



WELLESLEY COLLEGE

Global Flora: Greenhouse Renewal, A Progress Report

In the Fall 2014 newsletter, I ended the *Global Flora: Greenhouse Renewal Phase 1* article on the optimistic note that we were aiming to break ground this spring. While we all are eager to begin the project (particularly with all the extra precautions and finger-crossing we've had to do during this winter's storms!) and have made great progress on planning and design, the project timeline has been "decompressed" to a spring 2016 construction start. An important reason is that the College has embraced a key project goal of achieving net-zero energy and net-zero water as part of the Living Building Challenge – very aspirational sustainability goals! The design team is fired up, and I am confident that the additional time and effort invested in planning will yield substantially lower operation costs as well as an impressively small environmental footprint for a conservatory-type building.

The longer planning period also provides more opportunity to plan the "indoor ecosystems" of Global Flora in detail. This article offers a current view of these plans and invites your participation in this very fun part of the process. Essentially we are planning an amazing indoor garden, and the more knowledge we can bring to the process, the better! Your experiences particularly in sub-tropical, desert, or Mediterranean-type habitats can

help shape Global Flora.

The plants and their arrangement in the Global Flora landscapes will tell several stories. Diversity of form is the overall theme. The main story is about diverse evolutionary lineages responding to common environmental conditions and challenges – in some cases converging on seemingly similar solutions, and in others with radically different approaches. For example, in the Dry House we will have cacti such as the golden barrel and the lady of the night, whose fleshy stems are green and perform photosynthesis, along with a palo verde – one of the famous "bean trees" (yes, it's a legume) which, as its name suggests, also has a green, photosynthetic trunk, along with minimal leaves. In the Sonoran Desert, cacti and palo verde frequently grow together, with the tree serving as "nurse plant" for young cacti. We are thinking to plant several small cacti at different distances from a palo verde to explore this relationship. This community grouping likely also will



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In Global Flora our large cannonball tree will have enough space so its extraordinary flowers can be seen more easily.

include several desert ephemerals in the understory, representing a very different solution to extended drought conditions.

As this desert example illustrates, careful choices of taxa and placement of plants will enable the collection to tell stories about topics such as convergent evolution and interactions between plants. At the same time, the landscape design doubles as an experimental design that students can use to test hypotheses, for example about plant responses to specific physical conditions. Completing the experimental platform will be several

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kinds of sensors measuring variables such as soil moisture and temperature.

Ever heard of a paludarium? I hadn't, until we started looking into ways to house aquatic ecosystems. Picture an aquarium, but with substantial emergent vegetation. Apparently, having plants extend out of the water gives them a competitive advantage over algae. With some fish and other aquatic organisms it is possible to create a reasonably self-sustaining pond microcosm in a tank. Ecologists interested in aquatic systems have experimented with microcosms like this for decades, as have aquarium hobbyists. A good-sized paludarium would be an exciting step up from the opaque-sided pools in the current Hydrophyte House, especially as many emergent plants have different leaf forms underwater than they do in the air. A diversity of emergent plants should do a good job of filtering nutrients, keeping the water clear and providing another interesting and beautiful biological community to explore. The more we know about which plants have both distinctive



A student favorite, sensitive plant, *Mimosa pudica*, might be grown in the subtropical understory of Global Flora.

form and complementary nutritional needs, the better our first iteration of this community will be.

We expect to do a lot of experimenting with community composition, and aim to let both individual plants and populations grow as space and aesthetics allow. For example, in the desert community described earlier, starting with several species of ephemerals in equal numbers, students could measure survival and reproductive success, then predict and measure changes in populations over time - a great opportunity to learn field biology methods during the school year, so they can hit the ground running on research projects during the outdoor growing season and summer internships in the "real world." Every

year Environmental Horticulture students grow sensitive plant (*Mimosa pudica*), delighting in the leaf-closing behavior of this easy-from-seed plant. What if we had a population of these growing in the understory of subtropical trees – how much fun would they be to study, as they compete with and possibly facilitate the growth of other plants (like the bean trees, they are nitrogen fixers)?

Another featured community will be a subtropical bog, letting our Venus fly-traps, sundews, pinguiculas and other carnivorous plants out of their little



The stem of the golden barrel cactus performs photosynthesis.

terrarium and into a more naturalistic setting. The small bog garden that we created near Paramecium Pond a few years ago is going strong, with pitcher plants, bog orchids, and cranberries among the diverse community, but the Venus fly-traps we tried out there didn't make it through the first winter (they are native to the Carolinas and we knew it would be a stretch). The indoor bog will be a nice comparison to the outdoor one, similarly aiming to maximize diversity in a small, unique habitat. The diversity of forms among bog plants is remarkable, as several different evolutionary lineages have converged on carnivory as a solution to low nutrient availability, each in their own way.

Some of our large and most distinctive specimens, such as the screw pine and the cannonball tree, will have some separation from other trees so that they can be better appreciated from multiple angles. Others, such as our many different palms, will be clustered to mimic the close spacing of subtropical humid forests, with vines and epiphytes on the trunks and a diverse understory in the shade below – again, lots of different

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growth forms within a single habitat.

We have so much to learn about our plants and how best to place them, which means there are lots of opportunities to get involved with the planning for Global Flora. One of last year's Environmental Horticulture students, Samantha Brown '16, spent the fall semester in Panama, where she did a research project on bromeliads. She returned to Wellesley eager to share her new knowledge and to learn more botany. Over winter break she compiled a list of preferred conditions for all of the bromeliads in our current collection, and recommended other species that would contribute to the diversity of form theme. One of her recommendations, *Abromeitiella*

chlorantha, prefers dry conditions, so now we'll be trying a bromeliad in the Dry House, along with a Mediterranean fan palm – both examples of outliers that have adapted to different conditions than most species in their lineages.

Every plant in Global Flora must earn its spot. Each will contribute to the big story of diversity of form and to the myriad other stories and research opportunities that the collection will provide. We expect the collection to continually improve over time as we learn about new exciting taxa to replace underperformers, as in any well-attended garden. Where the collection begins at the opening of Global Flora depends on our collective knowledge of the wonderful world of botanical diversity.

If you know of a plant whose form

has a good story, and that couldn't grow outdoors here at Wellesley, it is a candidate for Global Flora, even if not part of our current collection (e.g. we'll be getting a *Welwitschia* from the Arnold Arboretum). It can be the overall form or a particular part such as flower or leaf that is of interest. For a current working list of Global Flora plants, please contact Gail Kahn or me. We'd like to hear from you, whether you garden somewhere where it doesn't freeze, visit a subtropical habitat, or maintain a beautiful paludarium. Scout for amazing and unusual forms, and send us photos and stories!

by Kristina Niovi Jones,
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