

## Chapter 7

# *From Garden to Globe: Linking Time and Space with Meaning and Memory*

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### Space, Time, and Mind in Gardens and Landscapes

Social memory is the means by which knowledge is transmitted from one generation to another. Individuals, not necessarily aware that they are doing so, pass on their behaviors and attitudes to younger members of their culture. To use an analogy from physics, social memory acts like a carrier wave, delivering knowledge across generations, regardless of the degree to which participants are aware of their role in the process.

Like a coaxial cable on the ocean floor, bundles of cultural information are arranged around a central concept. Manifested as both a practice and an ideal, such concepts prompt people to construct a variety of reasons for their existence. This multiplicity of rationales for engaging in certain practices ensures the transmission of fundamental information but also leaves room for individual differences in experience, perception, and conviction.

The idea of the *garden*, the many rationales for which range from practical utility to cosmic meaning, is such a concept. At a more inclusive scale, *landscape* is similarly rich, both in meaning and in concrete reality. Landscape is the visual signature of a territory (a vista) that is partly formed by the people who inhabit it.

The information contained in gardens and landscapes is conserved in the character and spatial arrangement of their respective elements. Arranged in patches or mosaics and distributed through time and across space, these elements constitute practical units of analysis. Examples of garden elements would be an heirloom medicinal plant or lettuce beds; a landscape element might be a woodlot or a moor. Inasmuch as initial conditions support and constrain human activity, these elements reflect both the distant and recent history of the human-environment relation. The focus on elements and their

relations to one another enables pattern recognition at any spatial scale: from that of the micrororganism to regional and ecological zones (Hammett 1992; O'Neill et al. 1991; Pielou 1975, 1984) and even more broadly to phenomena at the continental (e.g., air mass patterns) and global (ozone layer) level (Gunn 1994; Turner, Dale, and Gardner 1989).

In addition to history (time) and geography (space), cognition is a third important dimension of the analysis. For example, in cultures where class differences are marked, elite gardens—comprised of flowers, trees, and shrubbery—serve symbolically as miniature landscapes; they display and enhance status and are sources of pleasure, not subsistence (Leone 1984, 1988). Employed almost like stage sets, pleasure gardens manifest individual attempts to transmit identity, taste, and style (Le Dantec and Le Dantec 1990; Pugh 1988; Thacker 1979); like all dramatic creations, they are subject to marked shifts in fashion.

If pleasure gardens are theaters, then vernacular gardens are schools. The vernacular (from the Latin word for "native") garden is a conservative form, home to a mix of vegetables, fruit trees, and other elements useful in the maintenance of the household (Hunt and Wolschke-Buhlmahn 1993; Miller and Gleason 1994). The English term *garden* (French *jardin*) has vulgar Latin (*gardinum*), Teutonic, and Norse roots (*garth*), the last of which defines "a small piece of enclosed ground, usually beside a house or other building, used as a yard, garden, or paddock" (*Oxford English Dictionary* 1971:1118; see also Erp-Houteban 1986). Vernacular gardens are herein defined as plots in which plants are tended by hand that form part of the domestic economy. Vernacular gardens sustain traditions, store hard-won solutions to local conditions, and represent real household wealth. Both vernacular and pleasure gardens represent in miniature a vision of the owner's cosmic order, but in the vernacular garden the gardener who labors and the owner who enjoys are usually one and the same.

The complex ways gardens are used and what they represent explain some of their enduring fascination. Gardens' historic importance during hard times; their convenience, quality, and economy; and the control they offer over the circumstances of production make them much valued in traditional societies.

Gardens are also places of recreation, creative personal expression, and escape; to many, their gardens represent a resistance to pesticides and the industrialized production of food. Household gardens (and the resulting stocked larders) reduce anxiety and encourage practical experimentation. They encourage reflection on larger issues of family, history, and providence; they inevitably represent, in the most immediate fashion, the rhythms of lives lived with the seasons and with death.

Because of vernacular gardens' diverse benefits and central role in traditional societies, they offer a rich, personalized mnemonic that is "good to think" (Lévi-Strauss 1963:89; see also Francis and Hester 1990). The greater the range of thoughts and behaviors and the richer the meanings that concepts such as the garden evoke, the greater the likelihood that diverse infor-

mation bundled around that concept will be transmitted. In the same way that a cable gains strength from myriad individual strands, the more reasons there are to value the garden the more likely it is that its messages will be transmitted.

In the vernacular garden, complex information about ecosystems and practices that ensure their maintenance are adapted to the region and the locale. This knowledge passes from one generation to another out of sentiment as well as good sense: vernacular gardening is an intimate activity, and kin share both the work and the harvest. Vernacular gardens act as reservoirs of ecological knowledge and social practice.

So too do landscapes. Unlike vernacular gardens, entire landscapes are rarely molded by a single person; instead, they preserve the record of many individual actions, ideas, and societal practices. Even when elites have the means to alter many aspects of the countryside, others are still free to attach their own meaning to various landscape elements and spaces and turn them to other uses (Marquardt and Crumley 1987; Crumley and Marquardt 1990; Dunbar 1991; Schama 1995). Vigilance and stiff punishment have never been enough to ensure that even a royal preserve could be kept safe from poachers and gleaners.

Elites can adorn their estates with exotic plants and animals and create or modify bodies of water, forests, and fields, but such activities are usually limited to their places of residence. An exception is when disparate properties are owned and rented out or the land is put up as collateral; then, the renter or debtor may be obliged to follow the wishes of a sometimes distant and ill-informed landlord or deed holder.

Institutions can shape landscapes by replicating activities in several locations. For example, religious institutions are frequently large landowners. It is estimated that during certain periods of the Middle Ages, the church owned over 50 percent of the land in France. Monastic orders and royal estates, while engaged in essentially the same kinds of activities as surrounding farms, nonetheless undertook them on a scale far beyond that of farm families (Harvey 1981). Former royal and monastic holdings can still be discerned on the French landscape from the air, although ecclesiastical policy and royal privilege are no longer major influences in shaping the landscape.

More fundamental to the shaping of landscapes and more enduring are activities associated with widespread patterns of subsistence. This is because many individuals and families, not just elites, find utility in the same elements of the landscape and foster their continuity from generation to generation. In contrast to industrial agriculture, in which particular crops or animals are raised exclusively for market, traditional farming meets the majority of domestic subsistence needs (Netting 1993). Vegetables, cereals, meat, and condiments are produced on the farm, most of them (excepting grains and herd animals) within steps of the farmhouse door. In the absence of electricity and community water supplies, a farm's woodlot, springs, and ponds provide heat, light, and water.

Spatial concerns are central to the efficient management of all farms, but

they are especially important on traditional farms, where numerous daily activities are the responsibility of relatively few individuals. Frequent tasks must be undertaken as close to one another and to home as possible. The less frequent the activity, the further it can be from the home (von Thunen 1966; Chisholm 1962). Over generations, the spatial organization of farms in a region becomes consistent with a particular suite of activities, and the landscape takes on a visible regularity.

### Learning Burgundy

Since my research group began working in Burgundy in 1975, we have examined changes in settlement, economy, environment, and demography that historic, long-term shifts in the Western European ecotones have entailed. From these data, we have projected changes that might accompany contemporary global warming. We have monitored contemporary practices that count as ecological successes (gardening) and as failures (extensive gravel mining in river valleys).

Our research methods include archaeology, a variety of paleoenvironmental studies, the analysis of maps and documents, and ethnography. We have interviewed dozens of gardeners and farmers and amassed documentary evidence for older plants and practices (e.g., from almanacs). We have three millennia of archaeological evidence for biota, land use, and settlement and over three centuries of detailed population data.

We have accumulated an extensive biophysical and social science database (Crumley and Marquardt 1987). The spatial data are aggregated into a Geographic Information System with over a hundred layers (Madry and Rakos 1996). Since the 1970s, we have been accumulating LANDSAT and SPOT imagery of the region, as well as data from AIRES and other scanners. We have digitized a variety of contemporary and historic maps (the earliest from 1759). This extensive information offers a unique opportunity to look closely at how the region's economies, both domestic and industrial, have been sustained for the past two thousand years.

Like most French householders, both rural and urban Burgundians have gardens despite the ready availability of produce in stores and at open-air markets. This tradition of domestic production appears to be unbroken as far back as at least the first millennium B.C. and offers a remarkable opportunity to study the role gardens have played in allowing households a means of autonomous adaptation to social upheaval and Burgundy's unpredictable weather.

Gardens play a critical role in reducing risks associated with inclement weather all over the world. Unlike field crops, gardens shelter numerous species in special soils and under controlled microclimatic conditions. Plants receive individual attention and enable the gardener to develop an intimate understanding of soils, winds, and seasons as they relate to the garden plot.

In addition to abundant produce, gardens both conserve traditional species and are filled with small experiments that yield new information.

The climate of Europe is the result of the dynamic interaction of three major climatic regimes. The temperate *oceanic* regime (sometimes called the Atlantic) characterizes the northwest quarter of the continent and carries moisture inland from the ocean; under present global conditions, this pattern dominates in the spring and fall. The subtropical *Mediterranean* regime characterizes the circum-Mediterranean littoral and North Africa and brings dry, desert winds north; this regime dominates primarily in late summer. The temperate *continental* regime dominates northeast Europe from the Siberian high and carries dry air west from the interior of the continent, primarily in winter. Burgundy sits at this climatic "triple point," and a look at the region's climate history reveals that the boundary between the temperate systems and the subtropical system (termed an ecotone) has shifted hundreds of kilometers in response to extended periods of globally cool (southward movement) or globally warm (northward movement) conditions (Crumley 1987c, 1993, 1994, 1995a, 1995b, n.d.; Gunn 1994; Gunn and Crumley 1991; Magny 1995; Richard and Magny 1992). The ecotone's historic movements provide a model to anticipate the specific conditions global warming will cause in a key food-producing region of the world.

In addition to raising global temperature and repositioning climatic regimes, certain greenhouse gases will increase seasonal slippage ("unseasonal" weather), variability in regional weather patterns, and extreme events such as powerful storms and hail (Camuffo and Enzi 1992:153). Since Burgundians have for centuries been forced to anticipate such conditions and to rally in their wake, traditional strategies are of particular interest.

The ecotone has traversed Burgundy several times in the past three millennia; its movements can be traced by means of physical evidence (sediment erosion and deposition, movement of plant communities) and archaeological and documentary evidence (changes in subsistence strategies, ecclesiastical records). Each time, the region's broken terrain and its human population have enabled some stressed species to find refugia in wild places and cultivated spaces. These historic examples demonstrate that the human population's ability to adjust to environmental change is closely tied to biotic and economic diversity.

Burgundy's physical environment is as remarkable and complex as its weather and climate. Its basement rock records a distant geological history that includes periods of marine transgression and mountain building; more recent sediments in the rivers and lakes reflect a combination of human activity and environmental change. The varied and much-modified geology and broken terrain of Burgundy yield a landscape in which microclimatic conditions play a crucial part in the success of plant and animal communities. While a locale may benefit from high-quality soils or abundant rainfall, advantages are easily offset by other circumstances, such as less favorable exposures or increased danger of frost and freeze.

Despite environmentally precarious periods in the region's history, Burgundy has nonetheless enjoyed considerable economic prosperity because of its geographical position. The primary river systems of Western Europe either rise in Burgundy (the Seine) or flow through it (the Loire, the Rhône-Saône river system). This has ensured the region's importance for millennia as a zone of transit and a center of commerce. There is evidence of Upper Paleolithic horse hunters and cave artists, and the importance of agriculture and stock raising, practiced for the past sixty-five hundred years, continues to the present in Charolais beef cattle and quarterhorse farms, vineyards, and the production of other specialties such as mustard and goat cheese.

Extraction of natural resources (gold, tin, iron) and manufacturing goods from them have been a major part of the region's economy for three millennia; by two thousand years ago Burgundian steel weapons were being purchased to equip the Roman army. From the tenth to the fifteenth centuries, the dukes of Burgundy were synonymous with Western European cultural refinement and political power. At the end of the nineteenth century, Burgundy was at the heart of European industry; the region's iron, coal, and oil resources subsequently fueled World War I. Nazi occupation in World War II and the extraction of radioactive materials in the 1950s further underscore the region's enduring strategic importance, both in terms of its geographical situation and its varied resources.

Disastrous late spring and early fall freezes, torrential rains, softball-sized hail, and extended droughts have all beset Burgundy at one time or another since we began working there over two decades ago. Historical records (from as early as 1645 and 1710) document similar circumstances, although it is clear that some periods were worse than others. Farmers accurately recount the years in which cold or drought or floods took their toll, and they retell relatives' weather tales from as far back as the late nineteenth century. One man, an amateur historian, knows the harshest winters and famine summers well into the eighteenth century.

It is for good reason that rural people know the region's various microclimates well enough to draw them on a map. Features such as a hill that both breaks the wind and produces a rain shadow or the elevation-related distribution of chestnut and cherry trees give every farm its distinct microclimate. Gardening and farming philosophy, captured in sayings (*dict-ons*), aids the transmission of information by encouraging the recognition of and response to conditions. Burgundian farmers and gardeners are keen observers of the weather, with a long tradition of weather-related sayings (Labrunie 1984; Taverdet and Dumas 1984). Many sayings are tied to the seasons through the calendar of saints' days or the phases of the moon. The "ice saints" warn of the danger of a killing frost until mid-May; wood fashioned into tools during the dark of the moon will be wormy. To know in advance about changes in the weather, one farmer asserts, one must simply "read the animals, which are no more beastly than humans."

Most people say they know the sayings and that there is "something to them" but that they don't slavishly follow the advice or expect the predic-

tions necessarily to prove accurate. The sayings serve as reminders, not laws, and produce reflection on the situation at hand but not necessarily a particular action. Such observations, gained from the close scrutiny of all living things and of the land, serve as indicators of well-being for farmer and gardener alike. Familiarity with all aspects of the mutable Burgundian environment has made possible the long tenure of gardening, farming, and pastoralism in this landscape.

### Lessons from the Garden in Husbanding Diversity

Research on the principles of intensive gardening practiced in the region (Crumley 1995b) identifies three critical elements. The *selection* of a particular suite of plants and animals has, over time, resulted in the traditional husbandry of species that have tolerance for a relatively broad range of conditions. Furthermore, the *wide repertoire* of species in local gardens ensures differential impact. Because a cool summer is better for cabbage than for garlic and a cold winter impacts rabbits less than pigeons, it would be a rare year that *all* husbanded plants and animals failed to thrive. Finally, the *planting and harvest cycle* allows for regular adjustments of the enterprise as conditions (e.g., seasonal slippage, weather events) change. These lessons can be summarized from the practice of nearly any Burgundian gardener: retired factory workers, suburban gardeners, and Charolais beef cattle farmers report very similar tactics.

Most Burgundian gardens have more than thirty species of vegetables, many (such as lettuce and beans) represented by several diversely tolerant varieties. In addition there are fruit trees and berry bushes (at least three or four species each), flowers, and herbs (tastes vary, but there are rarely fewer than five or six kinds). There are usually several categories of "special plants," family heirlooms such as arquebuses or exotics. Some people raise small stands of rye to attract pheasants, and a few still have grapevines, although nowadays vines are stringently regulated.

Today people buy their seed, bulbs, and plants; they also continue to save and trade with neighbors, as was common in the past. Historically, there were fewer species and varieties than there are today, but microclimatic differences from one farm to another ensured genetic diversity; trading was especially important, and stocks from outside the region were rarely purchased. Today, there are plentiful varieties and species available through catalogs, but these designer plants encourage the abandonment of less photogenic traditional varieties and the substitution of less genetically diverse stocks.

Animals are an integral part of these gardens, and many include several varieties of chickens, ducks, and geese; cages for pigeons, rabbits, and snails; and hives for bees. The farmers' larger domesticated animals include (besides the Charolais cattle) goats, pigs, sheep, and (only occasionally since the advent of tractors) horses.

In addition to harvesting their gardens, people range across fields and

through woods. They hunt mushrooms and pick several species of wild plants, either for consumption or to make natural pesticides. This latter practice is only one of a dozen ingenious and nontoxic means of controlling insects that employ household staples such as mustard, milk, and salt. Some remedies require the assistance of other garden denizens, such as releasing a turkey in the potato patch to eat potato bugs.

Garden soil is improved with spade work, aeration, constant weeding, the dung of horses and cattle, and (less frequently) the droppings of some of the caged animals. The location of smaller plants (such as radishes and lettuce) in the garden is changed each time they are replanted (about every six weeks), and a three-year round is employed for more extensive plantings of cabbage, potatoes, and clover. The latter serves as food for the rabbits.

The planting rhythm is tied to the seasons and reflects both the species diversity and the uncertain weather. Several vegetables, such as radishes, carrots, lettuce, and beans, are planted every ten days so they may be harvested continually, providing protection from complete loss and the opportunity to adjust the species planted to the shifting weather patterns. Before the freezes end, many people start smaller garden plants in a cold frame or greenhouse and then move them to the garden when the threat of frost is past.

### Changing Landscape Units: Farmyard, Pasture, Field, and Wood

Burgundian farmers must think at more encompassing scales than that of the garden. In some regards, the farmer's control over many hectares of pastures, fields, hedgerows, woods, and ponds resembles that of the estate owner. There are, however, several differences. Farmers cannot follow whimsy any more than can serious gardeners; rather, they must engage in careful calculations that sustain the profitability of the land. Large bank loans mean that their land, farm equipment, crops, or animals may not be entirely theirs to deploy. Thus the bottom line is whether the operation of the farm is profitable and allows the farmer to service his debt.

The European Community's Common Agricultural Policy (CAP) and the 1992 General Agreement on Tariffs and Trade (GATT) were hotly contested by farmers as well as other groups. While these agreements have been examined in terms of economic costs and benefits at several levels, there has been very little research on their effects on the landscape and other changes they have entailed.

Market conditions are forcing Charolais beef farmers to adopt practices completely counter to ecologically sensible customs handed down for generations. For example, the soil, vegetation, and moisture characteristics of Burgundian pasturage counsel a ratio of one animal per hectare; this calculus has been scrupulously respected for centuries. The CAP and the GATT have forced farmers to violate this calculus; in order to remain competitive, they have expanded their herds to compensate for lower market prices.



Larger herds require larger pastures and larger farms, and the number of animals per hectare has increased. Farmers began buying the land around vacant farms and digging up the sheltering hedgerows. Fewer hedgerows mean less shelter for cattle and ultimately more bovine health problems, a reduction in wildlife and noncultivated species, less plant diversity in the pastures, and more erosion. In order to reduce costs further to stay competitive, the remaining large farms require more hectares in cereals and fodder and ultimately more herbicides. This further deteriorates a key relationship between wild and domesticated species, threatens irreversible degradation of the Burgundian landscape, and risks failure in the transmission of ecological stewardship.

In addition to hedgerows, other familiar elements of the landscape are also changing. Woodlots and forests, once characterized by a great variety of deciduous species and some conifers, have begun to be replaced by single-species commercial conifer plantations or to be transformed into pastureland. Since 1945, and even more aggressively since the 1980s, conifer plantations have been encouraged by the French government, which subsidizes the purchase of both land and seedlings. Like the loss of hedgerows, the disappearance of woodlands impacts wildlife and noncultivated species. Traditionally, these woodlands were located in less fertile upland areas. If converted to field or pasture, there is greater likelihood of an increase in erosion and ambient environmental toxins. Plantations of single-species conifers also decrease wildlife habitats, and many farmers are convinced that the different reflective properties of conifers have the capacity to change local climate.

Especially instructive is the disappearance of the *ouche*. The word is of Indo-European derivation, and its current French form is derived from the Gaulish *\*olca*. It is briefly defined in dictionaries of Old French as "a field of good quality (sometimes an orchard) near the farmhouse." What elements constitute an *ouche*? I asked several older residents. It is an area very near the farmhouse, usually about an are (100 square meters) in size. It is often, but not always, fenced. Frequently, a source of good water (a spring or a well) is present. It has fruit and nut trees (such as cherry and chestnut) that can shelter such things as rabbit pens; coops for chickens, ducks, and other fowl; pigeon lofts; cages for snails; or a small shelter (a shed or *crèche*, a manger or crib) for tending small or sick animals. Grass covers a part of the area. An *ouche* includes or is contiguous with the family *potager* (kitchen garden). A part of the *ouche* is often made into the overflow garden, where plants that require greater space and less care (like potatoes or cabbage) are grown. There is always a compost pile, sometimes a toolshed, and before indoor plumbing there would have been an outhouse, shielded from sight by vegetation and located at one of the *ouche*'s outer edges. *Ouches* can be part of, but may be distinguished from, the elements and spaces that constitute a farmyard; those would include buildings and turnarounds for large equipment, silos, and livestock barns.

I first heard the word in an interview I taped with a farmer about his garden; I looked it up in my big Oxford Hachette dictionary, but it wasn't there.

Inquiries of linguist colleagues (Melchert, pers. comm.; Eska, pers. comm.) soon uncovered the word's five-thousand-year-long history, which reaches back to the Indo-Europeans, the earliest agropastoral people in Europe.

Excited about stumbling on an element of the landscape that has endured for several thousand years, I asked my friend Dauvergne to take me to see ouches. His family has farmed in the commune (an administrative division) of Uxeau (a Celtic word meaning "high defended place") for centuries. That afternoon we visited the sites of a half dozen he knew about; disappointingly, every one had been quite recently transformed into a pasture or field or put to other uses.

I did eventually see a few ouches. Their owners assured me that proper maintenance of the ouche had been discontinued only recently. Many ouches, albeit in disrepair, still had their fences; fruit and nut trees still stood, and in some there were still rabbit pens and potato patches. One tumble-down crèche now sheltered a cat and her kittens.

What does it mean that ouches have quite recently begun to disappear from the Burgundian landscape? There are a few potential causes for their demise that our historical knowledge allows us to eliminate. It cannot be directly the result of rural exodus, which accelerated with urban industrialization in the mid-nineteenth century and, at least in Burgundy, has now slowed to a trickle. Some rural communes are even gaining population, although this is due primarily to the proliferation of secondary residences and the rural homes of office workers and retirees. It is not a result of rural mechanization; tractors, combines, and the like have been utilized since just after World War II.

The demise of the ouche most directly is tied to abandonment of the principle of diversity (Holling 1986). While Charolais herds have been a primary farm commodity for three centuries, it is only since the 1970s that Burgundian farmers have specialized in the production of Charolais beef for the world market and begun to increase the size of their herds. As herd size increased, both the production for sale of other farm products and the number of working farms diminished; abandoned farmhouses or ones with non-farming inhabitants became more common, and surrounding lands were bought up to accommodate the larger herds. Other factors that have diminished the ouche's importance are the increased regulation of farm production for sale and the proliferation since the 1970s of supermarkets, where chickens, eggs, and other produce can be easily and cheaply obtained (Crumley 1987d).

After over five thousand years, the ouche, emblematic of sustained agropastoral production in a temperate environment, has outlived its usefulness. Diversity, tied for so long to climate and geology and domestic independence, has been sacrificed to international competition and government regulation. The irony is that Burgundian farmers understand what remaining economically viable has and could cost.

At least once before Burgundy's diversity has been compromised. Bur-

gundy enjoyed a remarkably stable period of dry summers and mild, rainy winters from about 300 B.C. to A.D. 200; characterized by the dominance of the Mediterranean climate regime, this period is called the Roman Climate Optimum. When the Romans conquered Gaul in 58 B.C., many independent Gaulish polities were made provinces of the Roman Empire. Among them were the Aedui, who inhabited what is now Burgundy.

While the Romans treated some polities harshly, the Aedui, with a strong pro-Roman faction and undeniable economic importance, were spared (Crumley 1987a). They had been leading exporters of diverse products, among them iron and horses for the Roman army, wool for garments, and cured hams for Roman tables. Since both metallurgy and grazing animals diminish forest growth, pigs were raised in places where woodlands were protected (Druidic sacred groves, family woodlots).

The trade-off for Roman leniency was that Burgundy became a producer of grains, breadbasket for the great cities of the empire. The Burgundian landscape in the Roman period was comprised of single-crop fields sown for export. Agricultural *villae*, farms owned by Roman or Romanized elites, appeared in the river valleys where horses had grazed; slaves and the landless planted wheat, millet, and barley. Mining operations were moved to other provinces (Spain and the area around Bourges); suppliers of horses were found nearer military challenges at the empire's ever-more-distant margins. The sacred groves were razed, simultaneously supplying the Roman navy with ships' timber and weakening Druidic power.

When the long period of stable climate ended in the middle of the second century A.D., the indeterminacies of the more typical temperate pattern returned. As climate worsened between A.D. 500 and A.D. 900 (the period sometimes termed the Dark Ages), human misery was intensified by plagues, famines, and wars. Our regional geological investigations indicate widespread late antique and early medieval erosion and flooding (Straffin 1998), in probability accompanied by an increase in hail and unseasonal frosts. As key elements in the rural economic system collapsed, debt cascaded through the social order. As the region's economy moved into a crisis, the stage was set for Burgundy's role in the spread of feudalism (essentially permanent debt labor) throughout Europe.

Economic and social disruption were the result of many factors, but chief among them was a marked reduction in economic diversity, coupled with a major change in climate. The socioeconomic system's flexibility and its resilience in the face of adversity had been destroyed; it would be several hundred years before Burgundy's prosperity was restored.

### The Past Teaches, the Future Learns: Policy Implications

Why should particularistic regional histories matter today? Burgundy's past can teach two important lessons, both applicable in any time or place. The

first is the importance of *diversity*, the second is that of *scale*. In many contexts—biological, economic, social, political—resilience in the system as a whole depends on the variety and flexibility of its constituent units. In human societies, the ability to endure by changing the scale of the endeavor is fundamental.

Because each region and locality have their particular characteristics, solutions that are workable in one place are not necessarily appropriate elsewhere. In Burgundy, historic landscape elements—the garden, the *ouche*, and the woodlot—have coevolved to accommodate the parameters of both local variation in weather patterns and long-term regional climatic change. These landscape elements are the result of centuries of experimentation, and they carry information about workable solutions to environmental uncertainty (Gunn 1994); they are the key to sustainability in that specific region. The web of plant and animal life they support has also coevolved, including mosaics of domestic and wild species that are resilient in extreme conditions; nonetheless, such systems have real limits.

The study of Burgundian climatic and environmental history reveals real thresholds that, when breached, crash the entire system. The social memory of Burgundy's inhabitants and our own ecological investigations indicate that these delicate relationships and their disastrous results are well understood. Older farmers are familiar with the false economies (reliance on too few species), landscape transgressions (widespread upland clearing), or weather patterns (extended drought followed by heavy rains) that caused past disasters. In more distant times, government edicts spelled ruin. Roman policy concentrated production in specific provinces; these regions became less diverse biologically, economically, and socially. Subsequent climatic deterioration, in concert with the diminished resilience of the social fabric, ushered in the Dark Age and the rise of feudalism (Crumley 1993, 1994).

The source of biological diversity resides in slight differences in the genetic material of varieties and species and their differential representation in populations; those organisms able to survive, temporally and spatially, specific onslaughts of pests, disease, or inclement weather pass that ability on to the next generation. Experimentation in gardens, the diversity of farm activity, and the maintenance of wildlife habitats retains these qualities at the landscape scale; the extensive cultivation or husbandry of selected species and the use of seed and breeding stocks that have been genetically altered do not.

In France, industrialized agriculture has already taken a measurable toll on many traditional activities: hunters must belong to a club that wins the collective right to kill a deer or a boar; squirrels are an endangered species. One can drive for miles in the grain belt of central France without seeing woods or even trees; as far as the eye can see, huge fields are planted with genetically altered cereals that are dependent on fertilizers and pesticides and cannot reproduce.

It is well known that French farmers have been among the most vocal in resisting the industrialization of agriculture and the necessity to compete in

global markets without governmental protection, but it is also true that they have had little choice. They must try to compete with their counterparts in Australia, South Africa, and Canada if their enterprises are to remain economically viable.

The global marketplace and the race to form a single global economy is something the Romans would have recognized. Managed by distant state authority, the biological and economic diversity of huge regions is subjugated in order to feed landless urban populations. Such was the Roman paradigm long before it was that of state collectives in the USSR and China or international cartels such as GATT and CAP.

In contrast to the global economy, economies of scale fit the conditions of their existence and retain plans for coping with distant as well as more local disasters. These smallholders (Netting 1993) organize their domestic economy heterarchically, that is to say, no single element (resource, strategy) is permanently ranked in importance above others, and diversity is valued (Crumley 1979, 1987b, 1995c; Crumley and Marquardt 1987; Ehrenreich, Crumley, and Levy 1995).

It is not just domestic economies that value the flexibility that diversification brings. Many businesses, small and large, have discovered the merits of heterarchical power relations that place decision-making power on the shop floor as well as in the board room; this recognition of workers' "indigenous knowledge" increases efficiency, employee loyalty, and production (Wheatley 1992). Investment houses counsel diversification of stock portfolios to smooth out market downturns. Omnivorous diet and diverse habitats gave even our early hominid ancestors a competitive advantage in changing conditions.

How can these lessons be applied to the contemporary world? If heterarchical organization and biological and economic diversity are the preferred strategies for managing uncertainty, the question must be, How uncertain are these times?

There are several important sources of uncertainty in the global economy. One is climatic instability, brought on by global warming. It has become clear that a warmer world will increase destructive, regionally and locally specific weather phenomena (hurricanes, floods, droughts, and perhaps even seismic activity) and disrupt seasonal patterns (Davis and Sellers 1994; Gunn, Folan, and Robichaux 1995), making weather in many parts of the world as capricious as that in Burgundy. These events will in turn affect financial markets, insurance, law, agriculture, tourism, and health (World Climate Programme 1997).

Another uncertainty is the very connectedness of global markets. Never in world history have so many economies been tied together. During the recent Asian market crash (fall 1997), U.S. investor confidence in a strong national economy and automatic buy programs stabilized the market. There remains, however, the danger that automatic corrections will not always be able to forestall the effect of investor flight, sending the global economy into free fall.

A third uncertainty is political. Armed conflict and natural disaster do not just threaten regional and national stability; refugees crossing national borders to escape fighting or famine, the threat of pandemic disease, and the international arms market (to name a few) spread the effects of conflict and disaster far beyond their places of origin.

What is sure is that however efficient industrialized agriculture is in the short term, its undervaluation of biological and economic diversity renders it a brittle structure. Agribusiness is everywhere maintained by means of expensive technology (genetic breeding, chemical fertilizers); in Europe, it is engaged in an aggressive campaign to ban traditional seed stocks. In the uncertain times that global warming will bring, global agribusiness, in its present form, will be unable to feed the world's population. No new technology can buy us the time to relearn what tradition—human memory and the memory in the land itself—has to teach.

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