

EINKORN TALKING, JUNE



Hello from your Einkorn.

Approaching the Northern solstice, the field at Lentz Spelt Farms senses its completion. Across the Columbia Plateau the stands of cereal grain are finishing their growing, it's all about the kernels now, the seed. Still sun-dependently green, the Farro grain heads bend earthward, whereas wheat heads remain straight up, mostly.

Any little breeze turns the farmscape into motion, the crops, now at their most pliant, respond with an undulation, breathing in that wind, ahhh, breathing out, exhaling with a bow and sigh.

For the ancients the tall grass ripple confirmed the living spirit of their stands of grain, spirit having long been associated with breath. And, by observation they knew change in their grass, they saw it alter its traits from place to place, from season to season, further proof that the Einkorn stands had spirit, essence.

From animist realization to the blessing of gods, then God, the Farro grains and their offspring wheats retained each their changeable land race character. Think of genotypes alive.

Until, of course, industrialization came along and would brook no variability. In the second part of the 1800s the first breeding of wheats occurred, and by mid-20th century industry had its soldierly wheats in stands short, straight, uniform.

Which uniformity is maintained by an extensive system of keeping the genetics in line. First though, USDA Wheat Quality Labs test the many new lines out of breeding programs at universities every year; in effect, the USDA acts as gateway for new varieties, assuring that new cultivars meet quality standards. Quality in terms of functionality, that is, including such aspects as gluten strength, flour yield, loaf volume, crumb structure. Not including, however, such niceties as mineral, vitamin and antioxidant content. Nor are grain aroma and flavor

included in the USDA quality testing of the last 60-plus years. There seemed to be no need for it, in view of the wheat industry's main customer, the white bread industry. If you're milling away bran and germ anyway, why bother about taste and nutrition? You can always "fortify" the stuff later, and for flavor use additives starting with sugar and salt. Just so long as all-purpose flour performs exactly the same year after year...

Once a new wheat variety is released to the growers, it's expected that they raise their wheats from certified seed. Seed certification programs are run by the quasi-governmental crop improvement organizations. The Washington State Crop Improvement Association – the WSCIA at Pullman – has a penchant for hiring ag teachers to do their field inspections. In June these inspectors zig-zag through the seed wheat fields, looking for weeds whose seed shouldn't contaminate the wheat seed, and they also keep an eye out for off-type wheat plants.

The seed wheat farmer then receives a document stating his field purity. If noxious weeds were found, those need to be rouged before harvest; the same goes for other types of cereal grain present in the field.

After harvest the seed crop gets trucked to a seed conditioning plant. When the grain's cleaned, a sample is sent to the Washington Department of Agriculture Seed Lab in Yakima. Once again the tests are for purity, in addition to germination tests. The seed lots that pass muster then receive from the WSCIA certification tags which are sewn on the seed grain bags.

Five classes of seed certification are established. First comes Breeder seed; this is raised in plots where each plant is inspected for uniformity. From Breeder seed Foundation Class seed is raised in small fields; from Foundation seed Registered Class seed is grown on larger fields; lastly, from Registered seed Certified Class seed wheat is produced in large enough quantities to supply the growers who then raise Common Class wheat, that is, commercial fields.

This seed purity system is mostly adhered to, although it's not enforceable. When growers save their own seed for planting, outside the seed certification system, the seed companies speak of "brown bagging."

In the last two decades the Plant Variety Protection (PVP) Act of 1980 is changing the seed industry. Fewer public varieties are released because university breeders as well as private firms want to cash in on their seed development and prevent any "brown bagging" by law. And guess what – the big farm chemical corporations have been buying up seed companies left and right.

If the incessant wheat breeding – crossing and re-crossing to no end – had its suspect aspects (that we will discuss further on in this newsletter), today the wheat industry relies on mutagenetic technology to a large extent.

Mutagenetic varieties are not genetically modified (GMO) cultivars but have the same trait as Roundup-Ready GMO varieties in that a grower can spray his field with broad-spectrum herbicide without harming his crop plants. Chemical farming was long able to deal with broad-leaf weeds in grain crops, thanks to broad-leaf-specific herbicides. But a major problem in

wheat fields of many regions is a weed that's a grass species just as wheat is, namely jointed goat grass, *Aegilops cylindrica*, a relative of wheat in fact.

According to the National Jointed Goat grass Research Program, funded through the USDA beginning in 1994, "winter wheat and jointed goat grass have parallel growth habits; they possess similar temperature optimums, photosynthetic maximums, and growth rates."

Washington State University weed scientist Joe Yenish explained in 2008 that goat grass and bread wheat cross in the field and produce hybrids, "wherever the two species coexist." The first generation of such hybrids is mostly infertile, due to the discrepancy in chromosome numbers of the two parent species – jointed goat grass is a tetraploid with four sets of chromosomes, bread wheat is a hexaploid with six sets. The hybrids – "vigorous plants with many tillers" - have five sets of seven chromosomes. The second generation of hybrids, however, displays increased female fertility and partial restoration of male fertility, i.e., viable pollen, Yenish noted. After a few generations, goat grass hybrids revert back to tetraploids, although they now contain some traits of the wheat with which they hybridized, he said.

A messy situation, right. Enter BASF, the German chemical producer of World War fame. To arrive at a solution to the goat grass problem BASF resorted to mutagenesis; in general, mutagenesis is achieved by exposing a crop plant to either irradiation or to extreme dosages of chemical, until a mutation is forced. In this case an herbicide was effective in introducing herbicide resistance to a French wheat named Fidel. Now you could grow Fidel and douse your field with the BASF herbicide marketed as Beyond, killing goat grass without affecting the wheat. Clearfield was chosen for the brand name of the mutagenes.

American wheat breeders received the trait from BASF in the mid-1990s, said Jim Peterson, wheat breeder at Oregon State University, Corvallis. Whereas new varieties are usually released after 10 to 12 years of breeding work, with Clearfield wheats the process was shortened to seven years.

The first OSU Clearfield variety was a cross using Stevens genetics, Stevens being a soft white winter wheat widely grown in the higher rainfall areas of the Inland Northwest, Peterson said. This cross was designated ORCF 101. It was followed by ORCF 102 which has Madsen characteristics suited for medium rainfall growing areas. Next ORCF 103 was released, an Eltan offspring adapted to low-rainfall regions. And so on.

"Oregon State University owns the varieties," Peterson explained. They're licensed to 26 regional seed companies who pay royalties to OSU and increase the seed from Foundation Class to Certified Class.

Growers who want to purchase certified Clearfield seed must sign a stewardship agreement. "In part, by that agreement the grower is legally bound to certain stipulations such as not back-planting the crop; the other part is a strong recommendation on how to use the technology so the loss of the technology (by weeds acquiring herbicide resistance) is minimized. The BASF people worked hard to communicate all the issues to the growers," Peterson said.

How about a wager? Bet you that when you ask your baker about Clearfield wheat, he/she won't know a thing about it. And yet, odds are that (unless your baker uses organic grains) he/she is using the mutagenetic wheat: in 2007 already, 30 million pounds of Clearfield wheat seed were sold for planting in Oregon and Washington, according to Peterson.

How the shift to corporate control over our food has speeded up! And we can't say we weren't warned: in January 1961, President (and former general) Dwight Eisenhower heaped suspicion on the military-industrial complex in his farewell speech. His warning did not specify wheat but addressed the unholy conglomeration of power over infrastructure in general, in the wake of industrial war. How did wheat come into it? By gargantuan mounds of nitrate stockpiled for munitions originally, and when the Second World War ended "ingeniously" pushed on farmers as synthetic fertilizer.

It was mid-century of the age of chemistry. The whole western world had gone gaga over the multitude of new formulations – plastics, wonder medicines, textiles, wondrous DDT – that promised to make the world a better place. Science was still trusted, mostly, and from the universities the farmers heard nothing but good about chemical farming. And look, yields more than doubled in some crops.

If there was a catch it was "lodging:" the old wheats were almost as tall as the Farro grains, and under the chemical regime the stands went down, the wheat stalks toppling earthward unbalanced. Industry decided to force wheat to adapt to chemicals without lodging.

At this point, Nelson Rockefeller together with the Mexican government had established the International Maize and Wheat Improvement Center east of Mexico City, CIMMYT for short by its Spanish acronym. Ostentatiously, the aim of CIMMYT was to have a "Green Revolution" to ease world hunger. Ulterior motives? Few suspicions rose against the waves of industrial giddiness.

Norman Borlaug, trained at the University of Minnesota, solved the lodging problem by dwarfing wheat at CIMMYT. Orville Vogel of Washington State University, Pullman had a hand in it; Vogel had passed germ-plasm of a dwarf wheat from Japan to Borlaug; soon university breeders everywhere were crossing and re-crossing wheats to shorten their stem. Breeders were hailed as agricultural heroes – Borlaug was awarded the Nobel prize in 1970 –, yet the realization grew that the industrialized dwarf wheats so integral to chemical farming systems were but a broken Staff of Life. One aspect, for example, is that when you dwarf a plant its root mass is reduced – less root, less uptake of soil nutrients, hence less nutrition in the seed. It took the American wheat industry a half century to acknowledge as much.

So what about the industry claim that the Green Revolution saved countless lives in Third-World countries?

We spoke with Lloyd Gudgeon who as rural development consultant spent time in places like Bangladesh. These days Gudgeon lives with his family near Gairloch on the west coast of Scotland. On the way to his house we walk by pasture where Highland cattle graze, instead of the modern, genetically-ballooned cows more commonly seen, even in Scotland. "This beef is

judged the best by chefs in every single taste test,” Gudgeon says of the Highland breed, but adds that farmers who raise the big-boned commercial cattle are the ones who stand a chance at profit, such the industrial slant. In so many cases, idealism is the driver for raising old breeds, Gudgeon reflects: “It comes down to how much income you’d be happy with, would you want to live on, say, £500 a month?”

Bangladesh: Gudgeon grew up in England and studied agriculture, then went to Borneo to specialize in tropical agriculture, returning to England to earn his Masters. “I wanted to go to far-away places,” he remarks. And to far-flung countries his degree transported him, to Thailand, Nepal, Sri Lanka, Vietnam, China, even a short project in Mozambique. Most of his Third-World rural development work he did in Bangladesh, a small country almost entirely surrounded by India, with over 156,000,000 people living in the Ganges River delta. Gudgeon was to train extension agents for the department of agriculture. He was employed by the British Overseas Development Administration (that had grown out of the Colonial Office, and has since metamorphosed into the Department for International Development); their 1980s Bangladesh project was managed under the auspices of the United Nations.

In looking back, Gudgeon seems to feel ambiguous about Green Revolution crop genes, Green Revolution farm chemicals, Green Revolution economy-of-scale that were thrust onto rural Bangladesh. Yes, there was great success in improving grain quantities, he says. “There is absolutely no doubt that the Green Revolution really bulked up food production, although, all that bulking up was carbohydrates.”

Bangladesh culture changed forever. “In the 1970s and 1980s there were thousands of extension staff, it was a way to put a government man in the middle of almost every village. They weren’t all agronomists, there were also ag engineers and ag economists,” Gudgeon says.

The ill effects of the Green Revolution in Bangladesh were enormous: “The damage to the social structure happened on different levels. Women were the most affected because the Green Revolution put agriculture into the hands of the men. And, it monetized agriculture, once they grew the Green Revolution crop varieties they needed money to buy fertilizer and chemicals. You don’t get those things in a barter system.”

Gudgeon has come to view the Green Revolution as “part of a series of trends.” In England the monetizing of farming goes back to the period historians call the *Enclosures*. “This happened mostly in the 16th and 17th centuries. Before then farmland was held in common, but in the 1500s the king had greater and greater ambitions that cost more and more money. When the king made war, someone who killed someone important (among the enemy) was rewarded with land – that’s how we got our aristocracy. Once the farmland was no longer common, there was rent to be paid, people were taxed.”

A similar scenario played out in Scotland in the 18th and 19th centuries, when the crofters were removed from the land during the *Clearances* to make room for sheep, Gudgeon says.

Trends to consolidate landholdings are repeated everywhere,” he notes. “I don’t see the Green Revolution as good or as bad. It happened, and it had good and bad consequences,” Gudgeon sums up.

The long run, now that we have that perspective, shows that the Green Revolution did not solve world hunger issues. If mid-20th century experienced a food crisis, today that’s double-edged malnutrition, Gudgeon points out. “Over here millions of people suffer from malnutrition because they eat too much, over there millions of people are malnourished because they have too little food. It’s plain stupid. We have to sort it out.

“Not production but distribution is the problem, and not just with food. Name me one disease that’s not treatable, curable, or preventable – there isn’t one, yet people still die of malaria, cholera, and other diseases. Why don’t we distribute sufficient medicines? Because we (the rich countries) don’t want to, it’s as simple as that.”

Yet even with a call for an enlightened sense of sharing, one plain fact remains – the Green Revolution fueled population increases.

The Green Revolution was an advanced phase of industrialization that robbed us of over 75 percent of traditional food crops, by some accounts. If you were to include land races, the percentage would probably be a lot higher. This means that even as we’re exposed to a stupendous supply of commercial food, of which a goodly portion ends up in the trash, our lives are impoverished in terms of natural diversity in our farmscapes and on our dinner tables.

The fast food trend rides herd, that’s for sure, at McDonalds you can eat the same crap in Peking as in London as in Nürnberg or Seattle. Ah, but Rome is different! Not that there aren’t fast food places, there are, but it was here that a major backlash against McDonalds et al was unleashed in the 1980s. The young protesters didn’t take long to invent their own motto – Slow Food.



Today the Slow Food organization counts over 100,000 members in more than 160 countries. And one of the most powerful antidotes to McDonalds is the Slow Food Show at the Stuttgart Messe in Germany’s Baden-Württemberg. You walk into two enormous halls teeming with visitors – over 80,000 in just four days. Some 470 stalls line the aisles in the middle of which a white-cloth-covered table stretches the whole length of the hall. The

foods on offer are an amazing kaleidoscope of regional traditions, exquisite mustards of the

Saarland, mare's milk from northern Germany, the whole palette of cheeses of Switzerland, a grand variety of honey from Franconia, Italian olive products galore, Einkorn breads from Swabia, and, this being Germany, beer, beer, beer, beer from every corner of the land. Ever hear of herb beer? Now you have. You can sample fine wines, savory sausage, thistle oil, rare pears, heirloom pumpkin seeds, precious pasta, piquant gherkins...

The exclusion of corporate food industries was glaringly obvious, this food show a stopper to homogenized eating, a celebration of fine taste in an absolutely astonishing diversity mostly organic. And you know what, not nostalgia for yesteryears' foods prevailed but a sense that out of old traditions arises the culinary future of regions – the chefs, all those chefs, don't come across as wardens of the bygone but gastronomic magicians of today and tomorrow, steering to renewed diversity while stirring soufflé.

"For good, clean, fair food!" is the Slow Food Deutschland motto this year: "If you sow utopia you will reap reality," Slow Food founder Carlo Petrini is quoted in one of the hand-outs at Stuttgart.



One arm of Slow Food, in a wordplay on old Noah, is the Ark of Good Taste. Organized in 1996, this Ark comes to the rescue of foods on the verge of disappearance, explains project leader Veronica Veneziano. She hails from Italy but currently works as project coordinator out of the Berlin office of the organization; at the Stuttgart show she's busy networking at the central Slow Food booth.

In high school, she relates, she was drawn to the Slow Food movement because their message encapsulates her own personal core beliefs. "Slow Food combines two things that are important to me, food culture as a matter of pleasure and responsibility," she puts it. "Food is not just fuel for the body. I'm a city girl, but even though, when I was growing up, the meals in my family were spontaneous and everyone cared about the places where the food came from, not in an academic sense, but instinctively."

The Slow Food Ark now has over 1100 "passengers" in 69 countries, 35 "passengers" in Germany, Veneziano says. "It's a

biodiversity project. The existence of plant varieties and livestock breeds is at stake, and so is their characteristic taste. All of these Ark 'passengers' have historical importance in their region. One criteria is that the product is available for purchase."

A Swabian “squarehead wheat” is an example of an Ark passenger; it stems from the 1880s when the original *Schwabenkorn*, that is, Spelt, was crossed with a hard wheat. “It’s a bridge between the earlier era of Spelt cultivation and the modern era of highly-bred wheats,” the brochure states. Discovered by a professor in a gene bank in 2008, the squarehead wheat was propagated from a handful kernels with the support from a bakery. In 2012 about four tons were harvested: “Spelt has outstanding baking qualities, the squarehead wheat combines those qualities with higher yields.”

The Ramelsloher Blue Leg chicken is another example. Widely raised between 1880 and 1920 near Hamburg, it was traditionally kept as *Stubenküken* – “room chick” – inside the house during winter, nesting in an especially designed piece of furniture, a long chest called a “chicken bench.” Among traditional breeds the Ramelsloher Blue Leg is rated as “extremely threatened” with extinction. In 2009 the breed numbered about 500 birds.

Some old breeds come close to vanishing more than once, for instance the “Angler Sattelschwein.” An early-1900s cross of the Schleswig-Holstein marsh hog and the Essex, England saddleback breed, the breed was outlawed by the Third Reich in 1934. At that point 5200 of the breed were still being raised in Angeln. In the 1960s a second decline occurred because the breed is slower growing, and its fat-to-meat ratio less desirable, than the industrial standards of the time. In 1991 a mere 10 Angler Sattelschweine could be found in Schleswig-Holstein; a grower association in conjunction with state government turned things around by establishing a genetic reserve. Today the Angler Sattelschwein is considered a superior breed for several aspects, including its large litters, outstanding mothering instincts, and its better than average use of fodder for growth that makes it particularly suitable for organic production. And, the meat tastes better than that of industrial breeds, so everyone seems to agree.

What Ark passenger foods, and also many other heirloom food products have in common, is their higher cost compared to the depressed prices achieved by mass production of streamlined corporate agriculture, Veneziano allows. “Quality needs to be paid for; old varieties and breeds cost more to raise, and there is a higher risk for the farmer. We use communication as a marketing tool – we publish articles and put on food shows like this. We also connect with farmers through our local groups – they’re called *Convivia* –, they organize farm visits, tastings, workshops. In Italy we work with an alliance of chefs, they’re sort of our ambassadors in local economies.”

Politically, though, the outlook for biodiversity is not good up on top. “On the European Union level there is too little support for small and organic agriculture,” Veneziano says. In fact, there is growing unease among German foodies over EU discussions on *Gentechnik*, GMOs, that is. Whereas GMOs are fiercely opposed across the political spectrum in Germany, corporate pressure on the EU in Brussels might lead to a forcible entry of GMOs, it is feared. Already, by an EU political ploy, Monsanto attempted to derail the German *Reinheitsgebot*, the “purity law” of 1516 when rules were established for brewing beer; good for us that Monsanto did not prevail.

Resistance against corporate control of our food is growing in many shades and colors of agitation for a more sane agriculture. “Last summer there was a huge march from Munich to Brussels, ‘The Good Food March’ in support of sustainable agriculture,” Veneziano notes. “And 25,000 people showed support for sustainable farming at the ‘*Wir habens satt!*’ (We’re fed up!) event in January in Berlin. It was organized by *Meine Landwirtschaft* (My Agriculture), a network of 40 German organizations promoting a better European agriculture policy. People came from all over Germany, but it surprised me how many Berliner took part. Berlin is a poor city, yet there is much interest in local, sustainable and fair foods.”

As we’re talking, hundreds and hundreds of foodies stream by the Slow Food booth, young and old. In the aisles it’s more of a shuffle and a milling than a stroll, so dense is the crowd. “Organic agriculture will grow,” Veneziano says with a confident smile.

Let’s take a look – how does a land race disappeared by industrialization happen to experience its resurgence?

The irony is that the same industrialized agriculture monolith that stole biodiversity, needs precisely that biodiversity in order to function. To be exact: biodiversity reduced to a million envelopes carefully filed in drawers in government buildings of many countries, in effect a global system of germ-plasm depositories.

We travel to one of those gene banks, the USDA-Agricultural Research Service National Small Grains Collection in Aberdeen, Idaho. Harold Bockelman is the head scientist here, curator of over 50,000 wheats including wild wheats, but not counting the barley, oat, triticale, rye and rice germ-plasm of the collection.

The U.S. government’s interest in crop seed goes back to the inception of the Plant Import Inventory in 1898, Bockelman tells us. “At that point they were simply looking at what was being grown.”

He points to shelves in his office that hold long rows of old, old books, the tome on the left being the Inventory’s first volume. Its Number One entry is *Brassica oleracea*, a cabbage.

“The Inventory is a very valuable reference even today,” Bockelman comments. Of course it’s been scanned to computer files. Over 660,000 plant varieties and genotypes are currently listed.

In the Inventory a wheat is assigned its PI number, “its primary identifier.” A second code is the Cereal Investigation (CI) number, Bockelman explains. “The classification describes the plant, if it’s a bread wheat or a durum, if it’s a winter or a spring type, how tall it grows and what color the spikelets are, what color the seed is, and how it reacts to disease. The name of the variety is noted, as well as its place of origin, the GPS coordinates of where it was collected.”

Ah, so it starts with collectors, sleuths after ancient plant sorts. Are we getting into the realm of Indiana Jones? In a way, actually, yes. Very old graveyards are sought out, graveyards from

the conquistadores' followers and their descendants, graveyards where violent bones lie – the New World for ages but a cauldron of native suppression. Among graves sunken, destitute, forgotten, haunted beneath centuries of rotted overgrowth or storm-blown sand – grow stalks of old wheat.

Why are they there?

Christian custom was to plant wheat on graves. According to a German man of the cloth, the tradition is rooted in the gospel of John wherein Jesus compares himself to a wheat seed. John 12, verse 24: "Verily, verily I say unto you, except a corn (kernel) of wheat fall into the ground and die, it abideth alone; but if it die (in the sense of sacrifice, as in the sacrifice of Christ), it bringeth forth much fruit." Thus the Scofield Reference Bible.

(One might wonder if Jesus really said "wheat," reasoning that he probably said "Emmer" because Emmer was the most important grain for the old Israelites; or, "Spelt" because the Romans were spreading those crop genes around at this time.)

Most old-wheats collecting of course took place on the edge of farming in the Old World. Industrialization had forced focus on high-yield wheats even in its early phases, so the likely locations to find ancient cultivars was, and is, where farmers stood by old traditions and kept planting the land race of their forefathers, away from the main growing areas. Picture then the collectors most definitely not as gumshoes but wearing sturdy hiking boots.

Farro grain land races for the collection were often found in marginal growing areas, because Einkorn, Emmer and Spelt are capable of producing good grain where wheats fail. Switzerland's high-elevation farms are a typical example of this.

Seed purity can pose challenges on the receiving end, Bockelman remarks, given the history of farmers saving their own seed, not a genetically very precise method. "When land race varieties are collected in a farmer's field, or in a grain bin, or at the village market, we simply expect mixtures. Especially wheats from Turkey are often a mixture of durum and bread wheat; for us it's a constant chore trying to separate them," he notes.

To track the hard red wheats – currently the lion's share of global wheat cultivars – researchers look in Iran. In the office of USDA-ARS scientists who try to fathom why the hard red wheat mutation survived, hangs a map of Iran studded with pins each representing a collected land race, an "accession."

And then there are the wild wheats. Undoubtably that puts our plant sleuth behind the wheel of Land Rover or Jeep. Of the thousands of wild wheats found, so far not a single hexaploid has been located, indication that Spelt and bread wheat were among the first selections farmers made after nature had offered up new crosses of Emmer and goat grass.

The hunt for wheats continues. In 2006 another wild strain of Einkorn was found in the Karaca Dag range of Turkey. Significant here is perhaps that the find was reported in the German Spiegel (a publication similar to Time and Newsweek). It wasn't just that the specimen was a

great addition to germ-plasm collections, but also that the find confirmed the place of origin of the very first *Triticum*. That the popular press took heed shows how strong the general interest is in the story of wheat.

But is wild Einkorn really a *Triticum*? Bockelman says that there is consensus that Einkorn is the A genome of modern wheat (AABBDD), however, the literature lists it sometimes as *Triticum monoccocum*, other times as *Aegilopoides boeiticum*. “The taxonomists don’t all agree.”

For Bockelman wild wheats pose special difficulty because their seed drops to the ground as soon as it matures, to “shatter” is the term. “That’s the big difference to domesticated wheats, those don’t shatter,” he says. “Our greenhouses look wild and weedy when we grow out wild wheats.”

The initial reason for establishing germ-plasm collections was to have as much genetic diversity as possible for the plant breeding that escalated in the early 20th century, and intensified during and after the Green Revolution. Consequently, a large percentage of the wheats over which Bockelman watches are cultivars out of wheat breeding programs governmental and private.

Besides providing plant breeding material, gene banks have an equally if not more important function in saving the world from quick starvation. For all the grand efficiencies of a globalized wheat industry, the vulnerabilities of colossal monoculture are frightening. The ever-present threat: the increasing ability of micro-organisms to mutate so that they can overwhelm a crop plant’s defenses. Against the menace of a newly evolved pathogen, biodiversity comes to the fore: gene banks distribute germ-plasm to plant breeders who test accessions and wild wheats for resistance to the new disease. Once they find a candidate, they cross it with industrial wheats, transferring the disease resistance.

The last major outbreak of a new pathogen – a mutated fungal strain of wheat rust – occurred in Uganda in 1999; how the world’s wheat scientists dealt with “Ug99” is well described in Susan Dworkin’s “The Viking in the Wheat Field” © 2009 (Harold Bockelman is mentioned on several pages; some of the Ug99-resistant wheats came from Aberdeen). Consider that wheat consumption currently adds up to almost a quarter of humanity’s calories, and then picture how quickly a pathogen can travel along global trade routes – Ug99 had made the jump to Pakistan within a couple of years –, and the severity of the threat becomes obvious.

Dworkin puts Ug99 into perspective by tracing some of the history of, and personalities at, the International Maize and Wheat Improvement Center in Mexico where the world’s largest wheat collection is held, altogether 73,559 accessions.

The Green Revolution out of CIMMYT punched its way to enormous success: by 1997 almost 90 percent of wheat in developing nations “... had been imbued with CIMMYT genes,” according to Dworkin.

The for-the-public-benefit focus of wheat breeding began to change in 1980 when the U.S. Supreme Court ruled in favor of the patenting of life forms (confirming the PVP Act). This led to biotech corporations committing “biopiracy,” in that genetic materials collected in Third-World countries were now patented in genetic variations for corporate profiting, Dworkin points out.

In 1998 Marilyn Warburton joined plant forensics at CIMMYT; trained as molecular geneticist, Warburton promoted biotechnology at the Center, Dworkin explains. She elaborated that when a scientist finds an advantageous gene, he/she inserts a marker – “for example, an antibiotic” – that will bond with the gene and travel along with it and announce its presence. “And that is called genetic modification,” Dworkin quotes Warburton.

Such molecular markers are actually only on the periphery of the ongoing controversy over GMO wheat. Genetic modification along the lines of Roundup-Ready corn, soybeans, canola, cotton is in the works for wheat as well. “There are now 282 million acres of GM(O) crops,” Dworkin notes. “After ostensibly leaving the wheat market in 2004, Monsanto returned only five years later with its purchase of WestBred, a Montana wheat germ-plasm company.” Dworkin also names Syngenta, Dow, and BASF in the race for the first commercial GMO wheat.

In conclusion, Dworkin wonders if the opponents of genetic modification turn out to be right and a catastrophe will arise from GMO proliferation, or, if GMO advocates will persevere but the resulting extreme of monoculture will lead to unforeseen problems. “The gene banks alone insure us against either eventuality,” she sums up. “If the seeds disappear, so could your food. So could you.”

Bockelman, whose workplace is all but surrounded by fields of GMO maize and GMO sugar beets, certainly is affected by the GMO trend. For one, he says his perspective on the world of wheats has narrowed: “I don’t get to see private varieties, not until their patent will run out, anyway.”

Ultimately, biotechnology could render gene banks irrelevant, he remarks. “Between now six biotech companies, there is so much money invested in wheat at this point that in the next few years something is going to happen (GMO-wise). The world of molecular genetics is changing fast. Still, seed banks will be around for a long time, although, maybe eventually they will become obsolete.”

Meanwhile we’ve all heard of the Norwegian island of Svalbard. “The Nordgen seed bank is located there, inside a mountain in the arctic,” Bockelman says, noting that he has sent quite a bit of germ-plasm there. Often referred to as “Doomsday Vault,” Nordgen is an international effort to assure crop seed survival in case of asteroid strike or nuclear war or unchecked global warming or... The facility opened in February 2008.

Nordgen is certainly justifiable, Bockelman remarks: seed banks have been prone to destruction ever since the first one was founded about 6750 B.C. between the Tigris and Euphrates. Seed banks are lost to nature’s tempests – earthquakes, cyclones –, and they can suffer damage during wars and civil unrest. “A couple of years ago, during the riots in Egypt, a gene bank was looted.”

Risk to their collected germ-plasm was a consideration for the USDA when it decided to disperse its collections from Beltsville, Maryland where they had been formally established in 1948. The decision to locate their small grains collection at Aberdeen was partly for practical and partly for political reasons, Bockelman says. “The history here goes back to 1915 to 1920 when the University of Idaho established an experiment station for irrigation systems. At that point the USDA had all their scientists based in Washington, D.C., although some of them came here in the summer season to conduct experiments with oats, barley, and wheat. In the environment here – desert with irrigation – small grains grow well, there are few diseases.”

Bockelman started work at the Aberdeen facility a year before the germ-plasm arrived from Beltsville in 1988. “There were three or four semi-truck loads, they were refrigerated trucks that came over a period of a few weeks,” he recalls. “The seed is kept in manila envelopes, in de-humidified refrigerated storage.”

An essential task of gene banks is to evaluate germination. “We do that constantly. Based on seed supply, we refresh our wheat germ-plasm every 15 years, our barley and oats every 20 years.” Bockelman works with a staff of six.

Stories of grain from archeological sites such as the pyramids still sprouting are a myth. “That’s just not possible. If conditions have been consistently dry and there were no insects, grain will stay intact for centuries, but it won’t make germ.”

If you think that a long career with small grains would pale a man’s interest in cereals, you couldn’t be more wrong. “It’s amazing what these plants will do to you,” Bockelman says in the context of land race identification. “There are still undetermined species that are mysteries.”

Bockelman also likes the human diversity to which his work connects him. “I have contacts with all kinds of people.” On one hand he fills requests for germ-plasm from biotech corporations, on the other he sends grams of ancestral seed to small farms, sometimes very small farms, who’re riding the buy-local, organic, heirloom trend of high-end specialty markets. In New England a project is underway to bring back small-scale wheat production as it existed a century ago, he says. Closer by, Steven Jones at Washington State University, Mount Vernon is working on wheats appropriate for wet Western Washington, and in that context is also resorting to heirloom varieties that long ago were local.

And Bockelman observed the resurgence of Farro grains. In fact, a lot of the Emmer Farro now sold in Seattle and Portland is an ancient Balkan strain that Montana State University obtained from Aberdeen, and after tedious selection and years of seed increase released as public variety Lucille. And the Einkorn of which Lentz Spelt Farms raised plots of seed increase, and later introduced as the first commercially viable Einkorn crop in America, the original grams of that seed also came from Aberdeen.

Yet another specialty market trend that originates with landrace comebacks are pigmented grains. Bockelman notes that blue, purple and black hulless barley varieties are part of the collection, as well as pigmented durums. But: “I know of no pigmented bread wheat land races.”

As we bid Bockelman good bye, we notice a boulder prominently placed by the walkway to the front door.

The inscription is a poem.



To explore the seed savers spectrum on the end opposite of big-government germ-plasm, we zoom along the Autobahn to Hesse, Germany. Off the freeway our directions take us along ever smaller rural roads. At several places we're cautioned: toad crossing! (Not a joke, you're really supposed to look out for the critters.)

In a little valley the village of Arenborn. In a stately old farm house, Ludwig Watschong. In the kitchen, coffee. In a few minutes we think of Watschong as Mister *Vielfalt* – “many folds,” i.e., “diversity” –, so often does he peruse the term.

The company he raises seed for is Dreschflegel (*Dreschflegel* means “threshing flail,” conveying the image of yesteryear’s manual agriculture).

“I’m a gardener, not a farmer,” Watschong says. “I grow out stock seed on three tracts, each about 1000 square meters” (three quarters of an acre altogether). He propagates about 80 heirloom varieties.



Watschong took a rather circuitous route to his professional passion. Schooling is a huge deal in Germany, not just on the college level but in everyday occupations from carpenter to brewer to supermarket checker. A young person not college-bound must succumb to three years of an apprenticeship-cum-vocational-school program, and of all things, Watschong chose chemistry. “The first year I learned how chemicals react, working with various materials like wood and glass.” The second year he spent in production, and the third year he worked in a corporation’s factory that manufactures chemical dye.

This schooling taught Watschong alright: “It got to me how dirty, how poisonous, how crappy the chemical industry is.”

He returned to earn his high school diploma so as to attend college where he studied sociology and anthropology. For a while. “Then I decided to go out into the world.” After spending time in India, he returned to Germany to study alternative medicine. From 1983 to 1988 he practiced naturopathy. “In that period I enjoyed my garden hobby more and more,” he relates.

In 1986 he co-founded a gardener association that defined itself as working “for the permanence of crop plant diversity.”

“We wanted to bring old varieties back into the public realm again,” Watschong explains. The association grew to several hundred members of whom each was a “godfather/godmother” responsible for a specific ancestral cultivar.

At the time Watschong and his wife, Nicola Uphoff-Watschong, lived in northern Germany near Bremen. They relocated in Arenborn because Hesse is a more central part of the country, and they have friends at a nearby university with a fine organic farming program, he notes.

Dreschfliegel was formed as a company in 1990. “We’re 14 partners, growing seed in different parts of Germany. Twice a year we get together to make business decisions. The five people who work in the shipping department also have a vote. Currently we sell 600 plant varieties. All our stock seed is certified organic.”

Growth to full-fledged commercial success was slow. “In the 1990s I worked as chef to make ends meet. I cooked at a facility when they held seminars.”

Yet the Dreschfliegel concept turned out to be a timely one: for over a decade Watschong’s three-quarter acre has proven itself economically viable. Which surprises his farmer neighbors, he comments: “They think it’s a bit strange what I do, but they respect that I’m making a living right here, that I don’t commute to a job in town.”

From the kitchen through a hallway we walk into the large shed attached to the farm house. Watschong puts on his wellington boots, and leads off into the spring sun shining down on, well, *Vielfalt*.

A thousand little plants seem to know him and greet him. They think of him as Mister *Vielfalt*, too, we’re sure. One of his three tracts, right behind the house, at first appears

as very small space for seed production, but after a look around confirms the plant diversity, we recognize a veritable cosmos aligned on arm's-length growing beds.

In a greenhouse Watschong shows us plant starts. What are those, wheats? Yes, a few varieties critical to the Dreschflügel collection he raises under special care, he explains. For us it's the first time seeing wheats as starts ready for transplanting.

Most starts in the greenhouse are old vegetable varieties. The heirloom tomato plants are still on windowsills in the house, Watschong remarks. They'll grow their first flowers before they're allowed into a plot, they're so frost sensitive.

About 10 percent of his varieties are seeded before winter, he notes. Around 30 percent are "wet" seed, meaning vegetables whose seeds are surrounded by flesh, cucumber, tomato and such. The dry seed are beans – some great fava bean varieties! –, soy beans from Thuringia, rare maize, carrot, radish. And, Farro grains and wheats from throughout the ages: "We sell a package that's a series of 30 *Triticum* varieties; it's a popular item with show gardens – after the wheats are grown it's interesting to observe the evolution from Einkorn to modern wheat. Schools are especially interested in that sort of demo. We're going to put together similar series of barley and oat varieties."

Perhaps the rarest cereal Watschong raises is a free-threshing type of Einkorn, *Triticum Sinscala*. "It was found not long ago in Turkey." Farther on are rows of *Triticum spherococcum*, a round-seed wheat. "Sometimes you can deduct grain characteristics from the nomenclature," Watschong remarks.

Where does he find the scarce, sometimes very scarce germ-plasm? Gardeners are a good source, Watschong says. And he also sends requests to gene banks: "I got some nice material from the German (government) gene bank that's in Gatersleben since the reunification. I have also e-mailed to the gene bank in Canada, their variety descriptions are great, they note things like protein level. Some germ-plasm I received from the gene banks in Holland, the Czech Republic, Poland. My barley cultivars I got from the gene bank of Japan, they even publish photos of the varieties they make available. They charge for their seed, though. Their barleys are mostly short in growth."

For the record, the USDA-ARS gene bank at Aberdeen did not respond to his requests.

As Harold Bockelman in Aberdeen, so does Watschong observe subpopulations among ancestral germ-plasm. "Sometimes you have subpopulations, they get selected out."

In the midst of all his various seed increase projects, Watschong also experiments. He's in the process of domesticating a wild "nutmeg weed," *Würzsilie*, *Seson amomum*. He's also trying to cross a perennial with an annual barley.

We wonder about the absence of identifying stakes on the growing beds. "I keep very good records in a notebook. Oh, yes, I write everything down," Watschong says.

We do not have to ask him if he keeps busy during the growing season. “On two of my 1000-square-meter tracts I pay someone to rototill, otherwise I do all the work myself.”

The reward? Working at something he truly loves, at a reasonable income. “The market is growing. We (Dreschflegel) get €2 to €4 (about \$2.60 to \$5.20) for a small package of seed. As gardener I get 50 to 60 percent of that. Mostly we sell to gardeners who strive to raise their own vegetables, and we sell to truck farms who direct-market at farmers markets and to restaurants.

“Diversity in crop plants is a growing niche,” he reiterates.

“Industry does not like diversity,” he says in introduction to an heirloom seed association horror story. In Germany and other EU countries, agricultural cultivars are strictly regulated, that is, farmers are only permitted to grow crop varieties on a government list, this being the same government who, of course, is under pressure from industry. You’d think that a seed saver company would not come under those regulations, seed increase plots being completely different from what common sense defines as agriculture, but in the case of a well-known French seed saver company, Kokopelli, a lower court and then the higher courts decided against the company in the matter of cultivar regulation, Watschong says.

Popular opinion is starting to run against such incidence of government over-reach, in fact, the whole steamroller food system in its paucity of diversity is ripe for condemnation, he insists.



“The problem with supermarkets is systemic, it’s too much work for them to offer diversity,” he says depreciatively. “That’s why farmers markets and on-farm stores are doing so well.”

Further indication of the public mood are good sales of a book about organic gardening that Watschong co-authored.

To our question if it’s hampered him that he had no formal schooling in gardening, we get a sidelong glance.

In leaving we ask if Watschong can part with a little *Triticum sinscala* seed.

“Sure.” Watschong smiles as he drops seeds into the little folded-paper envelope.

Seeds-without-borders is good common ground.

