This chapter is about building bridges. All who participate in Asian herbal medicine can—with an open mind—gain understanding from one another and the body of knowledge that each values. I hope you find it thought-provoking and inspiring to reach across the invisible boundaries of language and science. The world is a dynamic place, and so is the rapidly changing realm of herbal medicine.

The essence of the matter is that it does matter how and where the herbs were grown; whether wild-harvested, grown with wild qualities, or as a genetically altered herb in a conventional agricultural operation. The qualities present can be measured organoleptically or by chemical evaluation. There may be an herb industry category of “cut and sifted,” but read on; the matter of herb quality is certainly not cut-and-dried.

**WILD QUALITY**

Most of the herbs used in traditional Asian herbal medicinal systems are still collected from wild stands in China. Why is there a demand for wild-crafted botanicals over cultivated? Herbalists understand that stresses from uneven water, nutrient availability, and insect and herbivore presence all elicit responses in the plants that amplify their medicinal value. Field-grown plants may not undergo such stresses if they are pampered too much, but research shows it is possible to simulate wild conditions in plant responses even in cultivated plants:

Medicinal properties in plants are mainly due to the presence of secondary metabolites which the plants need in their natural environments under particular conditions of stress and competition and which perhaps would not be expressed under monoculture conditions. Active ingredient levels can be much lower in fast growing cultivated stocks, whereas wild populations can be older and due to slow growth rates and other stressors can have higher levels of active ingredients. While it can be presumed that cultivated plants are likely to be somewhat different in their properties from those gathered from their natural habitats, it is also clear that certain values in plants can be deliberately enhanced under controlled conditions of cultivation.

As discussed in chapter 1, the result of long-term wild-collection practices in China is that the very survival of some herbs is threatened. The only way that Chinese herbal medicine will be able to continue into the future, while still maintaining high quality standards, is through the development of sustainable harvesting practices and the cultivation of wild-quality herbs in diverse locations around the world. Therefore, in cultivation, the goal is to attempt to reproduce the conditions found in the natural environment. Growing herbs in as natural a way as possible—with somewhat lean soils, low inputs of fertilizer and amendments, and diversified plantings—is called wild-simulated cultivation. Farmers and gardeners mimic nature by growing plants that are suited to the site or location, with the conviction that plants experience fewer problems when they grow within their comfort zone. It also means that
some stress pressures are allowed. Wild-simulated cultivation has the potential to produce herbs that can be more medicinally effective than conventionally cultivated plant material. Growing herbs with wild simulation takes many forms, and it is a decidedly more hands-off approach—each growing location will have its own parameters; see chapter 3 for more information on these unique techniques.

Another key factor is polyculture, the basis for sound wild simulation. Whether forest-grown, hedgerow-grown, garden-grown, or field-grown, herbs placed in association with other plants experience synergistic environmental effects—aiding in pollination and providing diverse habitats for soil organisms, insects, and other critters.

Polycultural intercropping brings balance by way of diversification: below-ground soil biology and above-ground pollinators and other life forms all work together to enhance the whole system—including the medicinal plants. It contrasts with conventional production growing, which tends to place like species of plants together.

Concerns about Quality of Cultivated Herbs

Botanical prescriptions are traditionally linked with the original growing locations of the herbs. Historically the term *dao di yao cai*, or “authentic region medicinal products,” describes this connection between herbal quality and geographical origin. An example of this would be the best quality of *Schisandra chinensis* (Five flavored fruit, *wu wei zi*), considered to be from Manchuria in northeast China. However, as herbs are coming under cultivation more frequently in China, they are sometimes being farmed in locations and under conditions that differ from their endemic sites, since “as long as the nature of the *dao di* species is known, there is no reason why they cannot be reproduced in agricultural fields.” Growing location alone is no longer a reliable indicator of *dao di* if cultivation techniques produce only the look but not the quality of the supply. Herbs grown according to the industrial model of monocropping—where extensive fertilizers, pesticides, herbicides, or amendments have been applied—generally make for large crop yields but poor-quality medicine. Herbs are not vegetable crops—if grown luxuriously with excessive inputs, they become less potent. This, in part, may be the root of the bias against cultivated herbs—though there is some good wild-quality *Schisandra chinensis* (Five flavored fruit, *wù wèi zǐ*) being grown in the northeastern United States.

Four crops are interplanted in this bed (clockwise from top left): *Withania somnifera* (Ashwagandha), *Salvia miltiorrhiza* (red sage, dān shén), shiny heart-shaped leaves of *Dioscorea opposita* (Chinese yam, shān yáo), and *Codonopsis pilosula* (poor man’s ginseng, dāng shén).
ASSESSING HERB QUALITY

Domestically produced herbs range in quality from very good to very poor, just the same as herbs from Asia. What makes the difference in the quality of an herb? Several areas must be evaluated. The first question to answer is whether the herb in question is authentic: is it in fact what it is labeled, and not either an adulterant (a “fake”) or a substitution (an actual medicinal herb, but not the species labeled)?

Nomenclature issues for medicinal herbs are problematic and continue to be in flux. There are diverse groups of people involved in the different fields of medicinal herbs, and each tends to hold onto their particular well-entrenched lexicon. Using botanical names is the most reliable way to identify specific medicinal plants—because generally there is only one name for a plant; however, it behooves each of us to reach across our particular field of knowledge and engage with other terminologies.

- Botanical names, which are used worldwide, are the most reliable way to reference specific medicinal herbs, but even botanical names occasionally change. For example, Polygonum multiflora (Fo Ti, shòu wū/yè jiao téng) has received the new botanical moniker Fallopia multiflora. Both of these genus names will be used for many years to come.

- Medicinal pinyin names—which are the transliterations of Chinese characters—describe only the processed medicinal herb part itself and do not indicate specific plants; there can be one pinyin name with different regional origins describing different herbal medicines—and referring to different plants as well. One such example is shān cí gū, which can either be an orchid of the Cremastra or Pleione genuses or a different plant with completely different action, Asarum sagittarioïdes. Pinyin medicinal herb names are problematic and unreliable for identification of medicinal plants due to more than one plant having the same name, exclusivity to China, and regional variability within China.

- Pharmaceutical names use some or all of the Latin-based genus and then indicate the part used. For example, Codonopsis Radix: Codonopsis is the genus and Radix indicates root. If used alone the pharmaceutical name may or may not indicate which species; the Codonopsis example is common and does not carry the species name—and is therefore not helpful in referencing a specific plant, of which there are a couple of standard and many more regionally commonly used species.

- Common names tend to be regional and are the least dependable of all. If one considers all the different languages and regional dialects throughout Asia there can easily be more than a dozen common names for just one medicinal plant. Asian herbal medicine is imprecise partly because Asia is vast and has a long history of regionally specific herbal medicine use—even within China itself.

Authenticity alone is not enough to guarantee quality. As herbs become scarcer, their genetic diversity—and thus their efficacy—is limited. In addition, wild herbs are sometimes collected when immature and outside of their traditional harvest times, resulting in unexpected chemical profiles or variable clinical outcomes. Was the herb old enough when harvested to gather enough active compounds to impart to the end user? Was the herb harvested at the correct traditional season (keeping in mind that chemical components change within the life cycles of plants), and was it harvested properly? How fresh is it? Freshness, if nothing else, has a profound effect on herb efficacy. Herbs are dried more for shipping long distances than is the custom for herbs that remain in China. Finally, chemical treatment is common for long distance shipping and preservation; sulfur is the most common treatment used for exported herbs. Sulfur, a frequent allergen, is itself considered a...
Connecting to Oriental Medicine Students

Herbalist Sean Fannin would like to see a whole superstructure of support that would link herb farmers to buyers, processors, practitioners, and finally end users. Focusing on the OM community, Fannin is working to build connections between growers like Peg Schafer and practitioners throughout the United States. “The relationship between herb growers and practitioners is starting to change. Our idea is to have a joining together of the grower, the practitioner, and the patient, so everybody is working together along the same lines—which is of course toward the individual’s health, but also the health of the community and the health of the planet as a whole.”

For OM students, working with living plants and the people who grow them adds an entirely new level to their appreciation of medicinal herbs. This is a crucial part of becoming a good herbalist, says Fannin. “As a student you should be around the herbs at every stage. See them in their living state. See them when they’re harvested. See them when they’re processed.” He says that in tasting fresh herbs, you can get a better understanding of quality: “Not just the flavor but the inherent quality. When you taste it you assimilate it, and you can start to get knowledge of the herb. And you just don’t get that as much from dried herbs. You have to really chew on them!” The more you understand the herb, he adds, the easier it is to know how to apply them.

Farming with the wild is a natural—almost unavoidable—approach if the end goal is superior herbs, adds Fannin. “We look at health within the body and it’s always about living in accordance with nature: having the right movements and the right nourishments. We are a microcosm of what is in nature,” he stresses. Therefore, if the herbs are cultivated in accordance with nature they should have good qi and good taste, the traditional indicators of the function and quality of a Chinese medicinal herb. “And they do,” he concludes.

For those students who don’t have access to an herb farm, Peg Schafer offers a few tips. First, get the book *Herbal Emissaries* by Steven Foster and Yue Chongxi. Then, pick an herb of personal interest and find out the requirements for growing it—“There is a Chinese herb for every location: wet, dry, high elevation, and so on.” There are vines, trees, succulents, garden-worthy perennials, and even incredibly ugly plants to choose from. Finally, start small and grow from there.
functional herb and therefore becomes an unwanted addition to anyone using the herbs. Though it is possible, I cannot verify if bulk herbs receive any treatment upon arrival in U.S. ports. Keep in mind that the distance travelled, country of origin, and the amount of regulatory compliance are all factors when assessing herb quality and supply chain risks.

**Traditional Physical Testing Methods**

Two traditional methods of determining herb quality and potency are through physical tests of macroscopic and organoleptic analysis—i.e., using the senses to identify the characteristic values, flavors, and functions. These methods are ideal for assessing identity and quality. Organoleptic examination of the whole herb by trained herbalists is the basis of the original discovery of Chinese medicines and was further developed into the extensive methodological system that exists today. To apply organoleptics to the equation, we may ask whether an aromatic herb still carries the tastes and aromas specified by the materia medica (authoritative reference books about the therapeutic use of medicinal substances), and thus the called-for function. Can you sense the vital qi, or potency, of the herb?

**Chemical Testing Methods**

In addition to the physical tests of organoleptic methodologies, the scientific approach of laboratory evaluation to determine herbal identity, the presence or lack of expected chemical components, and biological activity—as well as pesticide, heavy metal, and microbiological screening—are becoming commonplace as good manufacturing practices (GMPs) become fully integrated. These techniques are important tools, especially in an evidence-based culture; however, be aware that GMPs do not address nor consider herb effectiveness. Agricultural suppliers are not obligated by regulation to comply; but it is in the interests of growers to assist herb buyers and product makers wherever possible. There are dozens of testing procedures that can be done—including some basic and easy to manage in-house microbiological methods testing for molds, yeasts and total bacteria, *E. coli*, and salmonella. For herb identification, quality, and purity, common tests include microscopy, thin layer chromatography (TLC), high performance liquid chromatography (HPLC), and gas chromatography/mass spectrometry. There are many other tests that can be used as well.

As a small grower, I cannot afford to do lab testing of the herbs I grow as it is very expensive. To my knowledge, larger growers conduct some of the nonchemically oriented tests, such as those for bacteria.

**REGULATING HERBS**

To promote the correct cultivation of herbs, farmers utilize certified organic (or even more stringent) guidelines, along with Good Agricultural Practices (GAPs)—standards of regulations that the Food and Agriculture Organization of the United Nations describes as “addressing environmental, economic and social sustainability for on-farm production and post-production processes resulting in safe and healthy food and non-food agricultural products.” At this time it should be noted that GAPs are new to the United States and China, and are not fully integrated in either country (GAPs are discussed in more detail in chapter 4). In the interim, for quality assurance, the transparency of harvest information and traceability of origin (two GAP criteria) are important safety features that U.S. cultivators should provide to buyers—along with other information, either in the form of a Certificate of Analysis (COA) or an herb specification sheet. A COA is a document that all herb manufacturers and pharmacies should be able to supply to consumers. The information provided varies according to the tests conducted. At minimum the documents should have the genus and species, origin, date and part harvested, and lot number—as well as the date tested, plant part and form of the herbal material, organoleptic and microbiological results, and pesticide as well as heavy metal figures. Identification and qualitative data are sometimes also available.

Growers can offer herb specification sheets to supply descriptive information to customers looking for transparency. Minimum information provided
should be genus and species, origin, plant part and date harvested, and lot number. Occasionally organoleptic characterization as well as microbiological testing information may be available. Botanicals typically change hands many times in the supply chain from distant harvesters/farmers to domestic end users; it should be remembered that the less often this takes place, the fewer quality control issues of transparency and traceability will arise.

The best way to regulate quality and control the purity of agricultural goods is through certified organic grown products. For a farm product to be sold in the United States as certified organic, it must be inspected by a third party agency that abides by the guidelines of the National Organic Program (NOP) and grants certification. Regarding the spirit of organic production, there is room for improvement with the NOP ruling; nonetheless, currently American agricultural goods are widely known to be in much better compliance than Asian products. Heavy metals, pesticide residues, and contamination continue to be problematic with both cultivated and wild-harvested Chinese herbs. For the good of all, this is an issue that hopefully will be resolved as soon as possible, but it can be avoided by purchasing certified organic U.S.-grown botanicals when available.

There are many movements afoot as alternatives to the certified organic status gained by the NOP. A couple of reasons some of them exist are because it is felt that the NOP ruling is not holistic or stringent enough in holding to a higher standard or philosophy; others feel it costs too much money to get or maintain certification. These are valid concerns—every grower must decide for him- or herself. However, use of the wording “certified organic” or “organic” to market products is not allowed unless one is participating in the NOP program.

**Genetically Modified Herbs**

There is also a concern regarding the encroachment of genetically modified organisms (GMOs) currently being developed in China to alter medicinal herbs for subsequent—and unfortunately undisclosed—release into the herbal medicine trade. These bioengineering techniques dictate gene expression, and by default will alter the nature of the herbs. Their (largely pharmaceutical originated) goal is to boost levels of what are currently thought to be the active ingredients. In the process, however, known or unknown therapeutically active compounds will be
changed, simply because transgenic techniques alter basic inherited characteristics. Chinese medicine has an exquisitely refined logic that is centuries old, with an elegant system of relationships between herbs, and the question arises: do we want lab scientists to decide for us what traits are desirable (or undesirable) in our medicines? This is not to malign progress or the scientific community; in fact, the scientific principle of precaution is a good standard to apply to this virtually unknown realm.

The use of GMOs and clonal techniques contrasts sharply with traditional plant breeding and with the effort to maintain genetic stock with wild qualities. Besides the issues of restricting or adding material inputs, an important aspect of protection of wild quality entails purposefully keeping the gene pool diverse. Cultivating and selecting seed from as many plants as possible, therefore allowing for a wide variety of genetic expression (and thus chemical components) to be present, benefits both the herb user and the germplasm. As the herbs develop over generations in the same location, they take on the unique qualities of that place that impart subtle differences as expressed by the dao di yao cai. However, plants are not bound by national borderlines; they are dynamic and ever-changing wherever they grow in this great big world. To illustrate this point, we only need to look at the well-documented example of the cabernet grape, which when grown in Napa or Sonoma County in California will express characteristics that are slightly different from the same grape stock grown in the Bordeaux region of France.

LIKE FINE WINES . . .

So how is it that domestically grown Chinese herbs differ from their Chinese grown or wild-harvested counterparts? They are like many paradigms; the same, but different. There was a time, not long ago, that the French thought that farmers growing wine grapes in California were misguided, and that fine wine was produced only in Europe. It took a few years, but the day came when California wines surprised the old-world viticulture industry by winning international wine competitions. These days, California is a recognized and respected producer in the world of viticulture. Australia, South Africa, South America, and other regions are also coming into play with some distinguished high quality wines of their own. There is no reason why Chinese herbs grown outside of China cannot achieve the same level of success.

Every region and indeed every farm location has its own particular combination of air, soil composition, water, and other unique components. These qualities are expressed in the character of each harvested herb. For example, one herb that responds well to the inherent conditions at the Chinese Medicinal Herb Farm is Salvia miltiorrhiza (red sage, dān shēn). An analysis using high performance thin layer chromatography (HPTLC) compared some herb-specific common marker chemical profiles of root samples from my farm and several other sources. The report that accompanied the analysis concludes that “Danshen (Salvia miltiorrhiza) can be successfully grown outside of China with organic agricultural methods. The harvested roots appear to have high levels of known bioactive compounds. This has positive implications for the environment, both in the reduction of pesticide and synthetic fertilizer usage, and in reducing pressure on Chinese agricultural land due to increased demand for Chinese herbs worldwide.” It continues:

In the HPTLC analysis, Lanes 9 and 10 represent samples of Dān Shēn roots.
obtained from the Chinese Medicinal Herb Farm in Petaluma, California. They were grown with certified organic agricultural methods. Lane 9 represents roots harvested in 2007, and Lane 10 represents dried roots harvested in 2006. It can be seen that the bands representing the bioactive tanshinones and salvianolic acid are qualitatively similar to and quantitatively more dense than the samples collected from various herb suppliers (Lanes 3–8, 11–14). This indicates that the Dān Shēn roots grown locally with organic methods met or exceeded the quality of Dān Shēn roots purchased from typical suppliers of Chinese herbs. The sample from the most recent harvest showed the highest level of bioactive compounds, possibly due to its freshness, demonstrating another advantage of growing herbs locally. Future studies should use a larger number of domestic samples, and attempts should be made to acquire Chinese sample material from the most recent harvest.

<table>
<thead>
<tr>
<th>Lane #</th>
<th>Component</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane 1</td>
<td>Tanshinone I, tanshinone IIA (with increasing Rf)</td>
<td>Table product (expired 2011)</td>
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<tr>
<td>Lane 2</td>
<td>Dihydrotanshinone, cryptotanshinone (with increasing Rf)</td>
<td>Table product (expired 2011)</td>
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<tr>
<td>Lane 3</td>
<td>Salvia miltiorrhiza root</td>
<td>Tablet product (expired 2011)</td>
</tr>
<tr>
<td>Lane 4</td>
<td>Salvia miltiorrhiza root</td>
<td>Hong Kong herb market, 2002</td>
</tr>
<tr>
<td>Lane 5</td>
<td>Salvia miltiorrhiza root</td>
<td>Taiwan herb market, 2003</td>
</tr>
<tr>
<td>Lane 6</td>
<td>Salvia miltiorrhiza root</td>
<td>San Francisco Chinatown market, 2005</td>
</tr>
<tr>
<td>Lane 7</td>
<td>Salvia miltiorrhiza root</td>
<td>San Francisco Chinatown market, 2005</td>
</tr>
<tr>
<td>Lane 8</td>
<td>Salvia miltiorrhiza root</td>
<td>San Francisco Chinatown market, 2006</td>
</tr>
<tr>
<td>Lane 9</td>
<td>Salvia miltiorrhiza root</td>
<td>Freshly harvested and dried specimen from organic herb farm in Petaluma, California, 2007</td>
</tr>
<tr>
<td>Lane 10</td>
<td>Salvia miltiorrhiza root</td>
<td>Dried sample from organic herb farm in Petaluma, California, 2006</td>
</tr>
<tr>
<td>Lane 11</td>
<td>Salviae miltiorrhizae radix</td>
<td>Sample from analytical lab; source unknown</td>
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<td>Lane 12</td>
<td>Salviae miltiorrhizae radix</td>
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<td>Salviae miltiorrhizae radix</td>
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<td>Salvia miltiorrhiza Bunge</td>
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<td>Rutin, hyperoside</td>
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