Oregonians continue to use the PI system extensively. Users include state and federal researchers as well as private seed companies and private individuals. Oregon is a major user in the western region, along with California and Washington.

Progress Reports:

1. **Shawn A. Mehlenbacher**, Dept. of Horticulture, Oregon State University, 4017 ALS Bldg., Corvallis, OR 97331

   **Hazelnut – eastern filbert blight (EFB).** In cooperation with Tom Molnar (Rutgers University), tests over several years identified more than 100 accessions with a very high level of EFB resistance. M.S. student Gehendra Bhattacharai mapped resistance from *C. americana* 'Rush' and hybrid selection 'Yoder #5' to LG7, and published the results in Tree Genetics and Genomes. The Serbian cultivar 'Ubov' transmits resistance to only about 25% of its offspring because of segregation distortion. Gehendra Bhattacharai mapped the resistance to LG6 in the same region as 'Gasaway' resistance and published the results in the Journal of the American Society for Horticultural Science. Ph.D. student Golnaz Komaei Koma mapped resistance from *C. heterophylla* 'Ogyoo' and the hybrid selection 'Estrella #1 (C. heterophylla sutchuensis x C. avellana) hybrid to LG6. When crossed with susceptible selections, OSU 1187.101 (Holmskij, Russia), OSU 1185.126 (Crimea) and OSU 955.028 (C. americana x C. avellana) transmitted resistance to ~50% of their offspring, while selection OSU 533.029 (seeds from Cecil Farris, Lansing, MI) was transmitted to about 70% of its seedlings. Selections from seeds collected in the Crimea and southern Russia (village Holmskij) transmit resistance to 24% to 80% of their offspring. Recent tests detected resistance in about ten selections from seeds collected in Turkey. High levels of quantitative EFB resistance have also been detected in a dozen selections of diverse origin.

   **Hazelnut – simple sequence repeat markers.** Brooke Peterschmidt Colburn developed 111 new simple sequence repeat (SSR) markers from transcriptome sequences and characterized them using 63 diverse hazelnut accessions. Her work was published in Molecular Breeding. Gehendra Bhattacharai developed new polymorphic SSR markers (tri-, tetra-, penta- and hexanucleotide repeats). The trinucleotide repeat SSRs were published in PLOSOne. The 'Jefferson' sequence (115× coverage), assembled from Illumina reads, served as the reference genome sequence for this study which developed a total of 343 new SSR markers. Genomic DNA of seven other cultivars was also sequenced using Illumina. Alignment of reads from these seven cultivars with the 'Jefferson' sequence allowed in silico comparisons and identification of polymorphic SSRs. The new polymorphic SSRs were characterized by amplification of 50 accessions with fluorescent primers and sizing with capillary electrophoresis, and 232 were placed on the linkage map. The remaining 192 SSRs are described in a manuscript accepted for publication in the Journal of the American Society for Horticultural Science. New hazelnut cultivars from OSU are being increased by private companies using micropropagation, and SSR marker fingerprinting is used to test trueness-to-name.

   **Hazelnut cultivar releases.** A release notice for pollenizers 'York' and 'Felix', released in 2012, has been accepted for publication in HortScience. Selection OSU 1108.001 was released as a new kernel-type cultivar 'PollyO' in January 2018.

   **Genome sequencing (PacBio).** In 2016, we sent leaves of 'Jefferson' hazelnut for Pacific Biosciences sequencing at the Arizona Genomics Institute (AGI). The long reads were assembled
into about 1,900 contigs, which is a large improvement over the 36,000 contigs in the Illumina draft assembly. 'Jefferson' carries EFB resistance from 'Gasaway' on LG6. Subsequently, we collected leaves of 'Jefferson', froze them in liquid nitrogen, and shipped them to Dovetail Genomics for the Chicago Hi-C procedure. Coupled with our PacBio sequence, they were able to merge the contigs and assemble 11 chromosomes, which is the haploid number for hazelnut. Based on our good experience with PacBio sequencing at AGI, we submitted two additional selections for sequencing in 2017. One has resistance from Georgian selection OSU 759.010 (LG2) and the other has resistance from the Spanish cultivar 'Ratoli' (LG7). The assembled sequences were received and look very good.

2. Kelly Vining, Dept. of Horticulture, Oregon State Univ., 4017 ALS Building, Corvallis, OR

Her project is using Mentha accessions from the Corvallis National Clonal Germplasm Repository (NCGR) in genomics research and breeding. She has generated genome sequence data for representative accessions of Mentha longifolia, M. suaveolens, and M. aquatica. The M. longifolia genome assembly was recently published, and represents the first genome sequence published for Mentha (Vining et al., 2017). M. longifolia, a diploid species ancestral to cultivated peppermint and spearmint, has a small genome (353 Mb). In her breeding program, four M. longifolia accessions and four M. suaveolens accessions have been used in interspecific crosses.

3. James Myers, Dept. of Horticulture, Oregon State Univ., 4017 ALS Building, Corvallis, OR

Two PhD students in the OSU vegetable breeding project used Phaseolus germplasm in diversity panels in their research. Haidar Arkwazee studied resistance to white mold caused by Sclerotinia sclerotiorum. Lyle Wallace studied flavor in snap beans. Both students defended their research in Spring, 2018. Jim listed some publications (Feng et al., Holdsworth et al.) on viruses that had their origin with isolates found in a collection that Mike Dickson made from China, which was deposited but never formally entered into the germplasm system. He received and catalogued the collection, which he plans to send back to NPGS for formal deposit. Both Lyle and Haidar used snap bean diversity panels that we have developed that were assembled in part from PI accessions.

4. Alex Stone, Dept. of Horticulture, Oregon State Univ., 4017 ALS Building, Corvallis, OR

96 garlic accessions (Allium sativum and related species) were received and planted in a trial funded by Western SARE. The primary goal is to screen for rust resistance. The secondary goal is to find varieties that fit diverse market uses or windows.

5. Sugae Wada, Dept. of Horticulture, Oregon State Univ., 4017 ALS Building, Corvallis, OR

Pear (Pyrus spp.) germplasm was obtained from the Corvallis Repository for micropropagation research. The pear industry agrees that rootstock improvements are necessary to support modernization and transformation of sustainable and profitable production systems. In vitro culture and rooting of pear rootstock cultivars is important for producing planting materials for the pear industry. Difficulties in traditional propagation and micropropagation of promising dwarf pear rootstocks, has long delayed the introduction of improved cropping systems for pear orchards. The development of new pear micropropagation media now makes it possible to propagate all types of scion pears in vitro (Reed et al. 2013b; Wada et al. 2013; Wada et al. 2015a; Wada et al. 2015b). Recently, an improved growth medium for pear rootstock (PRS medium) was developed (Wada and Reed 2017). Promising pear rootstocks might be found in various genetic backgrounds, including a range of different Pyrus species. Desirable characteristics such as disease resistance, compact tree architecture, early fruit production (precocity), high yields, and quality fruit are indispensable for
the pear industry to remain competitive nationally and globally (Elkins et al. 2012a). There is an urgency to develop and adopt new size controlling rootstocks that also show disease resistance, tolerate abiotic stresses and positively influence fruit quality and yield. Therefore, investigating wild pears originating from other regions worldwide, and in particular some of the promising species currently preserved at USDA National Clonal Germplasm Repository in Corvallis, OR, will be crucial.

6. Neil Bell, Marion County Extension Service, 1320 Capitol Street NE, Suite 110, Salem, OR

Cuttings were received of 30 olive cultivars from NCGR in Davis in July 2017. They will form part of a cold-hardiness evaluation to identify olive cultivar best suited to the cool climate of the Willamette Valley. Of the 30 accessions, 21 immediately rooted. The remainder will be requested again. The olive accessions are being held in a stock block to allow re-propagation in the future and ensure uniform plantings of all cultivars in the evaluations.

7. Vidyasagar Sathuvalli, Hermiston Ag Research & Extension Center, Oregon State University, 2121 South 1st Street, Hermiston, OR 97838

Germplasm from the potato gene bank is being used by the OSU Potato Breeding program, which is an integral part of the Tri-State potato breeding program. Three important achievements on the use of germplasm are listed here:

A. New sources of resistance to Columbia root knot nematode (CRKN). Screening of wild potato germplasm identified resistance. *Meloidogyne chitwoodi* can cause serious damage in potato, decreasing tuber value for the fresh market and processing industries. Genetic resistance to CRKN was first identified in the wild diploid potato species *Solanum bulbocastanum* accession SB22 and was successfully introgressed into tetraploid potato breeding material. To expand the base of genetic resistance, his Ph.D. student Ryan Graebner screened 40 accessions representing nine wild potato species obtained from NRSP-6. Greenhouse screening identified 15 clones from *S. hougasii*, one from *S. bulbocastanum*, and one from *S. stenophyllidium* with moderate to high resistance against three isolates of *M. chitwoodi*. Geographical mapping showed that resistance sources identified in this and previous studies originated primarily in the states of Jalisco and Michoacán in west-central Mexico. Resistance from these new sources will be introgressed into elite potato populations and cultivars with durable resistance to *M. chitwoodi* developed.

B. Wild potato species resistant to *Verticillium dahliae* identified after greenhouse inoculation. *Verticillium dahliae*, capable of inciting Verticillium wilt, is a major soil-borne pathogen of potatoes. While moderate levels of resistance to *V. dahliae* have been identified in cultivated and wild potatoes, there is a need for additional sources that confer strong, unambiguous resistance to this pathogen. Eighty seedlings from 22 wild potato accessions originating in North and South America were inoculated for their response to *V. dahliae*. The screening identified two clones of *Solanum andreaenum* and one of *S. bulbocastanum* with resistance equal to or greater than 'Ranger Russet', the moderately resistant cultivar. These new sources of *V. dahliae* resistance have different geographic origins and expand the list of *V. dahliae* resistant germplasm. Resistance from these new sources will be introgressed into elite potatoes.

C. 'Castle Russet': A dual purpose potato cultivar with resistance to potato virus Y, potato mop top virus and corky ring spot. 'Castle Russet' is a medium- to late-maturing variety with high full season yield of oblong-long, heavily-russeted tubers with high dry matter content and cold sweetening resistance than those of standard potato varieties. 'Castle Russet' is extremely resistant to all strains of potato virus Y (PVY), corky ring spot (CRS) disease caused by tobacco rattle virus (TRV) and potato mop top virus (PMTV). 'Castle Russet' has greater resistance to *Fusarium* dry rot, common scab, and most internal and external defects than 'Russet Burbank'.
'Castle Russet' has moderate tuber dormancy with good fry quality when stored between 40 °F and 48 °F. Its high late season yields of U.S. No. 1 tubers; typy appearance and good culinary qualities make it a suitable candidate for fresh market production. OSU took the lead in releasing this variety, a joint release by the Tri-State Potato Variety Development Program. The pedigree of 'Castle Russet' includes germplasm obtained from NRSP-6, Potato Genebank.

8. Solomon Yilma, Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331

He received tissue cultured plants of seven clones, which will be used in the OSU potato breeding project as sources of resistance to PVY, PVX, late blight, and pale cyst nematode. resistant for our breeding program. (PI634530, Reiche; PI634531, Costanera; PI676259, INKA GOLD; PI343201, MP1 63.613/63; PI607475, Nicola; PI676260, SARPO MIRA; PI633601, EDEN)

9. Elias Sabry, Seed Lab, Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR

He used Amaranthus accessions from the Ames (IA) germplasm center to develop a grow-out test to distinguish different amaranth species. An abstract was published in Seed Technology.

10. Dan Curry, Dept. of Crop and Soil Science, Oregon State University, Corvallis, OR 97331

On behalf of the Oregon Ryegrass Commission, he requested seeds of PI 193145 'Gulf' annual ryegrass for increase under the direction of the Ryegrass Commission. "It was very important to the commission that they obtain this source of seed and they are very grateful that the PI station was able to provide good quality seed."

11. Jennifer Lorang, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis, OR

She and project leader Tom Wolpert received Avena lines that are wild diploid progenitors of cultivated hexaploid oat. They thought they might be useful as a part of our genomic/mapping effort to identify genes for fungal toxin sensitivity. They screened all of the taxa provided for sensitivity to fungal toxins produced by plant pathogens, in hopes of finding lines to map genes conferring disease susceptibility. None of the lines provided proved to be useful for further investigations at this time and this work has not yet been published. "Thank you for providing these lines. The service that the U.S. National Plant Germplasm System provides is crucial for our continued research efforts toward understanding molecular mechanisms of plant disease."

12. Aaron Heinrich and Nik Wiman, OSU North Willamette Research and Extension Center, Aurora, OR 97002

Apple scions were ordered for their cider research. The objectives are to evaluate the performance of these varieties in western Oregon (yield, disease/pest resistance, bloom and harvest dates, how well the fruit holds on the tree, etc.) and determine their suitability for use in hard cider (juice characteristics and sensory evaluation with OSU fermentation science). All varieties were grafted in either the winter of 2017 or 2018, and data collection will begin when the trees are established and begin to bear fruit.

13. Chad Finn, Research Geneticist, USDA-ARS Hort Crops Research Lab, 3420 NW Orchard Ave., Corvallis, OR 97330

Dr. Finn uses plant germplasm in his berry breeding program, and has released many cultivars in recent years. He has been involved in the RosBREED project "Enabling Marker-
Assisted Breeding in Rosaceae" and in a black raspberry SCRI project. A long list of publications has resulted from these efforts.

14. Tim Ford, Senior Research Agronomist, Lebanon Seaboard Corporation, 35632 Cold Springs Road, Lebanon, OR. 97355

A large number (656) of clover (Trifolium) accessions were planted in evaluation nurseries in fall 2017. They are being evaluated this summer for potential for turf under low maintenance conditions. He is hopeful the promising collections can be used and combined with other germplasm to develop a variety for use as a low maintenance turf, with good turf characteristics, seed yield and nitrogen fixing capabilities. It will take several years to identify those with the most promising characters. So far, only a few accessions seem to exhibit both a decumbent growth form and high seed yield potential.

15. Virginia G. Lehman, Blue Moon Farms, PO Box 2390, Lebanon, OR 97355 (new e-mail address: Lehmanv33754@gmail.com)

Dr. Lehman requested 130 accessions of fava bean (Vicia faba) to develop a small-seeded line for use as a cover crop or organic rotation crop by small farms. There are no successes to report to date, as they are still in the evaluation phase. "The Fava bean germplasm collection is invaluable to our efforts … The use of the collection is greatly appreciated."

16. Steve Johnson, Peak Plant Genetics LLC, 32674 Dever-Conner Dr. NE, Albany, OR

All of the grass seed samples received from the U.S. National Plant Germplasm System were check varieties for Plant Variety Protection Trials. They were used to obtain the data necessary to apply for US Certificates of Plant Variety Protection and to enter the varieties into the Oregon Seed Certification Service program.

17. Chad Miebach, Radix Research, 93593 Pitney Lane, Junction City, OR 97448

Accessions of clover (52 of Trifolium subterraneum and one of Trifolium ambiguum) were requested, but the seeds will not be planted until August. In the past, he explored accessions of Poa bulbosa for possible turf qualities but found nothing of value.

18. Yedil Hunde, Barenbrug USA, 36030 Tennessee Road SE, Albany, OR 97321

Festuca pratensis accessions were obtained from the Genetic Resource Information Network (GRIN) system in late 2017 but have not yet been planted. To ensure adequate vernalization, they decided to plant them in fall 2018, and are holding the seeds in cold storage. Seedlings will be raised in their greenhouse and then transplanted in the nursery in the fall.

19. Tom Brentano, Novel AG, Inc., 17301 River Road, NE, Saint Paul, OR

Grass accessions were requested and used as standards in morphology measurement studies as required for Plant Variety Protection applications and certification recommendations. Sincerely,

20. Dustin W. Herb, OreGro Seeds, 33080 Red Bridge Road, Albany, OR 97322

A total of 137 accessions of various cereal crops (wheat, oat, rye, triticale) were requested for evaluation of agronomic performance and forage potential with the goal of breeding for both
domestic and international markets. Of the material received, many accessions had poor germination and therefore could not be utilized. However the remaining accessions are being increased this year for large trials next year.

21. Mike Dunton, Victory Seed Company, PO Box 192, Molalla, OR 97038 (www.VictorySeeds.com)

Seeds were requested from GRIN with the intention to include them in observational grow outs and compare them to the historical record for accuracy as well as trueness-to-type. If the variety meets these requirements, or requires minimal cleanup, they will be scheduled for increase grow outs and eventually re-introduced to the gardening public through our catalog. The materials were just received this spring and are only now being rotated into their schedule. They consider GRIN a valuable preservation tool and resource, as is reflected in the listings on their web site. "Thank you for the work that you do as part of this biodiversity preservation work."

22. Jerry Hall, Grassland Oregon, 4455 60th Avenue NE, Salem, OR

Jerry requests seeds every year. This year's request was for 58 accessions of Coriandrum sativum. In Spring, 2017, several Trifolium and Brassica oleracea accessions were requested and seeded at the Grassland Oregon research facility in Salem, Oregon. These accessions were requested to assess their ability to grow in Western Oregon, as part of their ongoing commitment to develop and/or introduce new alternative crops for farmers in Western Oregon. Some of the Trifolium accessions tested in prior years look very promising.

23. Dayna Carlson, 18390 SW Boones Ferry Road, Portland, OR

Her current work is on breeding peas and watermelons that are disease resistant and suitable for the local environment (Kögen Climate CSB, growing Zone 8-B). Watermelon accessions PI 612462 and PI 556994 were sown this year. So far, PI 612462 has shown traits preferable in our climate. However, PI 556994 has shown less vigor and some disease issues. Pea (Pisum sativum) PI 175228 was ordered for use in breeding a hardier soup pea but insufficient seed was sent and so other pea varieties where used in this year's breeding. It will be reordered next year.

24. Helena Mathews, Phytelligence, Mathews, Helena, Phytelligence, 16160 SW Upper Boones Ferry Rd., Portland, OR

Hazelnut cultivars developed by Oregon State University (Jefferson, Eta, Theta, Yamhill, Dorris, Felix, McDonald, Wepster, York) were requested and are being used to develop micropropagation systems for them.

25. Kiawe Elliott, Forest Island Farm, 97755 Elk Creek Road, Myrtle Point, OR 97458

He requested scions of apple and pear accessions, adding to the cultivars obtained in previous years. All of the USDA pears and apples were grafted and are doing well, both in the Willamette Valley and on the Southern Oregon Coast. His goal is to find new varieties for home and commercial use on Oregon's South Coast and the Willamette Valley, and to breed new varieties for similar purposes. Some of the precocious varieties have started to flower and fruit, and he made a few crosses with the USDA varieties, mostly with quince-compatible pears and disease resistant apples with M. floribunda in their pedigree. He uses M. fusca as a rootstock for apples in seasonally flooded areas and has noticed that varieties with M. floribunda genes take especially well on that rootstock.
26. Richard Kerns, 10575 Tyee Road, Umpqua, OR 97486

Accessions of Chenopodium quinoa were requested in a search for a low or no saponin quinoa variety that grows well in his location and has eating quality to match the more common high saponin varieties. A high quality no saponin variety would drastically reduce the home processing requirements (time, water, blender and energy) needed by the higher saponin varieties. He provided information on germination and seed production.

**Spring 2017:**
- PI 510537—germination from 90% to 96%, high survival rate of seedlings to transplant stage, 10 plants have now been transplanted and doing well so far, many more seedlings will soon be ready to transplant.
- PI 614923—germination from 28% down to 10%, low survival rate of seedlings to transplant stage, 8 plants have been transplanted and doing OK so far, no other seedlings survived.
- PI 510534—germination rate less than 10%, only 3 survivor seedlings but these 3 are transplanted and doing OK so far.

**Fall 2017:**
- PI 510537—plants grew well and produced a lot of seed, however the seeds are very susceptible to sprouting on the plant with very little rain.
- PI 614923—the 8 plants grew well and produced seed with promising seed size and flavor, will trial again in 2018.
- PI 510534—the 3 plants grew well but seed size was small and not very abundant.

**Spring 2018—**
- PI 614923—about 100 plants are growing well (on June 1) from the saved 2017 seed harvest. I hope to have enough seed harvest to do saponin level tests and eating quality tests in the fall. As PI 614923 was most promising in 2017, it is being grown again in 2018.

27. Mark Krautmann, Heritage Seedlings Inc., 4194 71st Ave. SE, Salem, OR

He requested three Cydonia and one Pyrus accession. He used the scions in his home orchard project for apple cider blends.

28. Alicia Smith, PSU Biology, 2101 SE Christensen Rd., Corbett, OR

Seeds of four Lupinus species were requested. She reported that the germination rate of the lupine seeds was extremely low, about 10-15% without cold stratification and 20% with. She ended up buying seed from a commercial supplier.

29. Bob VanderZanden, 8065 NW Jackson School Road, Hillsboro, OR

Seeds of two clover (Trifolium pretense) accessions were requested. The seed quality was not great. He saw poor emergence and issues in greenhouse, and is down to about 60 plants on the Dutch type (PI 554143) and only 15 on the German one (NSL 53978). The plants are growing now but no results this year.

30. Dave VanSlyke, Dave, 3781 Melrose Road, Roseburg, OR

Five accessions of Avena strigosa were requested as part of the mission of Melrose Whole Grain to restore heritage grains. They requested the samples to evaluate for potential grow out. Avena strigosa was used historically in northern Scotland for a food source and they we considered moving into that grain for their version of traditional stone ground Scottish oatmeal. However, due
to the very small size of the seed, it would not be cost effective to use it for that application. They are instead growing out common oats from Scotland for that purpose. *Avena strigosa* has a very interesting story, but it seems Melrose Whole Grain will not be part of it.

31. **John Schaefer**, Natural Resources, Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians, 1245 Fulton Avenue, Coos Bay, OR 97420

*Nicotiana* seeds were requested in an effort was to find viable seed of *Nicotiana quadrivalvis* var. *multivalvis* hidden in the accessions. Nomenclature changes have lumped several varieties under *N. quadrivalvis*. Variety *multivalvis* is culturally significant to his tribe and was thought to be extinct. All accessions were successfully grown out and determined to be *Nicotiana quadrivalvis* var. *quadrivalvis* (4 chambered seed pods) with the exception of TW23 which is an unknown species of *Nicotiana* (lavender, assymetric flowers, two chambered seed pods). This information was sent to the US *Nicotiana* Germplasm collection and I believe the record has been updated. Apparently, TW19 and TW 20 were formerly classified as *Nicotiana bigelovii* var. *multivalvis*. From the exceptional size and variable shape of the seed pods of TW19, I speculate that TW19 was recently inadvertentley crossed with var. *quadrivalvis*. Note: He attached a photo of flowers of six accessions.

32. **Brett Webber**, Webber Orchard, 1008 Almaden Street, Eugene, OR

Order 13519 was for a variety trial of cold hardy pomegranates for commercial production in Junction City, OR. All 20 varieties of pomegranate were planted in Spring, 2017. Some varieties were planted later than the others and so they had different growth rates. All varieties survived the winter. The lowest temperature recorded was on February 2018 at 24 °F. Some varieties died back further than others though no variety completely died. Growth this year has been good, but no flowers have been seen yet. Order 16198 was for a variety trial of cold hardy figs for commercial production in Junction City, OR. All varieties were planted in Spring, 2018. No results yet.

33. **Jonathan Eeds**, 5369 Donald Street, Eugene, OR

He requested scions of 18 apple accessions. He began grafting cider apples in 2015, intending to study the different varieties, old and new, for cider production in Oregon. This is more of an accelerated hobby than a business proposition. He is currently an operations manager for a high tech company in Eugene, but will retire at the end of June, and then devote considerably more time to developing his orchard, which is only two acres at this point. All of the varieties listed below were obtained from the USDA in New York. All but 'Mary Potter' and maybe 'King of the Pippins' survived. He is seriously considering taking a cider craft workshop at OSU, as this will be the first year that he has enough apples to make some home cider.

34. **Natalie Boothe**, 155 Division Street, Manzanita, OR

Seeds of 60 accessions of poppy (*Papaver* spp.) were requested. Out of the seeds she received, only the California poppies were viable seeds that she was able to grow. They were beautifully colored, in darker and lighter variations than she is accustomed to seeing in the area. The plants did well in coastal conditions two blocks from the beach. They seemed to thrive in a medium consisting mostly of sand, with no nutrients added, and in fact did better than those planted in a mix of nutrient rich "super soil". They were drought hardy, and preferred to not have their "feet wet", which explained their having done better in a more sandy soil.
Publications:


