occurs several times during a seven to ten day period. As each break ends, removal of a growth inhibitor readies the next crop. Hand-harvesting takes place, before caps turns soft. Size does not indicate maturity, but growers and consumers prefer larger mushrooms. Accurate measure of maturity lies in how opened up the veil becomes. Each square foot of the mushroom beds yields approximately 2½ kg (5½ lb) of mushrooms. Growers must discard any diseased or damaged mushrooms and treat them with certain chemicals, such as salt or alcohol, to prevent the rest of the crop from becoming contaminated.

Among the Mushrooms: The Major Players

Some of the most commonly eaten mushrooms in the modern world now include cultivated ones. There are several species that are very popular in culinary circles, but which still elude the commercial cultivator's prod, though some growers are enjoying success with truffles, discussed in brief in chapter Three.

Cultivated Mushrooms

Blewits (*Clitocybe/Lepista nuda*)
Purplish blue blewits often grow in rings or arcs. They are most prevalent in Europe, where they are called 'wood blewit'. Spore prints reveal pinkish spores. Mildly toxic if eaten raw, the blewit pairs well with chicken. Look for blewits in autumn markets or grouped along paths or piles of leaves in deciduous forests.

Button/white (*Agaricus bisporus*)
The cultivated mushroom most commonly eaten, the button first grew in caves near Paris. Available whole or sliced in most supermarkets, this creamy white mushroom lacks flavour, but is safe to eat. In spite of being served raw in salads by many a chef, the button should be cooked prior to eating because of the indigestibility of its cell walls. Cremini and portobellos belong in this group.

Mushrooms in all sizes and shapes.

***Enokitake/enoki* (*Flammulina velutipes*)**
Very different in appearance from the wild version, which sports caps as large as 5 cm (2 in) in width, the cultivated *enoki* looks nothing like its wild cousin. Cultivated *enoki* caps measure no more than 5 mm (¼ in) in diameter and have long pasta-like thin stalks. Japanese cooks add *enoki* to soup as garnish while, in the West, they appear in salads.

***Maitake*/Hen-of-the-woods (*Grifola frondosa*)**
Called the 'dancing mushroom' in Japanese, *maitake* grow in clumps on tree stumps in the wild and in glass containers or plastic bags when cultivated. These polypores interact negatively with MAOs (monoamine oxidase inhibitors), a type of antidepressant, because of their tyramine (an amine similar to epinephrine) content. Cooks sauté *maitake* or dry them for later use in soups and other dishes.

Oyster (*Pleurotus ostreatus*)
Oysters grow wild more or less year-round on stumps and trees; they are now also cultivated. Unlike other mushrooms, oysters digest ('eat') small animals such as nematodes (roundworms) and rotifers (wheel animals). They also play a role in bioremediation, or the application of biological processes to environmental problems, and could potentially be used to clean up oil spills. They are most often used in stir-fry cooking or in stews.

Paddy-straw (*Volvariella volvacea*)
The quintessential Chinese mushroom, usually found floating around in a bowl of hot-and-sour soup, the paddy-straw resembles a tiny wind-blown umbrella with ragged edges. Cultivated by the Chinese on rice straw, this mushroom looks like a death cap but its spores are pink, not white. The eminent Chinese mycologist S. T. Chang believed that the ancient Chinese cultivated it, but no documentation exists to support this claim.

Shiitake (*Lentinus edodes*)
The shiitake has enjoyed a long history – of nearly 1,000 years or more – of cultivation in China and Japan, where growers

Dried shiitakes, a common Asian ingredient.

inoculate oak logs, called *shii*, with spawn to produce hundreds of mushroom. Shiitake boast a pronounced earthy flavour and there is evidence to suggest that the species may be effective in the treatment of certain cancers.

Wood ear (*Auricularia polytricha*)
Wood ear, or jelly fungus, may be the first mushroom ever cultivated, according to mycologists Shu-Ting Chang and Philip Miles, in *The Biology and Cultivation of Edible Mushrooms* (1978). Growing on hardwood trees or sawdust, this gelatinous mushroom, which is shaped like an ear (hence the name 'wood ear'), dries well and generally appears in markets in dried form. There is evidence to indicate that wood ears could play a role in combating heart disease and cancer.

Wild Mushrooms

Field/meadow mushroom (*Agaricus campestris*)
Found growing in grasslands, this mushroom's bright pink gills and pure white cap make it a gorgeous addition to the cook's pantry. The mushrooms grow in a scattered pattern, sometimes in rings. Quite common in Europe, the mushroom is also known as 'pink bottom'.

Cep/cèpe/porcini/King Bolete (*Boletus edulis*)
One of the most popular mushrooms in cooking, porcini grow in forests or grass near woodlands. Much of the dried porcini available in markets today come from China. Fresh porcini look fleshy, with brownish caps and greenish-brown spores. Cooking with porcini, dried or fresh, results in memorable dishes, especially when stewed with pork and chicken.

Chanterelle (*Cantharellus cibarius*)
Chanterelles resemble tiny yellow trumpets and smell like apricots. Their bright yellow colour and yellow spore prints make them a mushroom easy to identify, as they nestle in the moss under

conifers or in humus. Cook fresh chanterelles with eggs or in a simple soup.

Matsutake (*Tricholoma matsutake*)
One of the most expensive mushrooms on the planet, the matsutake enjoys high esteem in Japan. The mushrooms grow in circles like a fairy ring. There has been little success in cultivating this cinnamon-scented mushroom: because it is mycorrhizal it has to be attached to the root system of appropriate trees, generally pines, in order to thrive. Matsutake taste best when grilled or added to light soups.

Morel (*Morchella esculenta* or yellow morel and *M. elata* or black morel)
Some of the most sought after fungi, morels belong to a group of fungi known as Ascomycetes, classified differently because their spores appear inside saclike cells, not on the interior of club-like cells, as with the Basidiomycetes. Morels grow just about anywhere where there is sandy soil, but many foragers find them in woods or orchards, usually in springtime. Resembling little sponges, morels lend themselves to a variety of cooking methods, including sautéing and stuffing.

Poisonous and Toxic Mushrooms

It is easy to mistake poisonous mushrooms for non-poisonous ones. The following descriptions of a few common poisonous mushrooms are meant only to be educational: PLEASE DO NOT use these descriptions, or the pictures in this book, as guides in foraging.

Although some writers claim that boiling certain toxic species renders them edible and safe, be cautious. Remember that toxicity can vary in different growing conditions, which means that it is possible to eat the same mushroom without ill effect on one occasion, but land up in hospital on another.

Poisonous mushrooms, beautiful but deadly.

Deadly galerina (*Galerina autumnalis*)
Often mistaken for honey mushroom, deadly galerina grows in a scattered pattern on decaying logs. The caps sport yellow gills with brown spores.

Death cap (*Amanita phalloides*)
Deadly poisonous, death caps have white gills and white spores.
Destroying angel (*Amanita ocreata, A. virosa, A. verna, A. bisporigera*)
Destroying angels grow under oaks and conifers. The caps present white gills and form white spores.

False morel (*Gyromitra esculenta*)
False morels are brain-like in appearance: when cut in half, unlike the hollow 'true' morels, false morels appear to contain small spaces filled with tissue.

Fly agaric (*Amanita muscaria*)
Fly agaric, used in visionary ceremonies and other rituals by many folk cultures around the world, resembles a red umbrella with white polka dots. They are usually not lethal, except to flies, which die when they land in milk imbued with pieces of fly agaric. This gorgeous mushroom makes an appearance in films such as Disney's *Fantasia* and is used as iconography on many a bedroom lamp and other products made for children.

Recipes

Historical Recipes

Mushrooms (Boletos Fungos) (Ancient Rome)

—from Apicius, *De re coquinaria* (first century AD)

Fresh mushrooms are stewed in reduced wine with a bunch of green coriander, which remove before serving.

Mushroom Sauce (Catalonia)

—from *Llibre de Sent Soví* (1324). Translation by Robin Vogelzang used with permission.

If you want to make sauce of mushrooms that are boiled, pressed and fried with oil, make sauce like this: take onion, parsley, vinegar and spices, and mix it with vinegar and water. Make pieces of the mushrooms, to fry, or serve with a fried mixture, and then put them in their sauce, or serve them grilled with salt and oil.

Mushroom Tart (France)

—from *Le Ménagier de Paris* (1393)

Mushrooms of one night are best, and are small and red inside, closed above: and they should be peeled, then wash in hot water and parboil; if you wish to put them in pastry, add oil, cheese and powdered spices.

To make a fregasy of Chicken (England and America)

—used with permission from Gulielma Penn, *Penn Family Recipes* (*c.* 1702)

Take your Chicken flea [flay] them and
Cutt them in peces
and boyle them gently in butter
with a bunch of sweet herbs,
after thay have bin a prittey while in,
putt sum good broath to them,
and when almost enough, a gill of white wine
then take the yeolks of 4 or 5 eggs,
and sum shred parsley
½ a nutmeg grated
And sum juce of Lemon
but if you have not that 2 or 3 spunfulls of vinegar
beate them well together,
and when the other is enough, put this to it
sturing it up and downe together a Litell while
you may putt mushrons to it, and slised Lemon,
this is for 4 Littell biskets
putt a bitt or 2 of butter too the eggs and
other things
when you mix them together

To Pot Mushrooms (England)

—from Eliza Smith, *The Compleat Housewife* (1758)

Take of the best mushrooms, and rub them with a woolen cloth; those that will not rub, peel, and take out gills, and throw them into the water, as you do them; when they are all done, wipe them dry, and put them in a sauce pan, with a handful of salt and a piece of butter; stew them till they are enough, shaking them often for fear of burning; then drain them from their liquor, and when they are cold wipe them dry, and lay them in a pot one by one as close as you can, till your pot be full; then clarify butter; let it stand till it is almost cold, cover them close in your pot; when you use them, wipe them clean from the butter, and stew them in gravy thicken'd, as when fresh.

Mushroom Catsup (United States)

—from Mary Randolph, *The Virginia Housewife* (1824)

Take flaps of proper mushrooms from stems – wash them, add some salt, and crush them; then boil them some time, strain them through a cloth, put them on fire again with salt to your taste, a few cloves of garlic, and a quarter of an ounce of cloves pounded, to a peck of mushrooms; boil it till reduced to less than half the original quantity – bottle and cork it well.

Mushrooms Served under a Glass Cover and with Cream (*Champignons Servis Sous Cloche en Verre et à la Crème*)

—from Charles Ranhofer, *The Epicurean* (1893)

Have some round slices of bread, three inches in diameter and three-eighths of an inch thick. Cut off the stalks from some very fresh mushroom heads . . . and sauté; range these on slices of bread (heads downward); season with salt and pepper and lay a single slice on a dish so that each individual guest can be supplied

with a separate one. Cover with a bell made either of glass or silver and push them into the oven for twenty minutes. After removing lift off bells and cover mushrooms with white wine velouté sauce (no. 415) or white wine espagnole sauce (no. 492).

Curried Mushrooms (British Colonial India)

—from C. Herman Senn, *Ideal Breakfast Dishes, Savouries and Curries* (1900)

Peel half a pound of button mushrooms, remove stems and wash them. Drain mushrooms and season with pepper and salt. Melt about an ounce and a half of butter in a saucepan, and fry mushrooms in this for a few minutes. Pour off the fat, and add sufficient curry sauce [see below] to barely cover mushrooms. Cook slowly for about fifteen minutes longer. Dress them on slices of crisp toast placed on a dish, pour sauce round the dish, and send to table with a plate of plainly cooked rice.

Curry Sauce

Peel and slice a small onion, scrape and slice a small carrot, fry both together in 1 oz. butter; when onion has acquired a light brown colour add one table-spoonful of Empress curry powder and stir for a few minutes. Next add a small peeled and chopped apple, moisten with half a gill of tomato pulp, and a gill of brown sauce, allow to boil for a few minutes. Season to taste, and pass it through a fine strainer and reheat.

Baked Boleti

—from Kate Sargeant, *One Hundred Mushroom Receipts* (1899)

Select carefully, as the boleti are prey of worms; cut off stems and pare with a sharp knife (some even recommend cutting off pore surface; but this takes away from the flavour). Bake with butter, salad oil, pepper, salt, and chopped herbs and bread crumbs, to which may be added some mince or anchovy or ham.

Duxelles

—from Arthur Robert Kenney-Herbert, *Common-Sense Cookery for English Households; with twenty menus worked out in detail* (1905)

Duxelles, or Fines herbes. Chop up six ounces of fresh mushrooms, six ounces of fresh chervil and parsley mixed, and two ounces of chives or shallot; put the minced shallot in a stew-pan with two ounces of fresh butter and a seasoning of salt and black pepper; fry over a low fire for five minutes, add minced mushrooms and parsley, fry for five minutes more, and put mixture in a jar for use as required. Half quantities will be found sufficient for most operations.

Modern Recipes

Mushroom Caviar

—used with permission from Darra Goldstein, *A Taste of Russia* (1999)

3 large scallions, including the green tops, finely chopped
3 tablespoons butter
340 g (¾ lb) mushrooms, trimmed and finely chopped
juice of half a large lemon
salt, freshly ground black pepper and cayenne to taste
160 ml (2/3 cup) sour cream
3 tablespoons snipped fresh dill

Briefly sauté the scallions in butter. Add the mushrooms and lemon juice and season to taste. Cook over medium heat, stirring occasionally, for 5 minutes. Remove from heat and stir in sour cream and dill. Check for seasoning. Set aside to cool to room temperature. Serve 'caviar' at room temperature, garnished with parsley.
Serves 6–8

Bigos (Hunter's Stew) (Poland)

—from Magdalena Pospieszna at http://polandpoland.com/bigos (2011)

230 g (½ lb) of bacon
450 g (1 lb) lean pork or wild boar meat
1 large onion
2 garlic cloves, finely chopped
2 cups cooked dried Borowik wild mushrooms (Boletus)
2 apples, cored and cut into chunks
2 or 3 prunes, cut up into pieces
2 root vegetables (swede/rutabaga, turnip or carrot), cut into chunks
1 500 g (14 oz) can plum tomatoes
230 g (½ lb) of sauerkraut (pickled cabbage)

450 g (1 lb) smoked sausages (Kielbasa), cut into small chunks
120 ml (½ cup) of red wine
120 ml (½ cup) of stock (vegetable or meat)
a few allspice berries
salt and pepper

Chop bacon into 5 mm (¼ in) pieces, cook until crisp, remove from the fat and set aside. Cut pork or wild boar meat into small cubes, add to fat in the pan and brown meat lightly. Mix in onion and cook until tender. Cover meat with hot water and simmer, covered, until well done. Add garlic, apples, prunes, Borowik mushrooms, vegetables and tomatoes and continue cooking for about 5–10 minutes. Combine sauerkraut with meat along with sausages and reserved bacon. Add red wine, stock and allspice. Mix these ingredients together and season with salt and pepper to taste. Cook, uncovered, until sauerkraut is tender and bigos is of consistency you prefer. Serve with crusty white bread or, if you prefer, traditional Polish bread.

Beef with Hot Pepper and Mushrooms (Nigeria)

—used with permission from Elizabeth A. Jackson, *South of the Sahara: Traditional Cooking from the Lands of West Africa* (1999)

60 g (½ cup) unbleached all-purpose flour
1 teaspoon salt
½ teaspoon ground red pepper (cayenne), or to taste
500 g (1 lb) beef chuck, cut into 5 cm (2 in) chunks
500 g (1 lb) fresh white mushrooms, large ones sliced and small ones left whole
60 ml (¼ cup) peanut oil
1 yellow onion, chopped
1 tomato, chopped

In a small bowl, mix flour with salt and red pepper. Put mixture into a plastic bag and shake. Toss in meat cubes and shake again, to coat meat well. Take meat out and place on clean plate. Repeat flouring process with mushrooms. Remove them to separate plate.

Heat oil over medium-high heat in heavy skillet. When oil is almost smoking, add meat and brown it well on all sides. Remove meat to a clean plate. Cook mushrooms until browned, being sure not to stir them too often, as this interferes with the browning process.

Add onion to the skillet. When onion is translucent, stir in tomato. Cook for 10 minutes over medium heat. Add leftover flour mixture and cook for 5 minutes, stirring constantly, blending flour into oil. (You may have to add a little more oil to make sure flour doesn't scorch.) Stir in reserved meat and mushrooms.

Add 360 ml (1½ cups) water; stir until mixture is smooth. Reduce heat to low and simmer for about an hour. Serve with white rice and fried green plantains.

Matsutake Rice

—used with permission from Keiko Purdy, Nankan-machi, Japan

First, make kelp soup stock: 2 sheets of 10 x 15 cm dried kelp, wash and boil it for 3 minutes with 475 ml (2 cups) of water. Remove kelp. Set aside.

Wash 500 ml (2½ cups) of short-grain rice. Set aside.

Wash and cut 6 or 7 medium-sized matsutake mushrooms into big pieces.

Mix 20 ml (1 tablespoon) of soy sauce and 40 ml (1½ tablespoons) of Sake.

Mix together in a pot, add 300 ml (1½ cups) water. Bring to boil with lid on. Remove lid until all the water boils out. Put the lid back on and simmer for 5 minutes. Fluff and serve.

Wild Mushroom Soup (Zuppa di Funghi Porcini)

—used with permission from Nancy Harmon Jenkins, *Flavors of Tuscany* (1998)

3 tablespoons extra-virgin olive oil
1 red or yellow onion, finely chopped
2 stalks celery, finely chopped
1 medium carrot, finely chopped
1 tablespoon unbleached all-purpose flour
about 450 g (1 lb) wild porcini (or other) mushrooms, cleaned and coarsely chopped
6 cups light chicken stock, heated to a simmer
sea salt and freshly ground black pepper
6 x 2.5 cm (1 in) thick slices country style bread, lightly toasted and rubbed with a cut clove of garlic
2 or 3 tablespoons finely minced garlic

In a soup kettle or heavy pot large enough to hold all ingredients except the bread, gently sauté in oil the onion, celery and carrot. When vegetables are soft but not brown, sprinkle with flour, stirring to mix well. Add mushrooms and turn them in the savoury

fat. The mushrooms will absorb a good deal of fat and then release it again, along with their juices. When this happens, pour in simmering stock and stir to mix well. Taste and add salt and pepper. Then cover pan and cook at slow simmer for about 20 to 30 minutes, or until broth is fully impregnated with the flavour of mushrooms.

Put the garlic-flavoured toasted bread in the bottom of a soup tureen, or put one slice in bottom of each soup plate. Pour simmering soup over bread and serve immediately, garnished with sprinkles of parsley.

Soba Noodles with Wild Mushroom Sauce

—used with permission of Lévana Kirschenbaum, Lévana Cooks, www.levanacooks.com

For one pound pasta. I love soba noodles, but of course you can use your favourite pasta. Cook the noodles according to manufacturer's instructions, with a few added drops oil (any oil, no need to use an expensive one) and a little salt. Make absolutely sure not to overcook, or you will get a sticky mess. Reserve 120 ml (½ cup) of the cooking liquid, and rinse the noodles under cold water.

Heat up 120 ml (½ cup) porcini oil in a large skillet. Sauté 680 g (1½ lb) sliced wild mushrooms, (whatever you can afford is OK, no need to set yourself back), until all mushroom liquids evaporate. Toss mushrooms, oil and all, with the pasta, reserved cooking liquid, salt and freshly ground pepper to taste, and sprinkle with lots of minced flat parsley or sliced chives. Serve.

Mushroom Mattar Masala

—used with permission from Monica Bhide, a food writer (*Modern Spice*, 2009), who focuses on food and culture and how they affect our lives.

300 g (2 cups) button mushrooms
3 tablespoons vegetable oil
1 x 2.5 cm (1 in) piece fresh ginger-root, julienned
2–3 garlic cloves, peeled and sliced
1 small tomato, peeled and diced
150 g (1 cup) cooked peas
1 tablespoon coriander powder
½ teaspoon red chili powder
¼ teaspoon turmeric powder
1 tablespoon dried fenugreek leaves
table salt to taste
water, as needed

Clean mushrooms and quarter them. In a large skillet, heat vegetable oil on high heat. Add ginger and garlic and sauté for about ten seconds. Add tomato and cook for about 5–7 minutes or until oil begins to leave the sides of the pan. If the tomato begins to char or dry, add a few tablespoons of water and keep stirring. Add mushrooms and cook for about 3–5 minutes or until the mushrooms are done and begin to release their moisture. Add peas. Add coriander, red chili, turmeric and dried fenugreek leaves. Sauté for 1 minute. Reduce heat to low. Add salt and 2–3 tablespoons of water. Cover and simmer until mushrooms are done, about five minutes. Serve hot. Garnish with chopped cilantro, if desired.

Mushroom Chestnut, Quince and Pearl Onion Stew
(*Manitaria me kastana kai kydonia stifado*)

—used with permission of Mariana Kavroulaki, culinary historian, Athens, Greece

160 ml (⅔ cup) olive oil, divided
1 kg (2 lb 3 oz) whole pearl onions, peeled
800 g (1 lb 12 oz) fresh pleurotus [oyster] mushrooms, cleaned and cut into 4–8 cm (2–4 in) long pieces
1 large white onion, chopped
5 garlic cloves, cut lengthwise
20 chestnuts, peeled and cut into two halves
2 bay leaves
1 cinnamon stick
orange peel, to taste
salt and freshly ground pepper
2 tablespoons tomato paste diluted in 180 ml (¾ cup) warm water
350 g (12 oz) quince, peeled and cut into 4 cm (2 in) pieces
½ cup sweet red wine, such as Mavrodaphne

Heat half the oil in a large pot, add pearl onions and sauté until soft. Add mushrooms and cook for 4 minutes, stirring frequently. Add chopped onion, garlic, chestnuts, bay leaves, cinnamon stick, orange peel and pepper. Pour in remaining oil and diluted tomato paste. Stir well, taste and add salt. The liquid should not cover the ingredients but if needed, add water. As stifado starts to boil, lower the heat. Simmer stifado, covered, over medium heat for 20 minutes. Add the pieces of quince, pour in wine and simmer uncovered until onions, mushrooms and quinces are tender and most of the liquid has evaporated. Serve hot. If you don't have access to quinces, you may substitute potatoes, or just leave them out, and still have a wonderful dish. The stifado can also be cooked in the oven.

Haitian Djon-Djon Rice (*Riz au djon-djon*)

A special dish that I ate when I lived in Haiti. This is a recipe cooked by my friend Rita.

475 ml (2 cups) Haitian *djon-djon* mushrooms or equivalent dried black mushrooms
3 tablespoons vegetable oil
50 g (2 oz) bacon
50 g (2 oz) boneless cod or other firm white fish
30 g (1 oz) salt pork
1 tablespoon finely chopped garlic
40 g (¼ cup) finely chopped scallions
45 g (½ cup) chopped parsley
380 g (2 cups) long-grain white rice
salt and freshly ground black pepper to taste
½ teaspoon dried thyme, crushed
pinch of ground cloves
1 tablespoon butter

Rinse mushrooms lightly in water. Drain, stem and chop. Add them to a saucepan with 4 cups hot water and leave to soak for 30 minutes. Bring to the boil, reduce heat and simmer for another 15 minutes. Drain again, reserving liquid.

In another saucepan, sauté bacon, fish and salt pork in oil over a medium heat until lightly browned. Remove and place on paper towels to drain. Add the garlic, scallions and parsley; fry until softened. Add rice and stir until coated with the oil. Cook until the rice turns milky white. Add mushrooms. Season with salt, pepper, thyme and cloves. Pour in 4 cups of liquid (water or chicken broth), including the water in which the mushrooms were soaked. Bring to the boil over a high heat. Stir in butter. Reduce heat, cover and simmer for about 25 minutes. Serve with fried chicken or pork chops.

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Telluride Mushroom Fest (U.S.)
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