

roots

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Beyond the beauty of art in botanic gardens

- Glass in the Gardens: an interview with Dale Chihuly
- Art as a gateway to the botanical world
- The Living Beehive: innovative garden design
- Using biophilia and art to transform visitor experience
- Communicating through landscapes



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 Marketing for public engagement

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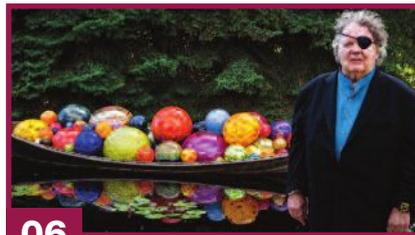
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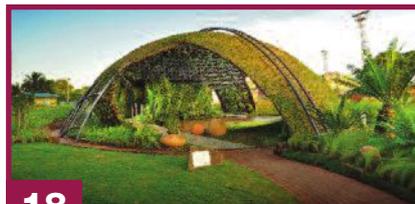
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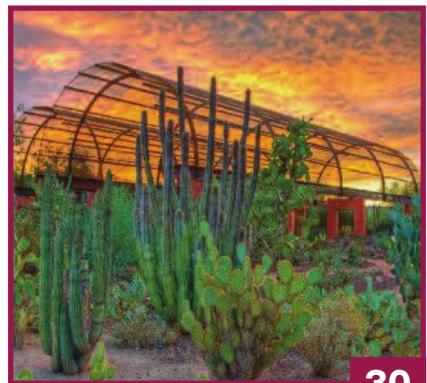
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First word

Art in the garden

ENGLISH

“Principles for the Development of a Complete Mind: Study the science of art. Study the art of science. Develop your senses – especially learn how to see. Realize that everything connects to everything else.”

Leonardo da Vinci (1452-1519)
(Atalay & Wamsley, 2008, p.96).

Almost a decade after his visit to Kew Gardens, a colleague from a Science Foundation in Switzerland recalled his experience, which was earmarked by Chihuly’s exhibition, Gardens of Glass, that was taking place at the time. Our colleague commented on the power of using art for public engagement in a botanic garden. Pieces of art like Chihuly’s inspirational glass work encourage people to make comparisons between living plants and manmade objects; hence they may observe nature more closely. It also allows a way in for people who may not know the scientific names of plants, making them more confident when wandering around the gardens as the art work will allow them to develop connections with the living plants without requiring them to be scientific

FRANÇAIS

“Principes pour le développement d’un esprit complet: étudier la science de l’art. Étudier l’art de la science. Développer ses sens – surtout apprendre à observer. Se rendre compte que tout est interconnecté.”

Leonardo da Vinci (1452-1519)
(Atalay & Wamsley, 2008, p.96).

Près d’une décennie après sa visite aux jardins de Kew, un collègue d’une fondation scientifique en Suisse s’est souvenu de son expérience, marquée par l’exposition de Chihuly, Jardins de verre, qui se déroulait à l’époque. Notre collègue s’exprime sur le potentiel d’utiliser l’art pour engager le public dans un jardin botanique. Les œuvres d’art, comme l’inspirant travail du verre de Chihuly, encouragent les gens à faire des comparaisons entre plantes vivantes et objets artificiels; et peuvent ainsi les amener à observer la nature de plus près. L’art peut constituer une ouverture pour les gens qui ne connaissent pas les noms scientifiques des plantes, l’art met les gens plus à l’aise lors de leurs promenades à travers les jardins, il leur permet de faire des connections avec les

ESPAÑOL

“Principios para el desarrollo de una mente completa: Estudia la ciencia del arte. Estudia el arte de la ciencia. Desarrolla tus sentidos – en especial el de aprender a ver. Así comprenderás de que todo se conecta con todo lo demás”

Leonardo da Vinci (1452-1519)
(Atalay & Wamsley, 2008, p.96).

Casi una década después de su visita a Kew Gardens, un compañero de Science Foundation en Suiza recordaba su experiencia, destinada a la exposición Chihuly, Jardines de Cristal, que estaba teniendo lugar en ese momento. Nuestro compañero comentó el poder de usar el arte como medio de participación pública en un jardín botánico. Las obras de arte como el inspirador trabajo de cristal Chihuly animan a la gente a hacer comparaciones entre las plantas vivas y los objetos hechos por el ser humano; a partir de ese momento observarán más de cerca la naturaleza. También permite que la gente que no conoce el nombre científico de las plantas se sienta con más confianza cuando pasee por el jardín botánico ya que el arte les permitirá desarrollar conexiones con las plantas vivas sin requerirles ser expertos científicos. Hein (2006, p.xix) explica que es arte es poderoso y con su “presencia estética sin mediación se insinúa en nuestro ser, haciéndonos ver y entender las cosas de manera diferente”

El arte en los jardines botánicos puede adoptar muchas formas diferentes, desde exposiciones hasta instalaciones de arte creadas por artistas profesionales, para ofrecer programas de educación de adultos sobre arte botánico o realizando festivales de arte para un público más amplio.

El arte siempre se ha inspirado en las plantas y las plantas se han interpretado de numerosas formas artísticas diferentes, desde la escultura y la pintura



Architecture students at Smith College design pavilions based on plants (Smith College)

experts. Hein (2006, p.xix) explains that art is powerful and with its 'unmediated aesthetic presence insinuates itself into our being, causing us to see and understand things differently'.

Art in botanic gardens can take many different forms, from exhibitions and art installations created by professional artists, to offering adult education programmes in botanical art and running art festivals for the wider public.

Art has been inspired by plants and plants have been interpreted in many different art forms from sculpture and paintings to photography and poetry. But art has also been a medium for botanic gardens to communicate their messages to the public, attract a different type of audience, that is not necessarily into plants, and engage visitors with plant science.

Botanic gardens as scientific institutions can use the arts to present the value of plant science to the public. Combining art and science can not only connect with people visually, aurally or through touch, without the need for language, but it can communicate with people on an emotional level. Art, such as music, according to McNealy's (2013) research can be used to provoke thought and make connections between the things that are familiar to people and scientific concepts which are not. And when science students are involved in creating art projects that communicate scientific concepts (see Gurnon, Voss-Andeae and Stanley, 2013) they may understand the concepts better, whilst the audience that experiences the art may become interested in learning more about the science behind the art.

In this issue of *Roots* we have asked various professionals linked to botanic gardens to give us their perspective on how art can be used for public engagement. Contributions include perspectives from artists, educators and the directors of gardens whose leadership has supported the use of art as a medium to interpret the plant world and encourage visitor's understanding of and connection with nature.

We hear the opinion of artists through a Q&A with Dale Chihuly by Tim Richardson in which they discuss how Chihuly started to collaborate with botanic gardens, why he is interested in

plantes vivantes sans devoir être des experts scientifiques. Hein (2006, p.xix) explique que l'art est puissant et 'par sa présence esthétique immédiate s'insinue dans notre être, nous menant à voir et à comprendre les choses de façon différente'.

L'art dans les jardins botaniques peut prendre de nombreuses formes différentes, depuis les expositions et installations d'art créées par des artistes professionnels, l'offre de programmes d'éducation pour les adultes en arts botaniques, jusqu'à l'organisation de festivals d'art pour le grand public.

L'art a été inspiré par les plantes et les plantes ont été interprétées sous de nombreuses formes artistiques, de la sculpture à la peinture, de la photographie à la poésie, mais l'art est aussi un moyen pour les jardins botaniques de communiquer leurs messages au public, d'attirer une audience différente, qui n'est pas forcément proche des plantes et de mettre leurs visiteurs en relation avec la science des plantes.

Les jardins botaniques en tant qu'institutions scientifiques peuvent utiliser les arts pour présenter l'importance de la science des plantes au public. Combiner l'art et la science permet non seulement d'accrocher les gens visuellement, par l'ouïe ou le toucher, sans besoin de langage, mais aussi de communiquer avec eux sur un niveau émotionnel. Selon les recherches de McNealy (2013), l'art, tel que la musique, peut être utilisé pour provoquer la réflexion et instaurer des liens entre les choses qui sont familières aux gens et des concepts scientifiques, qui ne le sont pas. Et lorsque des étudiants en sciences sont engagés dans la création de projets d'art qui good but better with «portent sur des» concepts scientifiques (voir Gurnon, Voss-Andeae et Stanley, 2013), ils peuvent mieux comprendre ceux-ci, tandis que l'audience qui découvre l'art peut être intéressée pour en savoir plus au sujet de la science derrière l'art.

Dans ce numéro de *Roots*, nous avons demandé à différents professionnels liés aux jardins botaniques de nous donner leur point de vue sur les manières dont l'art peut être utilisé dans le but d'impliquer le public. Les diverses collaborations comprennent les points de



Peacock Blue Tower by Dale Chihuly was installed at Garfield Park Conservatory, Chicago, in 2001 (Dale Chihuly)

a la fotografía y la poesía. Pero el arte ha sido también un medio para comunicar los mensajes de los jardines botánicos al público, atraer a un tipo distinto de audiencia, no interesada especialmente en las plantas, e involucrar a los visitantes en la ciencia de las plantas.

Los jardines botánicos como instituciones científicas pueden utilizar las artes para presentar el valor de la ciencia de las plantas al público. Combinando arte y ciencia no sólo se permite conectar con las personas visualmente, auditivamente o través del tacto sin la necesidad del lenguaje, sino también sirve para comunicarse a nivel emocional. El arte como la música, según la investigación de McNealy (2013), se puede utilizar para provocar la reflexión y establecer conexiones entre las cosas que les resultan familiares a la gente y conceptos científicos que no lo son. Y cuando los estudiantes de ciencias se involucran en crear proyectos de arte que transmiten conceptos científicos (ver Gurnon, Voss-Andeae y Stanley, 2013) entienden mejor los conceptos, mientras el público que experimenta el arte se interesa más por la ciencia que hay tras el arte.

En esta edición de *Roots* hemos pedido que varios profesionales vinculados a los jardines botánicos nos dieran su punto de vista sobre los artistas, educadores y

focusing his art on plants, and how he uses the gardens' plant collections to create the glass displays. While, land artist and garden designer Leon Kluge discusses his Living Beehive, which mixes innovative planting and traditional Zulu architecture to engage children with the importance of conserving ecosystems.

From the point of view of the botanic garden, Teodlinda Balcázar Sol and Javier Caballero discuss two projects in which Jardín Botánico de la Universidad Nacional Autónoma de México joined forces with artists to transform living collections, old pipes and sewers with installations, sculpture and painting to highlight the harmonious relationship between art and science.

Creative and well thought out landscape design can be a powerful tool for connecting people with nature. Janelle Hatherly showcases examples of 'art in the landscape' from across Australia. Whilst, Richard Piacentini and Sonja Bochart describe how biophilic design can be used to create inspirational spaces to engage audiences and improve human and environmental health.

But sometimes it's the taking part that counts and Nina Avila showcases the school programme at the Desert Botanic Garden in Phoenix, Arizona, which uses the concept of biomimicry to get students to think about the form and function of natural objects and inspire their own innovative designs. While at the Botanic Garden of Smith College in Northampton, USA, they are not only engaging students of all ages with science through practical art projects but also using these projects as an opportunity to study how small children learn.

And it's not just visual arts that can be used as powerful communication tools. Maria Amélia Martins-Loução, Gisela Gaio-Oliveira, Teresa Antunes and Ireneia Melo describe the subtle art of attracting people to Lisbon Botanic Garden through a variety of cultural events mixing music, games, performances, art, science and conservation.

Art in botanic gardens has been used from the day the institutions were established, in the form of botanical drawings which aimed to portray plants with scientific accuracy and level of detail for them to be recognized and

vue d'artistes, d'éducateurs et de directeurs de jardins dont l'administration a apporté un soutien à l'utilisation de l'art comme support en vue d'interpréter le monde végétal et de stimuler la compréhension des visiteurs concernant la nature ainsi que leur lien avec celle-ci. Nous découvrons l'avis d'artistes par le biais de questions-réponses avec Dale Chihuly par Tim Richardson, où ils discutent de la façon dont Chihuly a commencé à collaborer avec les jardins botaniques, de pourquoi il s'intéresse à tourner son art vers les plantes, et de la façon dont il utilise les collections de plantes des jardins pour créer les verrières. Par ailleurs, l'artiste du « land art » et paysagiste Leon Kluge explique sa ruche vivante, qui mélange des plantations innovantes et l'architecture traditionnelle zouloue pour impliquer les enfants quant à l'importance de la conservation des écosystèmes.

Pour illustrer le point de vue des jardins botaniques, Teodlinda Balcazar Sol et Javier Caballero discutent de deux projets dans lesquels le Jardín Botánico de la Universidad Nacional Autónoma de México s'est associé à des artistes afin de transformer les collections vivantes, les vieux conduits et les égouts grâce à des installations, des sculptures et des peintures pour souligner la relation harmonieuse entre l'art et la science.

Une conception paysagère créative et bien pensée peut être un outil puissant pour relier les individus à la nature. Janelle Hatherly présente des exemples d'« art dans le paysage » provenant de toute l'Australie. Aussi, Richard Piacentini et Sonja Bochart décrivent comment la conception qui tient compte du besoin de relation avec la nature (« biophilie ») peut être utilisée pour créer des espaces d'inspiration afin d'impliquer le public et d'améliorer la santé humaine et environnementale.

Mais parfois, c'est le fait de participer qui compte et Nina Avila présente le programme scolaire du Jardin botanique du désert à Phoenix, en Arizona, qui utilise le concept du biomimétisme pour encourager les étudiants à réfléchir à la forme et à la fonction d'objets naturels et à utiliser ces éléments pour en inspirer leurs propres conceptions innovantes. Au Jardin botanique du Smith College à Northampton aux États-Unis, il ne s'agit pas uniquement d'impliquer des

directores de los jardines cuyo liderazgo ha apoyado un mayor uso del arte como medio para interpretar el mundo de las plantas y aumentar tanto la comprensión de los visitantes como su conexión con la naturaleza.

Escuchamos la opinión de artistas a través de una entrevista con Dale Chihuly realizada por Tim Richardson en la cual debaten sobre cómo Chihuly comenzó a colaborar con los jardines botánicos, por qué le interesa centrar su arte en las plantas y cómo utiliza las colecciones de plantas del jardín para crear la exhibición de cristal. Mientras tanto, Leon Kluge, artista y diseñador de jardines, debate sobre su colmena viviente, la cual mezcla la arquitectura innovadora y la arquitectura Zulu tradicional para involucrar a los niños en la importancia de la conservación de los ecosistemas.

Desde el punto de vista del Jardín Botánico, Teolinda Balcázar Sol y Javier Caballero discuten dos proyectos en los cuales el Jardín Botánico de la Universidad Autónoma de México unió sus fuerzas con varios artistas para transformar las colecciones vivas, tuberías viejas y alcantarillas en esculturas y pinturas para destacar la armoniosa relación entre el arte y la ciencia.

El diseño de paisajes creativo y bien planificado puede ser una poderosa herramienta para conectar a las personas con la naturaleza. Janelle Hatherly muestra ejemplos de "arte en el paisaje" de toda Australia. Por otra parte, Richard Piacentini y Sonja Bochart muestran como el diseño biofílico puede usarse para crear espacios de inspiración que involucren al público y mejoren la salud humana y del medio ambiente.

Pero, en ocasiones, el hecho de formar parte es lo que cuenta y Nina Avila presenta el programa escolar del Desert Botanic Garden en Phoenix, Arizona, que usa el concepto de biomimetismo para que sus alumnos reflexionen acerca de la forma y la función de los objetos de la naturaleza y usarlos como inspiración para sus propios diseños innovadores. Mientras que el Botanic Garden of Smith College en Northampton, EEUU, no sólo involucra en la ciencia a estudiantes de todas las edades a través de proyectos artísticos prácticos, sino que usa estos



Xerekua (nests), sustainable art installation by Ana Isabel Guillén, Elizabeth Merchant and Tsanda Kutsi Salas (UNAM)

distinguished from other species. Considering the long tradition of the use of art in botanic gardens it is now time to question its purpose and effectiveness. Is art currently a medium that has been overused in botanic gardens and is being recycled and repeated, in its current form? Is art in botanic gardens banal or does it still have the power to bring innovative ways of communicating plant science to people and connecting them to plants? What is the current evidence from the practice of botanic gardens around the world and where can it lead?

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étudiants de tout âge dans la science par le biais de projets artistiques pratiques, mais également de se servir de ces projets comme opportunité pour étudier les moyens d'apprentissage des jeunes enfants.

Et il n'y a pas que les arts visuels qui puissent être utilisés en tant que puissants outils de communication. Maria Amélia Martins-Loução, Gisela Gaio-Oliveira, Teresa Antunes et Ireneia Melo décrit l'art subtil d'attirer les gens au Jardin botanique de Lisbonne grâce à une diversité d'évènements culturels qui mêlent la musique, les jeux, les spectacles, l'art, la science et la conservation.

L'art dans les jardins botaniques a été utilisé depuis le jour où les établissements ont été fondés, sous la forme de dessins botaniques dont le but était de représenter des plantes avec une précision scientifique et un niveau de détail leur permettant d'être reconnues et distinguées des autres espèces. Au vu de la longue tradition de l'utilisation de l'art dans les jardins botaniques, il est maintenant temps de questionner son objectif et son efficacité. L'art est-il actuellement un support qui a été surexploité dans les jardins botaniques et qui est recyclé et répété dans sa forme actuelle ? L'art dans les jardins botaniques est-il banal ou a-t-il encore la possibilité d'apporter des moyens innovants de communiquer sur la botanique auprès du public et de le relier aux plantes ? Quels sont les témoignages actuels découlant de l'expérience des jardins botaniques dans le monde et à quoi cela peut-il mener ?

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proyectos como una oportunidad para estudiar como aprenden los niños más pequeños.

Y no es sólo que las artes visuales puedan ser utilizadas como poderosas armas de comunicación. Maria Amélia Martins-Loução, Gisela Gaio-Oliveira, Teresa Antunes y Ireneia Melo describe el sutil arte de atraer a la gente al Jardín Botánico de Lisboa a través de una amplia variedad de eventos culturales mezclando música, juegos, espectáculos, arte, ciencia y conservación.

El arte en los jardines botánicos se ha usado desde el día en que se fundaron las instituciones, en forma de dibujos botánicos que pretendían representar las plantas con exactitud científica y nivel de detalle para poder reconocerlas y distinguir las de otras especies. Considerando la larga tradición del uso del arte en los jardines botánicos, ha llegado el momento de cuestionar su propósito y efectividad. ¿Es actualmente el arte un medio que ha sido utilizado en exceso en los jardines botánicos y está siendo reciclado y repetido? ¿Es el arte algo banal en los jardines botánicos o tiene aún el poder de ser una herramienta innovadora para comunicar la botánica a las personas conectándolas con las plantas? ¿Qué evidencias existen en la actualidad sobre las prácticas en los jardines botánicos de todo el mundo y hacia dónde conducen?

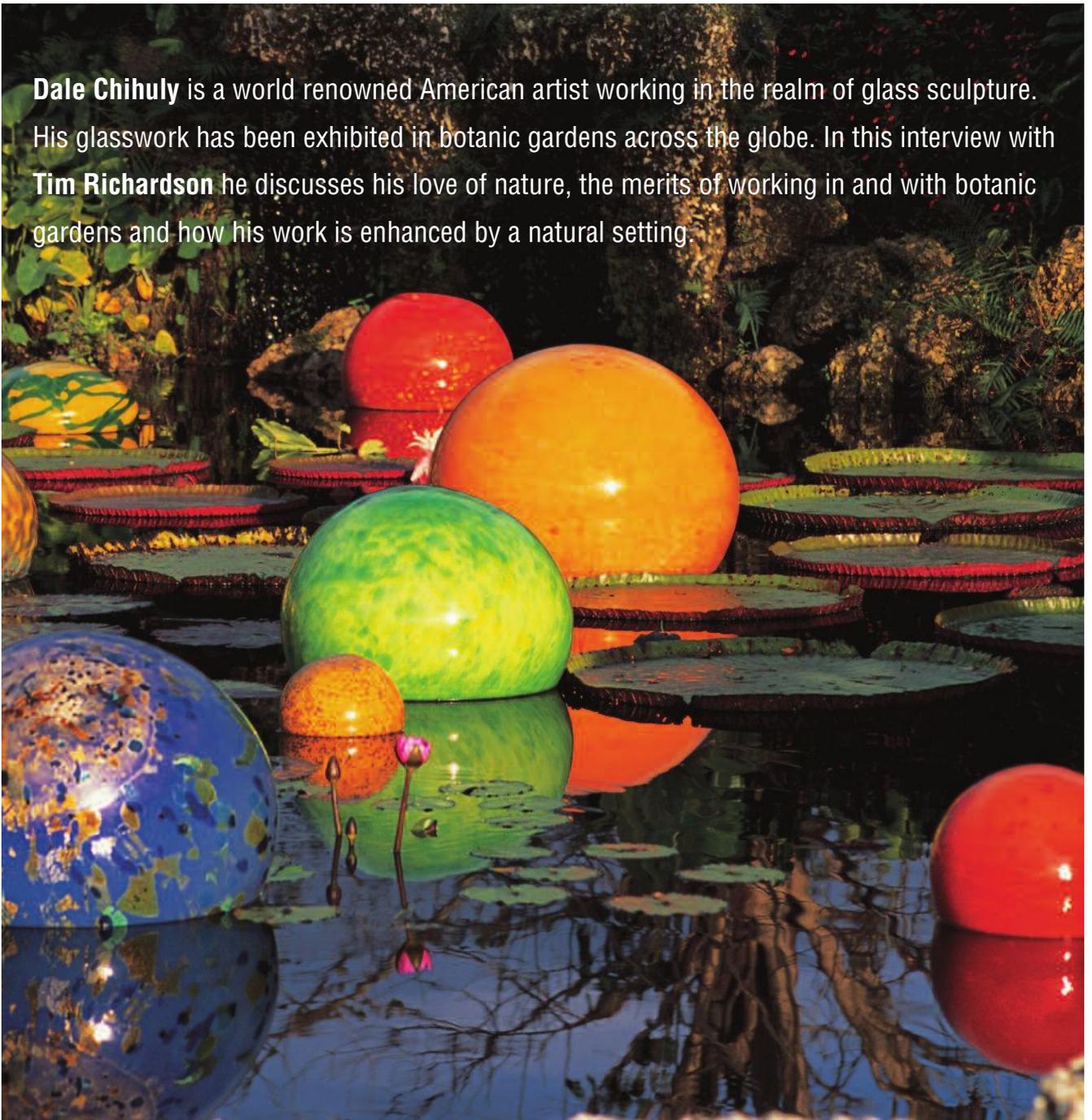
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Glass in the gardens:

an interview with Dale Chihuly

Dale Chihuly is a world renowned American artist working in the realm of glass sculpture. His glasswork has been exhibited in botanic gardens across the globe. In this interview with **Tim Richardson** he discusses his love of nature, the merits of working in and with botanic gardens and how his work is enhanced by a natural setting.



Nijima Floats, 2005, Fairchild Tropical Botanic Garden, Florida (Dale Chihuly)

Dale Chihuly is a Seattle-based glass artist who developed his unique style in the late 1960s and 1970s, when he taught at the Rhode Island School of Design and then at his own Pilchuck Glass School in Washington State. Chihuly's work is exhibited in major museums and galleries worldwide. His botanic garden series began in 2001 with an installation of his glass forms among the plants at the Garfield Park Conservatory, Chicago. Chihuly exhibited at the Royal Botanic Gardens, Kew, London in 2005. Other botanic garden venues include New York Botanical Garden (2006), Fairchild Tropical Botanic Garden (2006, 2007), Missouri Botanical Garden

(2007), Phipps Conservatory (2007), Desert Botanical Garden (2008, 2013) Franklin Park Conservatory (2009), Cheekwood Botanical Garden and Museum of Art (2010), Frederick Meijer Gardens & Sculpture Park (2010), Dallas Arboretum (2012) and Denver Botanic Gardens (2014). An estimated 8 million people have visited Chihuly's botanic garden shows, the most popular being the show at Missouri.

Here Dale Chihuly (DC) talks to Tim Richardson (TR), a contemporary landscape critic and author who contributed an essay to the book *Chihuly Garden Installations* (2011), about the nature of his work in botanic garden settings.

TR: Did you have any interest in plants and gardens in childhood or in the earlier part of your career?

DC: I grew up in a house that had a large garden [in Tacoma, Washington]. My mother worked in the garden every day, about eight hours a day. It had about 90 rhododendrons and azaleas and I would play in the garden with my little toy soldiers and so on. I would play in the garden but I never helped my mother. I don't know why that is - I loved seeing the flowers but I never gardened. Every now and then after I left she would find a little toy soldier.

TR: What are the practical challenges of working in botanic gardens? Did you find that the scientific remit of these institutions had any impact on the work, the way it is presented and its reception by both visitors and staff?

DC: The botanic gardens were just so helpful - more so than working with a museum or gallery, in my experience. They worked with us in terms of lighting, planting, pruning and cleaning. The directors got very engaged with what we were doing - always very excited. In most cases they'd seen my work at another institution so they had a pretty good idea of what it was going to be.

TR: Is there a fundamental difference, for you, between working with plants in glasshouses and working out of doors?

DC: It all started off at Garfield Park in Chicago. That was a huge glasshouse: 50,000 sq ft. I've always loved glasshouses and I felt quite comfortable in them. Later we started working outside and in places where there were hardly any glasshouses. I found there was not a real difference working indoors and outside - you just had to get used to it. I probably do prefer the installations being outside. It seems so natural. At Chihuly Garden and Glass [in Seattle] visitors have the interior situation - eight interiors - then a glasshouse I designed, and then they go outside into the garden. We take photographs of people in the space and we often ask them which was their favourite. I'm always stunned



The Sun, New York Botanical Garden, installed 2006 (Dale Chihuly)



Macchia Forest, 2007, Phipps Conservatory and Botanical Gardens, Pennsylvania (Dale Chihuly)

by how popular the garden installation is. We have 600,000 people a year and a lot of them are probably gardeners, so they can relate to the outside.

TR: The episodic nature and the rhythm of the botanic garden shows seems to be extremely important. How do you work that out?

DC: I just trust my gut. If I make each piece work well then they all go together as a whole. We don't try to create a particular rhythm - we just try to make each installation as beautiful as we can. They should work together naturally.

TR: Can you describe the challenges and potential of creating installations and episodes which function at night-time? Does nightfall fundamentally alter the character of installations and episodes, or does it deepen what is already there?

DC: We didn't do the night shows as much in the beginning. We were working on the inside, mainly, and the glasshouses weren't open at night. But once we started working outside we did a lot more. The most important thing is the lighting. We found that once [botanic garden staff] had seen one of the shows with night lighting, they were convinced they wanted it, too. Some people prefer it at night, some in the day. The two experiences are totally different. For one thing you light up the installation. It stands on its own against darkness. The difference [between night and day] is like taking a photo of something against a black background, not a white background. We like people to be able to see both. When we sell a ticket for a Chihuly garden show, people always have an option to come back at night to see it. I do have a lighting person, Steve Cochran, who always works hand in hand with the garden.

TR: The garden shows are quite theatrical in flavour. What role do the visitors/audience play, if any?

DC: I do see them as theatre. Even on the inside, when I do shows in glasshouses, it's theatrical, and that has a lot to do with the lighting.

TR: Do you like the gardens to be full of people, or is it better to view the works in solitude?

DC: I tend to like it with a lot of people, as I know more people are enjoying the work. I think people feel good about the fact they are seeing something they are liking and other people are enjoying it as well. It's like when you go to a great show of Van Gogh paintings; there are by definition a lot of people in that gallery, yet you enjoy the paintings just as much as if you were alone.

TR: I have tried to make comparisons between the development of your series of forms in glass and the way plants develop and vary in nature through a process of natural selection. Does that comparison make sense to you?

DC: The way I work with glass is very organic - it's a natural way of making glass pieces using centrifugal force, heat and gravity.

TR: At what point in your development as an artist did apparently organic forms start to become important to you? To what extent did these forms arise from the properties of glass itself?

DC: It's been like that from the very beginning. Traditionally glass forms were always made in a symmetrical way. What I did was start to make new and different forms.

TR: In terms of the plant types your pieces 'work' with - or against, or entwine with - do you favour exotic in general, i.e. strident forms and bright colours, or are there examples of you working with quieter forms of plantlife, or native plants?

DC: So much of it has to do with the way I feel at the time, when I do my walk around the garden. It's really what I want to do at that time.



Chihuly Garden and Glass, 2012, Seattle, Washington (Dale Chihuly)

I take in the atmosphere, the plantlife and so on. It's been that way from the beginning of the series until the end.

TR: Are there any noticeable similarities between the many botanic garden settings in which you have worked? Do you come across the same issues and opportunities again and again, or does it always feel new?

DC: I found them all different. I've never been to one where I felt I was looking at the same place again. There are all kinds of different things in a garden which allow me to make an installation. Going around looking at [different botanic gardens], I'm fortunate to be able to pick and choose where I want to work.

TR: Has the experience of working in botanic gardens changed the direction and nature of your work, would you say, or is it simply another way of showing off the works?

DC: It has certainly added a great deal. One major installation is Millefiori. That would not have developed without working in the gardens. It's a garden in itself and it made a big difference that it was to be sited outside.

TR: Is it your intention to create a sense of a total work of art with each of these garden shows, and if so how do you aim to achieve that?

DC: There is some of that. I think of them [the installations] as detailed individual projects but it can be that all the parts make up one big, beautiful installation. A lot of [the botanic garden shows] feel like a complete project.

Chihuly is creating a new exhibition at the Fairchild Tropical Botanic Garden in December 2014.

RÉSUMÉ

Le travail de l'artiste Dale Chihuly basé à Seattle peut se découvrir dans des musées et galeries du monde entier. En 2001, il a commencé à développer des installations pour les jardins botaniques, jusqu'à présent exposées dans quelques-uns des jardins botaniques les plus reconnus à travers le monde, notamment le Jardin botanique tropical de Fairchild, les Jardins botaniques royaux de Kew, le Jardin botanique de Missouri et bien d'autres. Dans cet entretien, l'artiste échange avec l'auteur et critique contemporain en paysagisme, Tim Richardson. Ensemble, ils discutent des relations tissées par Chihuly avec les plantes, des défis et des opportunités de travailler dans et avec les jardins botaniques et de la relation qui existe entre le travail de l'artiste et les décors naturels.

RESUMEN

La obra del artista afincado en Seattle Dale Chihuly se puede contemplar en museos y galerías de todo el mundo. En 2001, comenzó a desarrollar instalaciones para jardines botánicos. Hasta ahora, se exhiben en algunos de los jardines botánicos más respetados en todo el mundo, incluyendo el Jardín Botánico Tropical de Fairchild, los Reales Jardines Botánicos de Kew, el Jardín Botánico de Missouri y muchos más. En esta entrevista el artista habla con el crítico de paisaje contemporáneo y autor, Tim Richardson. Los dos debaten sobre la relación de Chihuly con las plantas, los retos y las oportunidades de trabajar con y en los jardines botánicos y sobre la relación entre la obra del artista y los entornos naturales.

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Bringing science and arts together for plant conservation

The Jardín Botánico del Instituto de Biología de la Universidad Nacional Autónoma de México (UNAM) is collaborating with young artists – committed to sustainable art and the environment. **Teodolinda Balcazar Sol** and **Javier Caballero** explain how the artists' work has transformed sewer covers and enhanced living displays to communicate the connection between culture and nature to the public.

Given that the Jardín Botánico del Instituto de Biología, UNAM in Mexico receives over one hundred thousand visitors each year the Mexican ministry of public education (SEP) has recognized it as an ideal location to engage adults and children with botany. The botanic garden is committed to achieving the goals of the Global Strategy for Plant Conservation (GSPC) (BGCI, 2002; Caballero *et al.*, 2012) and therefore the garden's program of guided visits, workshops, and educational activities, directed at the general public, aim to build a culture of conservation surrounding the flora of Mexico.

Since its creation, the botanic garden has been the stage for a variety of visual and performance arts. Along its 55 years of existence our garden has hosted painting (Hernández, *et al* 1994a) and sculpture exhibitions as well as theater, and for the past 25 years has offered spring and fall concert seasons annually (Hernández *et al.*, 1994b; Balcázar *et al.*, 1997).

In compliance with Target 14 of the GSPC regarding education, the botanic garden invited young enthusiastic artists, committed to contributing to a harmonious and sustainable relationship between nature and culture, to develop innovative activities which blend science and the arts. The activities aimed to raise public awareness for conserving biodiversity.

Two successful projects were *Art of the Earth* and *Urban Nature*. In the exhibition *Art of the Earth*, held in 2010, a series of installations were interwoven with the garden's plant collections to highlight the beauty of nature and the need to prevent its destruction (Anonymous, 2010). In the



Xerekua (nests) by Ana Isabel Guillén, Elizabeth Merchant and Tsanda Kutsi Salas, this interactive art aims to connect people with nature. Art included in the Earth exhibition (UNAM)



Visitors investigating Florecimiento by Felix Carranza (UNAM)

In the third phase garden senior staff and representatives of the artists' groups, critically reviewed the proposals. The garden staff and the artists jointly decided the location of each artwork, so that the installations would be integrated into the display area and the impact on visitors would be maximized.

In both cases, the results of the exhibitions surpassed our expectations. Twenty-four pieces of art were displayed in the garden as the result of the work of over forty artists participating either individually or as a group. The installations presented mythological creatures as well as conservation ideas, endangered species, biological processes, environmental issues, and the relevance botanic gardens to society. Tables 1 and 2 describe the works of art exhibited in the two projects.

exhibition *Urban Nature*, in 2012, artists were invited to transform the pipelines, sewer boxes and manhole covers as these were left as scars of urban expansion in areas of the garden by contractors and engineers. The artists painted and sculpted native and mythic plants and animals representing the urban spaces return to nature. *Art of the Earth* was financed by external funds obtained by the participating artists and *Urban Nature* was funded by the botanic garden.

Integration of science and art

The work displayed in both exhibitions was focused on establishing a shared language and a vision between scientists and artists. The process took place in three phases. In the first phase, talks and guided tours informed the artists about the objectives, structure, and function of the botanic garden, and its relevance to education and conservation (Caballero, *et al.*, 2010). Artists were also made aware of the considerations they must pay to the living collections and the limitations they may pose to the design and installation of their works of art. It was decided that the artists would use biodegradable materials, preferably of natural origin, or recycled.

During the second phase artists developed their proposals including honing their conceptual foundations, producing images or models of their project and deciding the materials to be used.

Table 1. Examples of artwork exhibited as part of *Art of the Earth*

Name of the Work and Artist(s)	Description
<i>Florecimiento</i> (Blossom) Felix Carranza	A giant flower made out of fabric and wood symbolizing the negative impact of humans on the ecological balance
<i>Invasion</i> (Invasion) Eliana Muhlia	Wire and rubber objects displayed in various locations across the garden. These represented invasive insect species and symbolized our fear of the 'other' which may be harmless elements of nature with which we coexist
<i>Urbanucactus eolici</i> Ariadna Gómez	Industrial artifacts used in air circulation devices simulating the shape and function of <i>Globose cacti</i> (<i>Mammillaria</i>).
<i>Basilisco Urbano</i> (Urban basilisk) Thania Estrada	Water snake made out of ceramic parts and plastic bottles representing the disturbance of ecological balance due to the introduction of alien species
<i>Efecto Dominó</i> (Domino effect) Exa Sánchez	Rectangular installations placed on the grass forming an interactive mosaic which represented the impact of urbanization and the ecosystem resilience
<i>Xerekua</i> Ana Isabel Guillén, Elizabeth Merchant & Tsanda Kutsi Salas	Nests made out of seeds and other plant materials representing the role of women in the oral tradition and the link between nature and culture

Table 2. Examples of artwork exhibited as part of Urban Nature

Name of the Work	Theme
<i>Victoriae reginae</i> Abigail Hernández	Installation inspired by the endemic species of Mexican agave, <i>Agave victoria-reginae</i> , which is threatened by extinction. The plant is also the emblem of the botanic garden of UNAM
<i>Tigridia</i> Andrea Garduño	Artwork representing <i>Tigridia pavonia</i> , one of the most beautiful Mexican flowers which is also used for medicine and food.
<i>Alegoría a la Conejera</i> (Allegory of the rabbit hole) Antonio "Topoi" Alborez	Inspired by the magic of stories and the botanic garden
<i>Axolote</i> Inés Barrón	Inspired by an emblematic species endemic to the lacustrine zone in southern Mexico City. The artwork is a metaphor for the <i>ex situ</i> conservation at the botanic garden
<i>Flor de la Vida</i> (Flower of life) Sara Gabriela Silva	Represents the diverse manifestations of life
<i>El Ritual</i> (The ritual) Yael Sol-Luna	Captures the beauty of metamorphosis of butterflies and reveals the transformation of life
<i>Cactus</i> Felix Carranza	Represents cactuses as species resistant to hostile environment containing liquid essential for life

Hundreds of visitors were engaged with the exhibitions and interacted with the pieces of art. Artists and environmental educators provided guided tours to the public, bringing together art and science and providing a space for dialogue. Bringing these worlds together was a communication challenge, given that the artists' work often does not require explanation, while the visitors to a botanic garden expect description and interpretation of what they are observing. As a solution to this challenge the artist collaborated with the educator, so that the information they provided to visitors was complementary; while the artist spoke about their work, the educator could refer to biology topics relevant to it.

The public was encouraged to contribute to the projects in different ways. In *Art of the Earth*, some of the work allowed and invited interactions such as climbing to nests or moving domino tiles. During *Urban Nature* the public were asked to

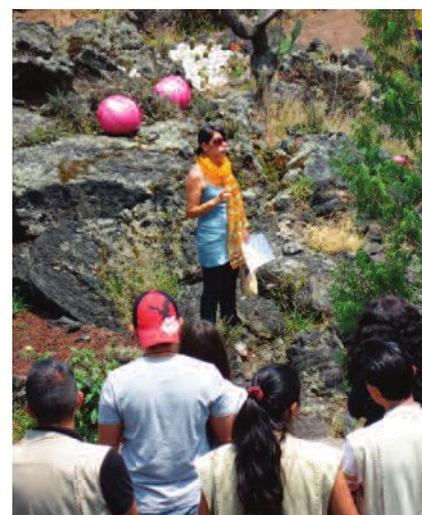
vote for the best art work in the exhibition. This captured their interest in art activities, and stimulated discussions about the structural, conceptual and biological aspects of each art work exhibited. The exhibitions enabled the garden to bring new and innovative art to the public which in turn has allowed them and the garden staff to explore new methods for communicating biodiversity conservation messages.

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Visitors listen to Ariadna Gómez talk about the creation of *Urbanucactus eolici* (UNAM)

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RÉSUMÉ

Afin de développer une approche originale pour sensibiliser le public à la conservation de la biodiversité, le Jardin botanique de l'UNAM s'est associé récemment à des artistes, jeunes et enthousiastes, qui ont la volonté de travailler de façon durable et harmonieuse avec la nature et la culture. Les expositions « Arte de la Tierra » et « Urban Nature » sont les deux projets qui ont été réalisés et qui ont remporté un franc succès. La première exposition consistait en une série d'installations intégrées à la collection de plantes vivantes pour sensibiliser le public à la beauté de la nature et sur l'importance d'arrêter de la détruire. Pour la seconde, les artistes devaient transformer les tuyaux et les égouts laissés par les ingénieurs et les constructeurs dans divers endroits du Jardin botanique. Les artistes ont peint et sculpté des plantes et des animaux natifs et mythiques dessus pour représenter le retour de la nature dans les espaces urbains. Les visiteurs étaient invités à interagir avec les oeuvres pour découvrir la connexion entre art et science et apprendre pourquoi la biodiversité est essentielle à leur vie.



Decorated sewer cover from the exhibition Urban Nature (UNAM)

RESUMEN

Con la meta de crear conciencia de la biodiversidad y conservación para el público visitante, el Jardín Botánico de la UNAM junto con un grupo entusiasta y diligente de jóvenes artistas unieron sus esfuerzos recientemente en un trabajo sustentable conectando armoniosamente naturaleza y cultura, resultando en exposiciones de dos proyectos principales: El Arte de la Tierra y Naturaleza Urbana. El primero consistió en incorporar la colección de plantas vivas del jardín, combinando la belleza y su naturaleza y la necesidad de detener su destrucción. En el segundo, artistas tuvieron como tarea transformar los restos de fontanería y cañería de desagüe en varias áreas del jardín botánico que habían sido abandonados por ingenieros y constructores. En estos materiales los artistas pintaron

y esculpieron imágenes de plantas y animales nativos y míticos de esta manera representando el regreso a la naturaleza a partir de un espacio urbano. El público visitante fue invitado a interactuar con el trabajo de esta tarea y así aprendieron los lazos que existen entre el arte, ciencia y que tan esencial es la biodiversidad para sus vidas.

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Art as a gateway to the botanical world



*A kindergarten child's painting based on the Spring Bulb Show and exhibited at Smith College.
See full exhibition: <http://www.smith.edu/garden/exhibits/edc231/> (Smith College)*

Pavilions inspired by flowers, Pompeian flower boxes and lithographs based on chrysanthemum dissections. **Madelaine Zadik** describes how the Botanic Garden of Smith College is utilising the wealth of creativity on its doorstep by collaborating with students to highlight the relevance of plants to people's lives.

Connecting people with plants is intrinsic to botanic gardens' mission to educate about the science, beauty and importance of the plant kingdom. Gardens are great learning environments and can reach people on an emotional, physical, intellectual and even spiritual level. Yet, not everyone is instinctively drawn to plants and gardens, so often we do not reach those without a preexisting botanical inclination. Finding new ways of reaching out to these groups and getting them excited about plants is an ongoing challenge. Art offers a communication channel that creates an inviting way in, is accessible to a wider public, and therefore enables gardens to better serve as advocates for the plant world.

At the Botanic Garden of Smith College, Massachusetts hosting art related exhibitions, including those displaying botanical printing, floral x-rays, and plants transformed into works of art has been successful in appealing to broader audiences and providing new ways of looking at plants. However, we were still seeking methods to provide the public with more active ways of engaging with plants.

Being situated in a small liberal arts college, our primary audience is the college community. However, many students don't necessarily feel the botanic garden is relevant to them, especially those majoring in engineering, dance, architecture, or other non-botanical subjects. Not connecting with this audience, right at our doorstep, means our wonderful conservatory and gardens were being missed by far too many. Our academic setting offers a wealth of disciplines and expertise which can be utilized to widen our audiences. Perhaps we need to get a little out of our comfort zone to create learning environments where students interact with our plant collections in unexpected ways. Involving faculty outside of the biological sciences to use our plant collection and gardens as pedagogical tools represented such an opportunity.

We began with two art professors running courses using the botanic garden as a teaching tool. The first taught lithography and the second art history. The lithography students had little science background, but with help from our staff they learned all about chrysanthemums in a variety of hands-on activities—studying floral anatomy, dissecting flowers, and even attempting hybridization. The course culminated in an exhibition of lithographs, inspired and informed by their investigations surrounding chrysanthemums. The art history class explored the role of plants in Pompeian life. Students planted Pompeian flower boxes, while researching the culinary, medicinal and ornamental uses of these plants. They learned how archaeological palynology (pollen study) has helped identify plants growing in the ancient city. An exhibition, *Pompeian Gardens: Illustrations from A Pompeian Herbal* with drawings by Wilhelmina Jashemski, was hosted in the art department gallery. In both cases, art students never expected to be engaging with the botanic garden when they registered for their classes. Many admitted they would not have otherwise stepped foot inside our facility, yet we were able to provide a window into the botanical realm and get them directly interacting with plants.

Our two most successful art related projects involved an architecture class and an education class, both producing exhibitions for the general public. These projects were particularly successful because of how involved and creative the professors of these classes became. Relying on the faculty's expertise in their respective fields assured that the botanical component of the classes was totally integrated with the class syllabus.

The botanical architecture project provided a perfect interdisciplinary approach to our plant collection. Students in *Introduction to Architecture: Language and Craft* (a studio art class), were given the task of reinterpreting the "spatial language of a flower". The assignments required close botanical observation: each student chose a flower, photographed it, and analyzed its spatial character in terms of architectural organizational principles. Students developed their own vocabulary for describing what they observed. They built models to abstractly represent the flower according to this visual language. Finally, they used what they learned from the floral architecture to design an outdoor pavilion. Through this process students learned about form and function in plants, discovering that



Pavilion design process by architecture student at Smith College as exhibited in project exhibition. See full exhibition at: <http://www.smith.edu/future/NewsEvents11/ArtExhibit11> (Pamela Dods)



Children investigating leaves as part of the Foundations and Issues of Early Childhood Education project (Susan Etheredge)

architectural and biological forms have much in common, including structure, circulation, and the influence of other factors such as sunlight, air, and water. Their photographs, models, and final projects were displayed in our exhibition gallery, wowing and surprising visitors, staff and students alike. Unsuspecting visitors became immersed in the connections between architectural and biological forms. It was a valuable learning experience for everyone, including the botanic garden staff. I am the first to admit that this project forever changed how I look at flowers!

For the education class, our conservatory became a living laboratory for a semester-long investigation of leaves. Students in Foundations and Issues of Early Childhood Education

were paired with kindergarten children from the Smith College Campus School. Our staff worked closely with the education professor and the kindergarten teachers to develop a leaf study curriculum. The goal was that, while the education students were engaged in guiding botanical explorations, they would gain first-hand experience of inquiry-based teaching and learning contexts for young children. Together the college students and children looked closely at leaves in the greenhouses and in the classroom and learned to use hand lenses and microscopes. They described the leaves using scientific language, but also employed art as a study tool. They sketched the leaves, traced them, painted them, made rubbings of them, and photographed them. Additionally, they read poetry and books about leaves and kept journals and field notebooks.

The leaf study laid the groundwork for the students' exploration of our Spring Bulb Show. Using the visual arts as a tool for recording information in their scientific studies, the children became immersed in a painting exercise. The Campus School art curriculum focuses on developing students' individual expression and students had already been exposed to a variety of materials and techniques. They were given specific instructions for looking at the flowers. They used a "thinking pen" (a marker with the cap still on) to plan their



A child and a college student investigate leaves in the botanic garden as part of the Foundations and Issues of Early Childhood Education project (Susan Etheredge)

drawings before actually taking the cap off and recording their observations. As they formulated how to record what they saw, any mistakes could be corrected before marking the paper. After the pen drawing, they added watercolors. Everyone was so taken with the paintings and as a result, although not originally planned, we created an exhibition that has been on show several times and can still be found online. Every time the paintings are exhibited, the public response is very positive. People are astonished that the work is created by such young children and want to know more about the project. They also frequently ask to buy cards or prints. It is very rewarding to see how the children's paintings strike such a cord with the visiting public. This project seemed especially fruitful because we managed to engage several types of audiences: the teachers, the college students, the kindergarten children and the general public.



Tracing leaves as part of the Foundations and Issues of Early Childhood Education project (Susan Etheredge)

Developing good relationships with professors (we hired a consultant to help us) and allowing faculty members the freedom to create projects that we could/would not do without their expertise has been crucial. Sometimes this can be scary, as it is uncharted territory. While some projects have been less effective, successful ones have been repeated. These forays into atypical projects have shown how art can function as much more than simply a lure. It can transform our audiences' experiences with our plant collection. When we spark our visitors' curiosity, it triggers their desire to know more. The trick is continually finding new ways to do this.

RÉSUMÉ

Connecter les gens avec les plantes est inhérent à la mission du Jardin botanique du Smith College, mais souvent nous touchons seulement ceux qui ont déjà un attrait pour la botanique. L'art offre une nouvelle voie pour attirer un public plus large que notre public habituel en fournissant une porte d'entrée attrayante et accessible. Deux projets, qui ont connu du succès et qui impliquaient des étudiants d'âges différents, étaient axés sur l'observation. Des étudiants en architecture ont photographié une fleur et ont analysé ses caractéristiques spatiales, puis ils ont utilisé ces

informations pour construire des maquettes et concevoir un pavillon. Nos serres ont servi de laboratoire vivant lors d'une animation pédagogique destinée à de jeunes enfants. Des collégiens ont étudié comment des enfants de maternelle apprenaient lorsqu'ils étaient engagés dans des activités basées sur l'investigation en étudiant des feuilles. Chaque projet a débouché sur une exposition publique qui a permis de toucher un plus large public. Nous avons exposé les maquettes que les étudiants en architecture ont utilisées pour analyser les fleurs et les pavillons qu'ils ont conçus. L'exposition des maternelles représentait des dessins.

RESUMEN

La conexión planta y gente es intrínseca en la misión del Jardín Botánico del colegio Smith, aunque frecuentemente alcanza únicamente a aquellas personas que ya tienen una inclinación botánica. El arte por su parte ofrece una manera nueva de atraer a un público mayor o diferente unido a quienes ya tienen un interés en las plantas, esta manera es más atractiva y accesible. Estudiantes de diferentes edades fueron los participantes de dos proyectos exitosos enfocados a la observación. Los de arquitectura fotografiaron una flor y analizaron su carácter espacial, la información generada fue usada para

elaborar modelos y diseñar un pabellón. Por otro lado los de educación infantil, el invernadero fue el laboratorio viviente donde los futuros arquitectos observaron como los pequeños de un jardín preescolar aprenden mientras observaban hojas y responden a preguntas específicas. Las exposiciones públicas de ambos proyectos se proyectaron aun mas mostrándose al público visitante. Tanto los modelos arquitectónicos producidos del análisis de las flores y los pabellones diseñados por estudiantes, como las acuarelas originales que los niños crearon usando su motivación y 'la pluma que piensa'. Ambas exposiciones proporcionaron evidencia de la inspiración y aprendizaje en la interacción gente/planta.

For information about Foundations and Issues of Early Childhood Education visit: <http://www.smith.edu/garden/exhibits/edc231/> or to view the botanical architecture exhibition visit: <http://www.smith.edu/future/NewsEvents11/ArtExhibit11>

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The Living Beehive: innovative garden design to engage children with conservation

Leon Kluge - innovative garden designer and land artist - has had a close relationship with plants his whole life. Here he describes how his Living Beehive has been designed to illustrate some of South Africa's precious ecosystems. His art aims to reconnect children with the natural world by highlighting our reliance on nature.

I had and still have a very close and special bond with botanic gardens; looking back now I had such a unique and privileged childhood growing up, living and playing inside the boundaries of a garden; my father was the curator of the Lowveld Botanical Gardens in Nelspruit, South Africa, and my grandfather was the curator of the Harold Porter Botanical Gardens in Betty's Bay, South Africa. I was basically born into a life of plants and so growing up, weekends would not be spent in a mall, but rather on outings with the orchid society or the local rare plant society looking for strange and wonderful plants in the mountains of eastern Africa. On these expeditions there would be people from all walks of life with one common link, the love for plants and the immense knowledge on flora and fauna they had gathered over the years and shared eagerly and freely with me. Learning so much about nature from a young age made me understand its value to humans, and the importance of conserving it.



Leon Kluge and David Davidson, who was part of the dome construction, in front of the Living Beehive (Leon Kluge)

Looking at the society in South Africa today I cannot help but wonder: "how are we going to cultivate more appreciation and love for our local natural heritage if the upcoming younger generations aren't exposed to nature in some way or form like I was from a young age? How can you love and appreciate something if you haven't spent time with it?"

Whilst giving a gardening talk to a group of school kids, it shocked me that when I put a simple question to them: "where does water come from?" I got the answer: "the shops".

I don't know what about that answer should have been more worrisome to me: the fact that they cannot just drink

water from the tap anymore, or the fact that rain, rivers and springs never even came up as a possible answer?

We have a lot of catching up to do, if we want that mindset to change. But we cannot blame the kids for not knowing where clean water, strawberries or even sugar come from. They need to see, smell



Interpretation panel explaining the construction of the Living Beehive (Leon Kluge)

and touch the strawberry on the plant or break open the sugar cane themselves; that's how the seed of wanting to know more about nature gets planted in a child.

This is where landscape artists such as me can help, by working closely with botanic gardens to educate the future generations and generate a bigger appreciation of nature in all its forms.

The South African Biodiversity Institute invited me to create the Living Beehive. This project became a garden installation that would explain the importance of keeping all our different and extremely threatened ecosystems alive and healthy and the important role the different ecosystems have in working as one massive filter to provide rural farmers and city dwellers of KwaZulu-Natal their clean drinking water. Living Beehive is based on South Africa's impressive biodiversity and its importance to providing clean water.

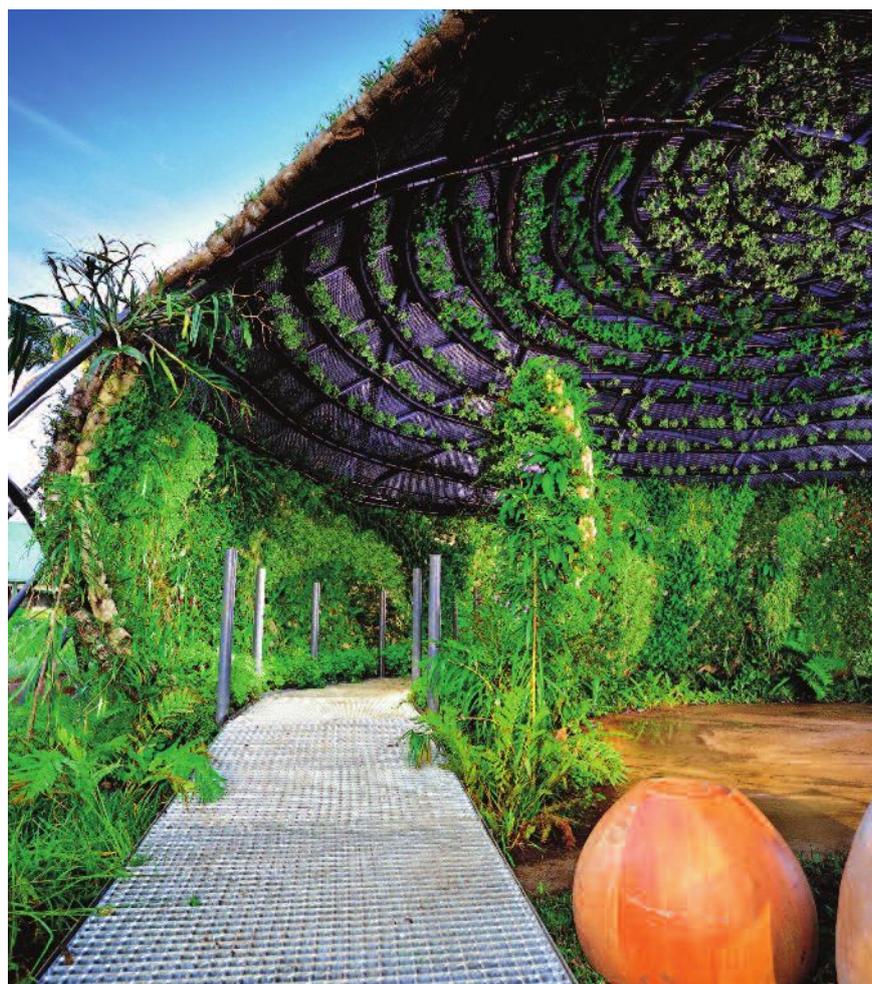
The shape and name of the dome derives from the early Zulu grass huts that were in and around the Durban area a long time ago; these were called beehive huts. Just as the early huts were made out of local grass, the outside of the dome of the Living Beehive is planted with a carefully chosen plant pallet consisting of mainly living grasses, some bulbous plants and other interesting plant species that add variety and color. For example, a wide range of Kniphofias and Dieramas have been chosen, which are part of the flora of the highlands of KwaZulu-Natal. This mountainous area is called the Drakensberg and its endless grasslands

and vistas are one of the true natural wonders of the world. This is where most of southern Africa's rainfall occurs. This is the starting point for the journey from

raindrops to drinking water supplying almost all of South Africa's main urban centres and the millions of people living in them. The grasslands are important because they provide clean water as well as providing grazing for livestock, medicinal plants and preventing soil erosion.

Underneath the grassed outer space of the Living Beehive, a walkway meanders through the inside of the dome, surrounded by vertical walls planted with species found only on the natural cliff-sides on the escarpments of the Drakensberg. These are the plants that very few people get to see, plants that have no fear of heights and thrive on the mist of the tumbling white waterfalls, plants such as Streptocarpus, Begonias, Impatiens and many more.

The ceiling, on the inside of the dome, is planted with local creepers found in the dense forests surrounding the city of



The walkway meanders through the inside of the Living Beehive, where the planting symbolizes dense forest and wetlands (Leon Kluge)

Durban; they hang from the ceiling creating a chandelier of foliage, giving the dome the atmosphere of a fairy-tale.

The water's journey does not end there; from the massive waterfalls the water travels through forest to the coastal wetlands, and so in the dome the water flows from the vertical greened walls into the wetland on the ground below, showcasing the plants that would occur in this environment and explaining each and everyone's role in the journey. All excess water in the dome gets caught up in a Holding tank underground to be recycled and used again.

We also provided a floor space inside the dome with grassed mounds that act as seating areas for people wandering through the Living Beehive. This little amphitheater acts as the perfect outdoor classroom.

The Living Beehive brings together people, engineering and biodiversity to show the type of innovative design and thinking that will reconnect people to nature. By investing in our natural resources we can create thousands of jobs. Greater investment in biodiversity can provide society with a wealth of services that can support service delivery and job creation in a low carbon economy.

Traditional botanic gardens are beautiful and amazing to have a picnic in, but they need to keep up with the times, to attract a younger crowd. That means exploiting partnerships between experts, such as artists, landscapers, land artists, architects, engineers and many more to create innovative gardens like the Living Beehive. If the budget is available, projects like the Gardens by the Bay in Singapore, also prove over and over again through the number of eager feet entering the gates every day, that gardens, art and technology can work in harmony to make the younger generations come out from behind the TV screens and experience sunshine and learn about mother nature.

RÉSUMÉ

Pour une vie saine, il est essentiel d'avoir des écosystèmes intacts et salubres qui fournissent une eau potable aux villes d'Afrique. Cependant, l'eau est une ressource qui devient de plus en plus rare à cause de la destruction des

prairies et des zones humides d'altitude. Pour communiquer auprès des enfants sur l'importance de maintenir ces écosystèmes, j'ai conçu une structure basée sur une hutte zouloue traditionnelle en forme de ruche. Le toit vert représente nos escarpements herbeux riches et diversifiés et qui sont les zones de captage pour la plupart de notre eau potable. A l'intérieur, c'est un espace pédagogique entouré d'une paroi et surmonté d'un plafond jardiné avec des plantes endémiques des falaises, rares et sensationnelles, plantées pour décrire le chemin suivi par l'eau à travers les différents écosystèmes avant d'arriver jusqu'à nos robinets. Pour former de futures générations plus vertes, il faut permettre aux enfants d'avoir à un contact proche avec la nature. Impliquer les artistes pour qu'ils jouent avec les plantes et l'ingénierie humaine est un moyen extrêmement efficace pour sensibiliser les enfants sur l'importance de conserver une planète saine. Fusionner les deux permet de créer des outils éducatifs excitants pour les jardins botaniques.

RESUMEN

El abastecimiento de agua potable para ciudades africanas asegura ecosistemas sanos que son esenciales para el buen vivir. Sin embargo, debido a la destrucción de mantos acuáticos y

sabanas, día con día este recurso está siendo más escaso. Una manera de comunicar a pequeños la importancia de mantener los ecosistemas ha sido el diseño de una estructura basada en la instalación de un colmenar tradicional de los Zulú. El techo verde representa la riqueza y diversidad de la sabana y pastos, que es el área de captura de agua en la mayoría de ecosistemas. Dentro se localiza el área de educación, rodeada por jardines verticales y techos, todos con plantas raras o extraordinarias que se encuentran en los peñascos, en ellos se muestran los diferentes ecosistemas en los que el agua es capturada y los caminos que esta sigue para llegar a nuestros grifos. Para inculcar una educación verde a futuras generaciones, los pequeños necesitan estar en contacto con la naturaleza; esta es una manera efectiva de entender y entrelazarse con un planeta sano. La instalación involucro artistas que juegan con plantas e ingeniería humana, combinando ambos se creó una tremenda herramienta educativa para los jardines botánicos.

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Volunteers, with their skills and expertise, were invaluable to the development of Living Beehive. (Leon Kluge)

The subtle art of attracting people to Lisbon Botanic Garden

For the past decade the botanic garden of the University of Lisbon has been developing approaches to attract new local audiences, as well as the tourists who already frequent the garden. **Maria Amélia Martins-Loução, Gisela Gaio-Oliveira, Teresa Antunes and Ireneia Melo** discuss the garden's various approaches, including dramatized guided tours and concerts, as well as the partnerships they have formed along the way.

In memory of Alexandra Escudeiro

Alexandra Escudeiro (1949-2013), biologist, worked for Lisbon Botanic Garden since the 1980s. She was appointed to study the flora, taxonomically, but rapidly she moved to philosophy of science and plant ethnography, areas that she embraced while working at herbarium. She was the pillar of environmental education at Lisbon Botanic Garden as well as of many outreach activities here described.

The Lisbon Botanic Garden

The Lisbon Botanic Garden is part of the National Museum of Natural History and Science of Lisbon University. The garden was established in the 19th century for the teaching of botany, however, in the recent years it is greatly valued as an idyllic spot within the city as well as an institution of cultural and scientific significance. Over four hectares, the garden has a diverse living collection of around 1500 species, which represents Portugal's cultural and environmental heritage.

Due to decreased funding, over the last 10 years, different approaches to fundraising have been developed, combining the need to attract visitors and the mission of the garden towards biodiversity conservation. Through various projects the total number of visitors has increased from 22,000 in 2002 to approximately 80,000 in 2013.

Art and Communication

Crafted from nature, gardens are neither all nature nor all art and design: but a synergy of the two. Botanic gardens, in particular, are an interaction between nature and scientific construction. In these gardens art, design and nature interact to produce the perfect place to inspire people about plants.

Lisbon Botanic Garden is a scientific institution, conducting research and running education programs on plant conservation, but it is also able to create aesthetically pleasing refuges from modern life. And this is what tourists appreciate the most when visiting Lisbon Botanic Garden. In 2003 foreign tourists made up 80% of the gardens visitors. Therefore we decided to develop new activities to attract local people.



Living mushroom exhibition. Short-term exhibition offered during wintertime to show species of fungi associated with different habitats (LBG)

Our first attempt in 2004 involved producing good quality and attractive leaflets with the garden map, noting the location of plant species and groups of special interest. Other engagement activities included: (i) selecting a plant species each month and disseminating its taxonomic and geographical information, as well as fascinating facts, on our website and Facebook page; (ii) developing 22 interpretation panels about key plant species (e.g. *Dracaena draco*) or groups (e.g. *Cycads*) to increase the scientific information provided to visitors; (iii) launching new exhibition areas displaying scientific illustrations as both a form of art and science communication; (iv) offering temporary exhibitions, such as the living mushroom exhibition, that have been attracting large and diverse audiences.

These examples illustrate that to engage visitors it is important for botanic gardens to maintain attractive plant displays and visitor facilities but also to use creative science communication methods about plants and their habitats. More than ever, as well as offering a refuge it is important for botanic gardens to raise public awareness for plant diversity and conservation by developing well focused communication strategies that include both science and art.

Art and public engagement activities

The way in which we appreciate a garden is constructed through our previous experiences and knowledge. Therefore, the way a botanist and non-scientist interpret a garden will be different. Botanic gardens' displays are a form of exhibition; the messages they



A youth theatre company perform in the garden (LBG)



An open air violin concert performed by local children (LBG)

convey are communicated through what is displayed and the way the plants are put together. Therefore, what matters is the significance people project onto the objects on display and what they may communicate to each individual.

During 2003, as part of the celebrations for the garden's 125th anniversary we developed special guided tours, entitled "The garden through the eyes of...". Individuals from diverse backgrounds – well known in politics, business, academia, economics, architecture, among others – were invited to offer tours throughout the garden. The guides were asked to describe the botanic garden from their own point of view. The events took place monthly for a year and attracted many new visitors.

Further recreational activities brought more visitors to the garden during weekends: children's music concerts, group performances, young theatre companies, poetry reading and family games. Also, dramatized guided tours, featuring characters like Linnaeus and Darwin were very popular, informing the public about the garden and the need to conserve plant biodiversity.

Art exhibitions have always been a part of Lisbon Botanic Garden, although held sporadically. Since 2003, new partnerships, with the Faculty of Fine Arts (Lisbon University) and freelance sculptors were established. Now new

artists use the garden to display their work every year. These exhibitions have invited new audiences and increased the garden's revenue.

The strategies

All the described activities have been developed through different projects and partnerships. For example, as part of the European Youth Volunteer project, running from 2004 to 2008, young students from different backgrounds came to the garden, to offer their expertise in art and architecture. This was an opportunity to highlight the link between science communication and art and develop ideas and projects that are still being used. The aim was to use the views and creativity of individuals from different backgrounds, to diversify, enhance and improve visitor experience.

Partnerships with art schools have focused on the exchange of expertise. We teach about plants and biodiversity and develop a better understanding of art expression. Another partnership was established with a film producer who drew parallels between the plant conservation efforts of botanic gardens and the actions of Cinematica an institution which preserves and disseminates film heritage. The parallel was drawn by using the idea of a race against time as depicted in *Alice's Adventures in Wonderland*, by Lewis Carroll.



"Linnaeus" guiding a tour through the garden (LBG)

Art *per se* (e.g. art exhibitions and concerts) is an effective tool in attracting visitors to increase revenue. However, there is often debate over whether these activities deviate from the organizational mission related to plant conservation and engaging the public with plants.

It is important to run activities in a botanic garden that promote creativity but also ensure that these are fully funded. We learnt that diversity in public engagement activities increases the number and diversity of visitors. We also learnt that partnerships with different institutions,

such as the Faculty of Fine Arts, are truly rewarding. Through them we have been able to communicate environmental issues and the beauty of plants. Lisbon Botanic Garden acknowledges the importance of running art activities whilst also fulfils its scientific mission. Thus, it will continue to promote the awareness for plant diversity and conservation through different and creative approaches, binding science and art to benefit its visitors.

RÉSUMÉ

Le Jardin botanique de Lisbonne a toujours attiré un large public de touristes internationaux, plus que de visiteurs locaux. Durant la dernière décennie, le Jardin a proposé un panel d'activités culturelles pour attirer le public portugais. Les deux principaux objectifs de ces activités ont été d'encourager des attitudes pro environnementales et de susciter le soutien du public vis-à-vis du Jardin. Pour atteindre ces objectifs, le Jardin a réalisé des jeux à faire en famille, des performances artistiques, des événements musicaux lors des soirées de printemps et d'été, ainsi que des expositions d'art dans le jardin. Différentes stratégies ont été développées : utiliser des programmes de volontaires européens, monter des partenariats avec d'autres organisations et développer le travail interdépartemental à l'Université de

Lisbonne, en particulier avec l'école d'art. Cet article aborde les interactions entre ces projets artistiques et le jardin botanique ainsi que leurs impacts sur le nombre de visiteurs et la transmission des messages du jardin au sujet de la conservation.

RESUMEN

El jardín botánico de Lisboa ha atraído siempre una amplia audiencia internacional de turistas y visitantes locales. En la última década especialmente para atraer al público portugués el jardín ha presentado un variedad cultural de actividades. Los dos propósitos principales de estas son el promover actitudes en pro del medioambiente y fomentar el apoyo del público para el jardín. El jardín tiene como meta lograr ambos por medio de juegos familiares, talleres de arte, eventos musicales, días abiertos antes del crepúsculo, y exposiciones de arte en todo el espacio del jardín durante las épocas de primavera/verano. Así se han desarrollado estrategias de programas europeos de voluntarios, y también asociaciones con otras organizaciones, conjunto con trabajo interdepartamental dentro de la Universidad de Lisboa, en particular con la escuela de artes. Esta contribución describe la interacción y el impacto que hay entre los proyectos de arte y el jardín, haciendo referencia a los números de visitantes y la transmisión de los mensajes del jardín en lo que a conservación refiere.

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Art exhibit by sculptor António Vasconcelos Lapa (LBG)

Using biophilia and art to transform the botanic garden visitor experience

Biophilic design has been proven to improve creativity and wellbeing. The BETA Project at Phipps Conservatory and Botanical Gardens has ensured that natural forms and imagery are found throughout the buildings to bring the garden inside. **Richard Piacentini** and **Sonja Bochart** discuss the development of the exhibition and the social and environmental implications of projects of this nature.

The problem

Our society's estrangement from nature has resulted in a significant decline in human and ecological well-being and has led to catastrophic problems such as climate change and loss of biodiversity. Botanic

gardens are in a prime position to help reverse this disconnection from nature. Humankind is inspired by beauty, therefore, by extending the splendor of the garden to the built environment through biophilic design and art, we can help bridge this divide.

Traditionally, botanic gardens have addressed issues like loss of habitat and biodiversity through both *ex situ* and *in situ* conservation efforts. In many cases these efforts have been successful in the short term. Less recognized, however, is the opportunity to address the problems by focusing on the longer term. Rather



CSL was designed to meet the highest green building standards, taking advantage of traditional aspects of biophilic design (Denmarsh Photography, Inc)



The BETA Project is an exhibition of art which evokes nature staged throughout the CSL (Denmarsh Photography, Inc)

than merely treating the symptoms of our disconnection from nature, we can work to change the root causes of this situation, altering behaviour in a way that will result in better human and ecological health.

The opportunity

We spend 80 per cent of our lives inside buildings that are designed to isolate and protect us from nature. If we can transform the human experience that takes place at the intersection of the built and natural world we may be able to develop behaviours that bring a greater respect for and appreciation of nature. For centuries, people have come to our gardens for inspiration and learning. An opportunity exists to create transformative visitor experiences in our buildings by capitalizing on biophilia: our inherent need to connect with other life forms. We can bring the inspiration of our gardens into the built environments and encourage others to do so too through



programs like the BETA Project (Biophilia Enhanced Through Art) at Phipps Conservatory and Botanical Gardens.

The process

The concept of biophilia, as coined by Erich Fromm and popularized by biologist E. O. Wilson, has long been a part of green building toolkit and a set of dependable strategies has emerged to inspire connections to nature. In our newest building, the Center for Sustainable Landscapes (CSL), which was designed to meet the highest green building standards in the world, we took advantage of many of the traditional biophilic design strategies: ample windows provide natural light and ventilation; views of the outdoors connect staff and visitors to the natural environment; the strategic placement of plants, in this case clean air plants, makes interiors more attractive while purifying the air.

Most people incorporate biophilic design into their buildings because of the well-known and documented benefits to human health and productivity. Yet, quite often, even if we apply these traditional forms of biophilic design our buildings can still feel uninspiring. If we want people to reconnect with nature then we must make our buildings beautiful and inspirational spaces in which people can live, work and play. It is with this idea in mind that we developed the BETA Project: a new art exhibition staged throughout the building and surrounding landscape at Phipps' CSL. The BETA

The interior of the CSL aims to connect the indoors with the outdoors by using natural forms and plants (Denmarsh Photography, Inc)

Project brings a new dimension of sensory engagement to the CSL, creating dozens of opportunities for visitors to experience nature's beauty through the lens of the artist. To reinforce the CSL's western Pennsylvanian location the exhibitions features mainly local artists, however, because the principles of biophilic design are universal, there is also a dynamic mix of international artists such as Dale Chihuly and Hans Godo Fräbel.

Not just pretty pictures

Using art to enhance biophilia is not simply a case of hanging pretty pictures around the building. It requires a concerted effort to understand what concepts resonate with staff and it must reinforce one or more of 10 BETA themes – scale, intrinsic connection, subtlety, sensory richness, beauty, mindfulness, rethinking possible, cycles and seasons, symbolic geometry and interactivity – which were defined at the outset of the project to ensure unity and consistency of purpose.

Early on at Phipps, staff members were engaged in interactive creative visioning, culture and branding sessions. The gatherings began with mindful meditation, allowing for centring, grounding, and fostering group focus and unity. This shared time together helped to inform and inspire the selection of artists, artwork and content as well as ensuring the exhibition was curated in a manner that was meaningful and appropriate to the project. During the discussions, staff gravitated towards a few key visual elements: circular forms, which help to instill a sense of wholeness; full spectrum color, which conveys feelings of inspiration and joy; and images of sky and birds, a representation of uplifting, broad and whimsical vision. The resultant variety of media and materials showcased in the BETA Project give the exhibition depth and dimension. Paintings, photographs, drawings, sculptures, plants, fossils, and even a sound art installation are brought to life by a palette of elements such as salvaged wood, steel, bronze, blown and torch-worked glass, mineral pigments, tree resin, gold leaf, rain water and vellum. The project includes gallery space to display the nature-related artwork from local schoolchildren and of regional artists on a rotating seasonal basis, to actively engage our community throughout the year.



The design of CLS and the BETA Project exhibition results in a space that feels alive and connected to the surrounding environment (Denmarsh Photography, Inc)

The result is a space that feels alive and connected to the surrounding environment. Everywhere you look there is a reminder that we are part of nature and that it is important that we integrate our lives into the systems by which it works.

The Positive effects

Enhancing the spaces where we spend most of our lives by means of biophilic design and biophilia inspired art can have a profound impact on occupants and visitors. Substantial evidence exists to demonstrate the positive effect such connections can have on human health and well-being and that making connections to nature, particularly when people are young, can profoundly affect how we experience and treat the natural environment throughout our lives (see Kellert *et al.*, 2008).

Climate change and anthropogenic loss of biodiversity are symptoms of our disconnection from nature. In the short term, we need to continue our traditional efforts to combat these problems. In the longer term, we should focus our efforts not on the symptoms but rather on the root of the problem. The connections we make between nature and people through our gardens can be fostered by bringing natural elements into our built environments through art, in a way that our visitors can relate to and which can be replicated in their lives. Through this we can play an important role in leading people to have a greater respect for the natural world of which we are all a part.

For more information about Phipps, the Center for Sustainable Landscapes and the BETA Project, visit phipps.conservatory.org and read the BETA Project exhibit guide.

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RÉSUMÉ

L'éloignement de notre société vis-à-vis de la nature a causé un grand déclin dans le bien-être humain et environnemental, et a contribué à des problèmes catastrophiques comme le changement climatique et la perte de biodiversité. Les jardins botaniques sont en première position pour aider les gens à se reconnecter avec la nature. L'humanité est inspirée par la beauté et, en développant la splendeur du jardin dans un environnement urbain par le biais du design biophilique, il est possible combler ce fossé. Le design biophilique par l'intermédiaire de l'art requière un processus de développement bien pensé, qui mène à la création d'espaces qui donnent de l'inspiration et connectent le public de façon cohérente avec la nature à travers tous les sens, permettant d'influencer les comportements et les expériences des gens. Les bénéfices du design biophilique sont bien documentés.

Bien plus que traiter simplement les symptômes de notre déconnexion avec la nature, nous pouvons changer les bases mêmes, en modifiant en profondeur nos comportements; il en résultera une meilleure santé humaine et environnementale.

RESUMEN

Hoy en día nuestra sociedad se encuentra separada de la naturaleza y esto ha inducido una decaída en el bienestar del medioambiente, al mismo tiempo contribuyendo a problemas catastróficos como son el cambio climático y pérdida de la biodiversidad. Los jardines botánicos están en una posición primordial en ayudar a reconectar la gente con la naturaleza. La humanidad se inspira en la belleza y, extiende su esplendor en un jardín a partir de un medio urbano usando un diseño biofilico y el arte, creando así un puente de unión en esta separación de la belleza natural. El amor a la vida [biofilia] es la conexión entre los sentidos y da la oportunidad para influenciar el comportamiento y experiencia de las gentes. Un diseño biofilico artístico requiere de un proceso de pensamiento planeado y profundo, que inspira la creación de espacios que conectan a la naturaleza y la gente con todos sus sentidos, influenciando nuevas experiencias y actitudes humanas. Los beneficios de un diseño biofilico han sido bien estudiados y documentados. No solamente para tratar los síntomas de separación con la naturaleza, la biofilia también puede ser usada para cambiar de raíz lo causa ese

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Art projects at the National Botanic Garden, Vácrátót, Hungary

The National Botanic Garden, Vácrátót, Hungary has a regular programme of activities that link art and science. In this article **Éva Halász-Szakács, Gergely Lunk and Tünde Thalmeiner** describe a children's competition, story book and trail that engage young people with plants through imagery in literature.

At the National Botanic Garden, Vácrátót in Hungary we aim to attract attention to the beauty of the world of plants, biodiversity, and to the indispensable role of plants in our life and culture. One of the ways we do this is by running programmes related to arts and plants on an annual basis.

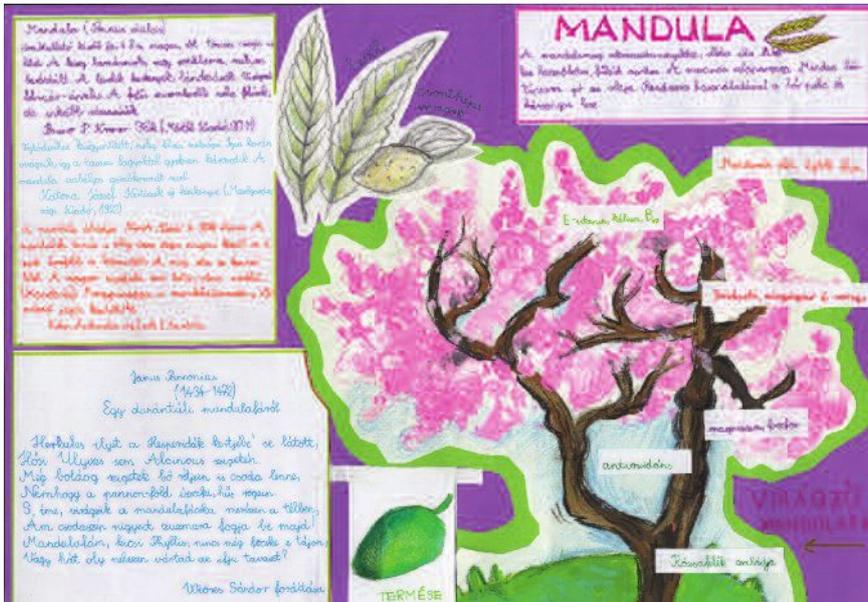
Highlighting our reliance on plants is essential as people's increasing disconnect from nature contributes to the perpetuation of many global issues. If we manage to create attachment to nature by children learning about it and loving it, then that may contribute to them becoming environmentally conscious

adults. Hungary's National Curriculum states (NCC, 2012) that: "generations growing up must know and value the rich variability of life forms in nature and culture... They must learn to use resources consciously, less intensively and responsibly in regard to their renewability." This requires that young people receive effective environmental education. "Environmental education involves training on culture, worldviews, and lifestyle. It conveys information, motivation, and values, but first of all it strengthens the sense of contributing to the efficient use of natural resources, and taking responsibility in protecting the environment." (Kiss and Zsiros, 2006, p.4).

The garden's public engagement activities satisfy the National Environmental Education Strategy of Hungary (see Vásárhelyi, 2010). This was



Landscape painting course held in the National Botanic Garden, Vácrátót in 2014 (National Botanic Garden, Vácrátót)



A special prize awarded competition entry by Zalán István Ruff (aged 11), depicting almond (*Prunus dulcis*) (National Botanic Garden, Vácrtót)

formulated by the Hungarian National Environmental Education Committee which is based on the 1992 Rio Declaration and states that extracurricular activities are effective educational experiences because of their freedom, relaxed time frame and the fact that they allow for experiential learning. Furthermore, they can enhance formal education by adding unique and exciting experiences that promote emotional attachment.

The National Curriculum of Hungary has also integrated key competencies recommended by the European Commission to be adopted by national education systems across Europe. At EU level eight key competencies have been identified as necessary for personal development, active citizenship, social inclusion and employment. These comprise: communication in native and foreign languages, competence in mathematics, science and technology, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship, and cultural awareness and expression (EC, 2006). The competency-based education can also be linked to Howard Gardner's (1983) theory of multiple intelligences that urged teachers to help students to use their combination of intelligences (abilities) for their personal and academic development.

The National Botanic Garden, Vácrtót is using art in its education programmes in line with the key competencies education policy and the national environmental

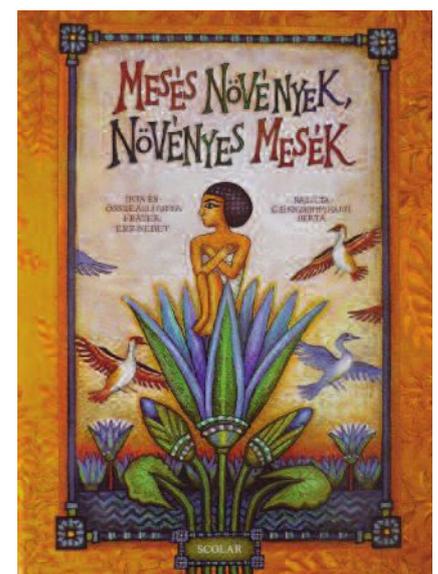
education strategy. For three years we have run a nationwide art competition for elementary school children, based on topics related to the garden, called: 'Investigate plants in literature'. We encourage participating students to read literature, search for reference to plants in them, make pieces of artwork inspired by them and research the chosen plant in scientific publications. This competition is of great educational value as it links literature to botany and results in fulfilment from creative enterprise. The curricula of more subjects are interwoven facilitating competency-based learning. Additionally, the competition shows children that many pieces of literature contain plants and plant imagery which indicate the close relationship of humans with nature in the past. We frequently come across plants in literature which work as metaphors and this further strengthens the people-plant relationship, enhances students' imaginations and widens their perspectives. The competition encourages participants to make personal observations and research, thus engaging students with nature, botany and the botanic garden.

'Investigate plants in literature' encourages young people to do research in specialist botanical literature to learn about plant characteristics and get inspiration from the botanical illustrations which also have their own artistic value. Each student participating in the competition has to create an A3 page to introduce the plant and use drawings, paintings and other plant illustrations

found in scientific literature to complement the description. Besides the scientific focus of the activity, the children develop their creativity and self-expression. The botanic garden determines only the size of the artwork (A3); the technique and media are decided by the children. Until now, we have received works in colour pencil, pastel, watercolour and tempera, including many in mixed media. Thanks to inspiring teachers supporting the children, we have received some very innovative and unique entries. Many children created interactive pieces e.g. folded booklets or included interactive elements such as movable flaps, windows and wheel charts. The creation of the artwork is expected not only to spark children's imagination but to also develop their emotional attachment to their own work and the plant itself.

Linked to the competition children could also participate in a *literary treasure hunt* during our spring programmes. They had to find 20 stations with plant quotations around the garden, each located close to a living example of the species in question giving hints and inspiration for children to create their own pieces for the competition.

Although we accept individual entries, we decided to reach children mainly with the help of schools. This year we received 152 applications from 48 locations. The works received for the



'Wonderful plants, Plant wonders' by Erzsébet Fráter; a book about plant-related myths and legends. (National Botanic Garden, Vácrtót)

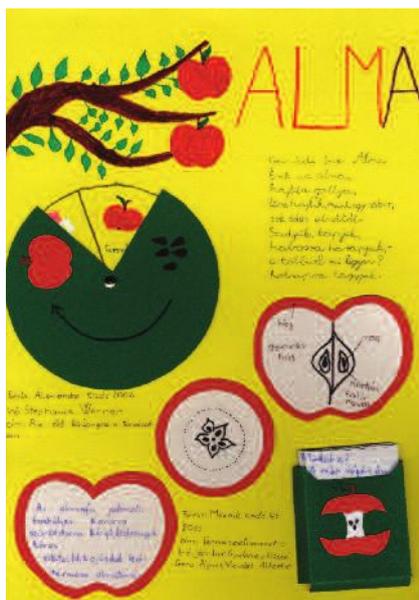
competition are exhibited for a month in autumn, during which thousands of visitors can enjoy them as both a means of botanical learning and works of art. The competition will be held in coming springs as a tradition and aims to attract entries from diverse groups of children.

This year, the prize for the winners of the competition was a signed copy of the book *'Wonderful plants, plant wonders'*. The book is by Erzsébet Fráter, the garden's collections curator, and presents plant-related legends and myths. This book is another example of the garden's activities that communicate the importance of plants through art and has also been used to develop an exhibition in the garden about biodiversity and humans' connections to plants. The book's beautiful illustrations alone are pieces of art, and the legends and myths about plants have great educational value. This exhibition is part of the garden's interpretation that aims to reach the thousands of people that visit the garden every year and contribute to the shaping of pro-environmental attitudes and behaviours.

In the future we are planning to start a *painting course* for older children, and already students from a secondary art school are coming to our garden to paint landscapes. By utilising different public engagement methods including art, we aim to ensure that visitors do not only take pleasure in the beauty of plants but they also learn about the research and conservation work of botanic gardens, environmental issues and the need to conserve biodiversity.

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A winning entry for the 'Investigate plants in literature' competition by Réka Miszori (aged 9). The dial shows the life-cycle of an apple. (National Botanic Garden, Vácrátót)

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RÉSUMÉ

Le Jardin botanique national de Hongrie organise un panel de programmes qui combinent l'art et les plantes. L'objectif est de montrer la beauté du monde des plantes et de la biodiversité, et leur importance dans nos vies et notre culture.

Au cours des trois dernières années le Jardin a organisé un concours « Explorer les plantes dans la littérature » : les enfants produisent un travail artistique inspiré par des plantes qu'ils ont trouvés dans des livres. Les gagnants sont récompensés par un livre intitulé « Plantes merveilleuses et merveilles de plantes », par Erzsébet Fráter, le conservateur des collections du jardin. Le livre explique comment le jardin utilise l'art pour sensibiliser le public et présente les mythes et les histoires traditionnelles liées aux plantes et à la culture.

Pendant les programmes de printemps, les enfants sont invités à participer à une chasse au trésor littéraire pour trouver des citations dans le jardin. Enfin, les étudiants de l'école d'art Fót viennent souvent en visite pour s'entraîner à peindre des paysages. Cette année, leurs œuvres feront l'objet d'une exposition. Actuellement le Jardin et l'école d'art envisagent de proposer un cours de peinture de paysages pour le public.

RESUMEN

El jardín nacional de Hungría organiza una gama de programas que combinan el arte y las plantas. La meta es un paquete de belleza de el mundo de vegetal, su biodiversidad y la importancia que este tienen en nuestras vidas y culturas.

Durante los 3 últimos años el jardín a llevado a cabo una competencia llamada: explore las plantas en la literatura; los pequeños producen trabajos buscando referencias de plantas en libros. Los ganadores obtienen una copia de 'Plantas maravillosas, maravillas de las plantas', escrito por Erzsébet Fráter, curador de las colecciones del jardín. Este libro es un ejemplo de cómo el jardín usa el arte para llevar a cabo su compromiso con el público y así se muestran los mitos de historias tradicionales que unen a las plantas y la cultura. Durante el programa de la primavera, se invita a niños a participar en una búsqueda de un tesoro literario, localizando alusiones en el jardín.

Finalmente los estudiantes de la escuela Fót Art que visitan frecuentemente el jardín, pintan el paisajismo; este año habrá una exposición de sus trabajos. Al momento el jardín y la escuela de arte están negociando la propuesta para un curso publico de paisajismo y pintura

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Inspiration from nature: using biomimicry to engage children with plants, science and art

In 2013 the Desert Botanic Garden launched a programme for schools that focussed on biomimicry. In her article **Nina Avila** discusses how, by exploiting their own creativity in the garden and back in the classroom, this approach was able to engage children with plant physiology, adaptation and local indigenous plants.

A shared space

Have you ever examined a plant and asked yourself “Why does it look like that?” Students and teachers in Phoenix, Arizona have been given opportunity to do just this when they visit the Desert Botanic Garden for a guided, school field trip. Repeatedly they are confronted by the *Carnegia gigantea*, the saguaro cactus, and wonder “why this symbol of the West has spines instead of leaves? Why does it resemble the shape of an accordion? How does it stand so tall without toppling over?”

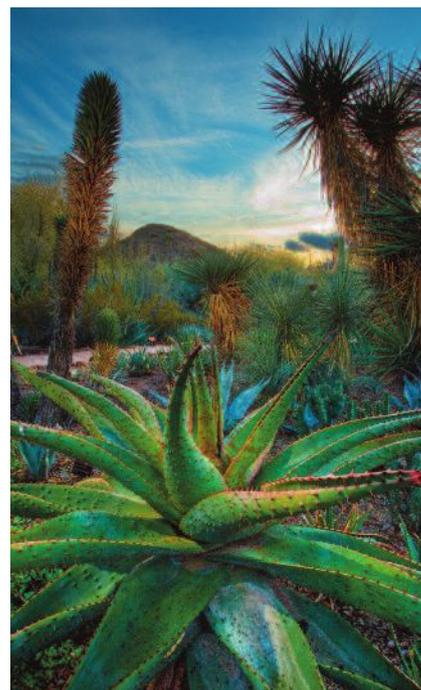
During the guided tour, students, teachers, and chaperones spend two hours with trained garden staff exploring the desert-adapted landscape. The plants often appear as though they are from a different world. However, their unique forms are adaptations that help the plant thrive in the dry and hot Sonoran Desert climate. What is noteworthy is that each observable form is connected to a specific biological function. For instance, the accordion shape of the saguaro allows the plant to expand and hold more water during summer monsoon rains. Once someone sees and understands a connection such as this, they begin to look for forms and functions in other organisms. Consequently, this new realization can lead to a greater appreciation for plant life.

In addition to the diverse collection of over 50,000 living plants, the Desert Botanic Garden is often home to art exhibitions that complement the mission and values of the institution. Visitors may be welcomed by man-made sculptures set within natural plant displays creating a one-of-a-kind experience. Most recently, Carolina Escobar, Philip Haas, and Dale Chihuly displayed their works of art amongst the mystifying plants of the desert landscape.

The contrast of structural art and diverse plant forms was a fortunate match for the education staff at the garden. The visually interesting duo was an opportunity to introduce a fascinating design and biology concept known as biomimicry to the formal K-8 (schooling for children aged 5 to 8) learning community. At the garden, plant life brings elements of function and biology to the forefront, while the sculptures highlight the creative yet challenging process of design.

Creating a connection

Biomimicry is best recognized as the “emulation of nature’s genius” as stated by Janine Benyus (1997, p.2), author of *Biomimicry: Innovation Inspired by Nature*. A more in depth definition from Biomimicry Education Network (2013, p.1) helps to paint the picture: “learning from and then adapting Nature’s best



The Succulent Gallery at the Desert Botanic Garden showcases some of the region's native flora (Adam Rodriguez)

ideas to solving human technological challenges, in order to create a healthier, more sustainable planet”. At the Desert Botanic Garden, biomimicry offers a chance to teach a new generation to view and value the natural world in a different way. Instead of passing by an organism and thinking reflectively that it

looks interesting, people are challenged to actively observe and question why it might look the way it does.

Biomimicry thinking goes a step further and asks: "How can humans mimic the functions of living organisms to sustainably and efficiently solve challenges?" For instance, when actively observing the spines on a saguaro cactus one might wonder if they function to provide protection. When biomimicry thinking is applied, the question becomes: "is it possible for humans to use a similar form, process, or system for protection in our lives?" The ideas are endless, but the inspiration begins by closely observing nature's solutions.

Real-world examples of nature-inspired design add a layer of relevancy to the discussions, observations, and activities of the garden's program. Willis (2011, p.262) suggests that 'when students know the information they are being asked to learn will be used to create products or solutions to problems that interest them, the new learning and its practice are valued because they want to know what they have to learn'; this is also something that many teachers already know from experience. One of the most common and relevant biomimicry examples is Velcro. Seed pods known as burrs from the burdock plant efficiently attach to clothing and animal fur with tiny hooks. Careful observation of this seed dispersal technique in nature inspired the invention of the quick fastening mechanism that many of us use on daily basis. It is through the lens of biomimicry that

students and teachers begin to connect the living plant collection to the artistic sculptures at the garden. They observe form, function, patterns, and systems in nature which are the foundations of understanding biomimicry. The artistic pieces enhance meaningful dialogue about what inspiration means and how the design process works. Students begin to see value in the natural world. Hands-on experiments and biomimicry case studies complete the field trip experience and prepare students for a design challenge back at school. In the classrooms, students are equipped with recycled materials and their new appreciation of desert plants. In small groups they carry out the design process introduced during the tour by building models of innovative, nature-inspired designs. Their structure should represent the ability to efficiently collect, contain, or conserve water or provide protection from the sun. The teachers have endless opportunities to enhance learning with presentations, journals, drawings, and other interdisciplinary activities.

Standards and teacher support

As schools in the United States adjust to changing academic standards in the classroom, it is crucial that cultural, nature, and science institutions such as botanic gardens evolve their programs to support the skills essential for student success. Botanic garden educators have the opportunity to model interdisciplinary and inquiry-based learning for teachers in addition to introducing them to new content within the environmental and life sciences.



A sculpture by Carolina Escobar displayed along the trails at Desert Botanical Garden (Adam Rodriguez)

The shifting standards challenge teachers to map out long-range units that pose questions, gather and interpret data, develop and evaluate solutions, and build supporting evidence. These goals can be achieved through lessons that are relevant, meaningful, and pique the interest of a wide range of learners (Larmer and Mergendoller, 2010). Project-based learning can help teachers make these connections, and a topic like biomimicry is certain to grab anyone's attention. Biomimicry might appeal to those who are passionate about animals, plants, and the environment but it might also appeal to those who are interested in design, engineering, and innovative technologies.

The Desert Botanical Garden challenges teachers to think of the "text", referenced in standards, as more than words on a paper. Text should be considered more inclusive and expansive to encompass dance performances, paintings, landscapes, plants, etc. Images and pieces of art tell a story and convey feelings, while plants have unique appearances that translate to biological functions. As educators in an informal setting, we can help enrich these interdisciplinary connections and



Students examine outdoor installation at Desert Botanical Garden (Jesse Tallman)



Students investigate a sculpture by Philip Haas at the Desert Botanical Garden (Jesse Tallman)

provide professional development for teachers who have the opportunity to bring the environment into their classroom lessons. Training, curriculum, and modeling inquiry techniques will set teachers well on their way to achieving rigorous academic standards.

Finding that spark!

Botanic gardens have countless educational opportunities on their doorstep that can make long-lasting impressions on teachers and students. Plants are not of immediate interest to everyone, but other organisms, patterns, systems, design, architecture, ecological relationships, or works of art might trigger an unexpected spark in a child. Biomimicry is by no means a new concept, but it is a tool for educators to encourage children's excitement about the natural world while simultaneously supporting challenging academic goals that prepare students for future success. Thoughtful curriculum has the ability to highlight the intersection between art and nature through topics such as biomimicry.

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RÉSUMÉ

A l'automne 2013, le Jardin botanique du désert à Phoenix, en Arizona, a officiellement lancé un programme scolaire qui associait art, science, nature et design dans une expérience exceptionnelle et interdisciplinaire. Divers ateliers basés sur l'émerveillement, l'observation et l'analyse critique ont permis de confronter des étudiants au bio mimétisme. Le bio mimétisme nous invite à être innovants et à utiliser les formes, les processus et les systèmes des organismes naturels comme source

d'inspiration pour développer des utilisations pratiques et durables. Le Jardin botanique du désert est un environnement idéal pour cela car il abrite souvent de superbes expositions artistiques intégrées aux plantes et aux animaux adaptés aux déserts. Des discussions sur ce paysage naturel et artistique ont incité les étudiants à réfléchir sur la forme et la fonction des objets. Les enseignants ont reçu les outils nécessaires pour prolonger cet apprentissage au retour en classe, avec pour défi de création inspirée par ces organismes vivants. Cela a pour résultat de former une génération nouvelle qui voit et apprécie le monde naturel d'une façon différente.

RESUMEN

Durante el otoño del 2013 el Jardín Botánico de Phoenix comenzó oficialmente un paseo escolar con una experiencia interdisciplinaria única, en ella se mezcla arte, ciencia, naturaleza y diseño. Dentro de una gama de actividades manuales que promueven la observación, sorpresas y pensamiento crítico, se presenta a los participantes el mundo del biomimetismo. Este motiva a los individuos a ser creativos tomando como base las formas, procesos y sistemas de los organismos vivos de una manera práctica y con uso sustentable. El área del desierto en donde se encuentra el Jardín Botánico es ideal porque allí se localizan esplendidas exposiciones de arte integrando las adaptaciones al hábitat tanto de animales como de plantas. Intercambio de opiniones referentes a los paisajes naturales y artísticos motiva a los estudiantes a pensar en la forma y función de los objetos. Una vez que ellos se encuentran de regreso en el salón de clases, su reto es el diseñar lo que los organismos les inspiraron, y es cuando los profesores facilitan las herramientas necesarias para extender este aprendizaje. El resultado es una nueva generación que visualiza y valora de manera diferente al mundo natural.

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Communicating through landscapes in Australian botanic gardens

Australian landscape and garden design has come a long way since the early colonial settlers. **Janelle Hatherly** gives us an overview of some of the ways contemporary botanic gardens are using creative design to complement the Australian landscape and communicate powerful messages about science and the environment.

My Country, “our wide brown land”

Australia is renowned for its expansive arid interior, unique biodiversity and spectacular natural beauty. Yet 200 years of intense human colonisation has taken its toll on the fragile ecosystems and now more than ever they need our protection and conservation.

Literature, music and the visual arts are creative expressions of human spirituality, values and emotions. Collectively referred to as the arts, they are influenced by culture.

The appeal of Australia’s natural environment, and the emotional tug it has on those born here is captured in the quintessential bush poetry of the Australian poet, Dorothea Mackellar (1885-1968). Even the youngest Australians can recite the second verse of her poem, *My Country*, from memory.

I love a sunburnt country,
A land of sweeping plains,
Of ragged mountain ranges,
Of droughts and flooding rains.
I love her far horizons,
I love her jewel-sea,
Her beauty and her terror -
The wide brown land for me!

Written in 1908, Mackellar’s feelings were not yet represented in Australian horticulture or botanic gardens. At that



Wide Brown Land sculpture at The National Arboretum, Canberra, in the early days of planting (Todd Milton)

time, the focus was on adapting exotics to this inhospitable, unfamiliar landscape. Landscape design is another human construction and is an art form in itself.

A brief history of Australian landscape design

Early colonial settlers brought their domestic and agricultural practices with them to Australia, clearing and cultivating the land in familiar ways. Mimicking what was popular overseas, residential areas, botanic gardens and public parks were developed in the Gardenesque style.

Exotic plants were arranged picturesquely, symmetrically or in geometrical beds and all surrounding native vegetation was removed. Even fragile plants survived transportation to Australia in Wardian cases and, once here, were propagated in glasshouses. Botanic gardens played an important role in their acclimatisation.

This traditional style remained popular until about fifty years ago and is still evident all around Australia. Fine examples can be found in mature sections of botanic gardens in Australia’s first capital cities.

The deliberate use of Australian plants in design only came into existence with the foundation of our national capital, Canberra, a mere one hundred years ago. The landscape architect Walter Burley Griffin incorporated the natural landform and native plants into his design for the city. Yet, he received and accommodated plenty of advice to use exotics – which still dominate Canberra’s older suburbs.

The late 1960s and ‘70s saw the development of the Australian landscape architectural profession and the widespread use of native plants in urban design. This had an enormous impact on how residential suburbs were created, as well as botanic gardens.



Installations at the Sculpture Garden at the National Gallery of Canberra. Robert Stackhouse's *On the beach again* (1984) in the foreground and Fujiko Nakaya's *Fog sculpture* (1976) in the background. (National Gallery of Australia, Canberra)

Officially opened in 1970, the Australian National Botanic Garden in Canberra was the first to study and promote Australia's flora. Other native botanic gardens soon followed. Despite their presence, growing Australian plant assemblages remained challenging because of the overall lack of knowledge of their horticultural requirements. They also suffered from a common perception that, being native, you could just throw them in and they would thrive. This was not the case.

The 'ecological' botanic garden evolved in the 1980s and '90s, as whole natural ecosystems were added to botanic estates. Alice Springs Desert Park is a fine example of an in-situ environmental education facility which interprets the predominant desert habitat. The displays work with the natural landscape recreating what could be there if the impact of colonisation was minimised.

Contemporary botanic garden design in Australia embraces principles of sustainability with modern buildings and gardens responsive to environmental conditions, site and context.

The botanic garden as a living museum

Sweeping societal changes brought about by digital computing and communication technology mark the beginning of the Information Age. This has had a significant impact on the role of cultural institutions. They are no

longer merely collecting institutions with displays open to the public. Now learning and social action have taken centre stage. With population growth and our increasingly urbanised existence, issues related to Australia's natural environment are becoming all the more important.

Given these trends, botanic gardens are becoming more aligned with museums and art galleries than with national parks. In new botanic garden developments, planners are adding the wow factor and creative installations which can be interpreted as "Art in the Landscape".

One of the best examples of this is found at the Australian Garden at The Royal Botanic Gardens Cranbourne. Its popularity and ability to communicate Australia's Red Centre has resulted in other botanic gardens creating museum-like exhibitions about Australia's dominant desert ecosystems.

Aesthetic landscape design and botanical displays are also becoming a creative feature of art galleries and museums. An outstanding example is the Sculpture Garden at the National Gallery of Canberra (<http://www.nga.gov.au/sculpturegarden/>) where evocative sculptural installations and a mist spray create emotional connections with the "quintessential Aussie bushland".

The most extreme expression of this style, to date, is seen at the Garden of Australian Dreams at the National

Museum of Australia in Canberra. The landscaped concrete courtyard makes strong statements about Australian self-consciousness and landscape design. Visitors either love it or hate it – but are definitely affected by it. As with any good exhibit, it provokes thought.

By combining the arts with horticulture, botanic gardens can manifest complex environmental concepts and issues and stimulate meaningful connections with plants and nature.

The National Arboretum in Canberra, opened in 2013, is a fine example of contemporary thinking in Australian botanic gardens. By reaching out to visitors through something that is familiar to them, it is becoming very popular with Australians. Nostalgia wells up as locals relate to the sculpture on the hill: "wide brown land", spelling out the description of Australia by McKellar, and based on her handwriting. The landscape and architectural design create 'works of art' and the planting of seedlings and young trees has a great 'future focus' and respects the time required to establish ecosystems. The mass plantings of single species, arranged into 100 forests and 100 gardens, enable stronger connections to be made with threatened, rare, and symbolic trees from around the world, for example, the historic plantations of Cork Oak (*Quercus suber*) forests.

Finally, art comes into its own when we attempt to communicate basic scientific concepts. By combining visual elements with performance and the written word, the gap between the lay visitor and the expert botanist/horticulturist is bridged. Language, as a particular example, is a powerful human construct and over the years, as an educator, I have found the creative use of words and symbols as artistic installations within thematic displays greatly facilitates public learning.

At the Royal Botanic Gardens in Sydney, *SEX+DEATH*, spelt out in *Nandina domestica* plants, introduced the temporary exhibition, of the same name, at the Tropical Centre in 2005. The exhibition discussed the concept that, just like humans, plants (in this case orchids and carnivorous plants) are capable of seduction, cooperation, death and deception.

In 2012, Darwin's birthday anniversary was interpreted in one of the evolutionary beds with a sculptural installation comprising six mirrored letters, each two metres high, spelling out Darwin's name. Key words (Evolution, Extinction, Variation, Inheritance, Adaptability, Selection and Divergence) and quotations by Darwin and other great minds appeared to 'just hang there' – like moments of inspiration or clarity of thought – offering insights and provoking thought.

Linking landscape design to education

Cultural institutions need to distinguish themselves from each other and competing recreational attractions whilst focussing on fulfilling their respective missions. For botanic gardens, this means inspiring the appreciation and conservation of plants and the natural environment, each within its local context and cultural sense of place.

But how effectively are botanic gardens communicating their mission and values to the general public? Are garden displays thematically planned and achieving their intended impact? Visitor feedback invariably includes appreciation of the peace and tranquillity and satisfaction with services, but botanic gardens need to provide visitors with more than pretty flowers and green wallpaper.

Most visitors are novices and their conceptual framework is different from that of botanists and horticulturists. They lack specialised knowledge, language and ways of thinking and looking which

experts/local knowledge holders acquire through learning and practice. It is the role of educators to help bridge this gap between novice and expert and art in landscapes can be an effective communication tool. It combines the familiar with unfamiliar and facilitates thinking and learning.

RÉSUMÉ

De même que les sociétés et leurs besoins changent, nos institutions culturelles évoluent également. Comme leurs missions se focalisent davantage sur la participation du public aux questions sociales et environnementales, les jardins botaniques s'alignent plus sur les idéaux des musées et des galeries d'art que ceux des parcs nationaux et des aires naturelles.

En associant la littérature, l'art visuel et l'horticulture, les paysages des jardins botaniques peuvent être dessinés pour être de puissants outils de communication. Cet article retrace l'évolution du paysagisme en Australie et montre comment les nouveaux aménagements des jardins botaniques ajoutent un facteur d'émerveillement grâce à des installations créatives et du design, et qu'ils peuvent être interprétés comme « de l'art dans le paysage ».

RESUMEN

Así como las sociedades necesitan cambiar, lo mismo sucede con nuestras instituciones culturales. Una parte de la misión de ellas es el enfocarse más e



Sex & Death exhibition, 2005, at the Royal Botanic Gardens in Sydney (David Fisher)

involucrar al público en los aspectos sociales y del medio ambiente; por sí solos, los jardines botánicos van a la par mas con los ideales de museos y galerías de arte más que con los de parques nacionales y áreas naturales. Combinando literatura, artes visuales, horticultura y paisajismo en jardines botánicos se puede desarrollar herramientas poderosas de comunicación. Esta contribución describe el diseño del paisajismo en Australia y muestra como, nuevos jardines botánicos desarrollaron instalaciones creativas y diseños que pueden ser interpretados como 'Arte en el paisajismo', dando esto un factor '¡guau! [¡sorprendente!]

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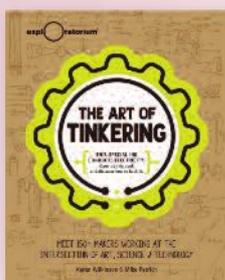
The launch of the Darwin Installation on Darwin's 200th birthday at the Royal Botanic Gardens in Sydney (Simone Cottrell)

Resources

RESOURCES

Books

1. The art of Tinkering, Exploratorium



©WC/Exploratorium

For several years *The Tinkering Studio* at the Exploratorium in San Francisco has been developing activities, workshops and experiments to encourage people to produce art works mixed with science and technology. For *The*

Tinkering Studio, it is not the product itself that is of greatest importance, more the process. Tinkering, for them, involves a non-linear development process, people are encouraged to explore and inquire, to break things down and change direction until their end result becomes clear to them. In the book *The Art of Tinkering* they describe their ideas and philosophies, give artist profiles of individuals who have used this creative technique and outline activities so you can tinker too.

Karen Wilkinson and Mike Petrich, 2014,
Weldon Owen, San Francisco USA
ISBN-10: 1616286091
ISBN-13: 978-1616286095
SRP \$32.50

2. Visual Thinking Strategies: Using Art to Deepen Learning Across School Disciplines

The Visual Thinking strategies (VTS) teaching methodology involves asking questions about objects, images and artefacts, rooted in inquiry-based education methods, to unlock students'

RESSOURCES

Livres

1. L'art de bricoler, Exploratorium

Depuis plusieurs années, *Le studio du bricolage* de l'Exploratorium de San Francisco a développé des activités, des ateliers et des expériences pour encourager le public à réaliser des travaux artistiques mêlés aux sciences et technologies. Pour *Le studio du bricolage*, ce n'est pas le produit qui est le plus important, mais la méthode. Bricoler, pour eux, suppose un processus de développement non linéaire, les personnes sont encouragées à se renseigner et à faire de l'investigation, de démonter des objets et de changer de direction jusqu'à ce que leur résultat final soit clair. *L'art de bricoler* décrit leurs idées et philosophies, donnent des profils artistiques de personnes qui ont utilisé cette technique et décrivent des activités pour que vous puissiez bricoler aussi.

Karen Wilkinson and Mike Petrich, 2014,
Weldon Owen, San Francisco USA
ISBN-10: 1616286091
ISBN-13: 978-1616286095

2. Stratégies de pensées visuelles: utiliser l'art pour accroître l'apprentissage dans toutes les disciplines scolaires

La méthodologie de l'enseignement des Stratégies de Pensées Visuelles (SPV), profondément ancrée dans les méthodes d'éducation fondées sur la démarche d'investigation, suppose de se poser des questions sur les choses, les images et les objets, afin de déverrouiller la compréhension des

RECURSOS

Libros

1. El Arte de Arreglar, Exploratorium

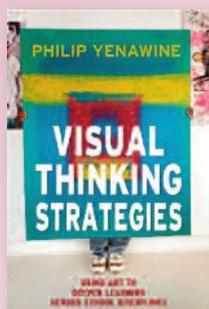
Durante varios años, *The Tinkering Studio* en el Exploratorium, de San Francisco, ha desarrollado actividades, talleres y experimentos para animar a la gente a producir obras de arte mezcladas con ciencia y tecnología. Para *The Tinkering Studio*, la mayor importancia no la tiene el producto en sí mismo, sino el proceso. Arreglar, para ellos, implica un proceso de desarrollo no lineal. Se alienta a las personas a explorar y preguntar, a romper las cosas y a cambiar de dirección hasta que su resultado final sea claro. En el libro *El Arte de Arreglar*, los autores describen sus ideas y filosofía, dan perfil de artista a individuos que utilizan esta técnica creativa y proponen actividades para que usted pueda también arreglar.

Karen Wilkinson and Mike Petrich, 2014,
Weldon Owen, San Francisco USA
ISBN-10: 1616286091
ISBN-13: 978-1616286095

2. Estrategias de Pensamiento Visual: Utilizando el Arte para Profundizar el Aprendizaje en todas las Disciplinas Escolares

Las metodología de enseñanza denominada Estrategias de Pensamiento Visual (EPV) implica hacer preguntas acerca de objetos, imágenes y artefactos, que están arraigadas en métodos educativos indagatorios, con el fin de desbloquear la comprensión de los estudiantes, mientras fortalecen sus habilidades para el pensamiento crítico, su lenguaje y su alfabetización. En su libro, el

understanding whilst increasing their critical thinking, language and literacy skills. In his book, co-creator of the VTS curriculum, Philip Yenawine, discusses how he developed this methodology as well as how teachers can, and are, using it to enhance children's learning



across a range of subjects and topics. The book provides an introduction and outline of VTS which can be also applied by botanic garden educators who would like to encourage young people to conduct close observations of plants.

Phillip Yenawine, 2013, Harvard Educational Publishing Group, Cambridge USA
 ISBN-10: 1612506097
 ISBN-13: 978-1612506098

3. Design, make, play: Growing the next generation of STEM innovators

Active learning and learning by doing is increasingly being shown as the most effective education method. This book is a compilation of case studies which explore innovative ways to inspire and engage children with STEM subjects, with a focus on interdisciplinarity. The book is aligned with the National Research Council's Framework for Science Education and showcases the ways in which education professionals in a range of sectors, from schools to museums, are using creative new methodologies to ignite children's natural curiosity and get them thinking about science, technology and engineering.

Margaret Honey and David Kanter, 2013, Routledge, Oxon UK
 ISBN-10: 041553920X
 ISBN-13: 978-0415539203

4. A Collaboration With Nature

Scottish artist Andy Goldsworthy uses only natural materials, from leaves to snow, to produce sculpture on a range of scales. Goldsworthy's pieces aim to compliment their surroundings leaving them undisturbed once they have returned to their natural states, for example large structures made of ice which melt and trickle away as the

étudiants tout en développant leur analyse critique et leurs compétences langagières. Dans ce livre, Philip Yenawine, co-créateur du programme SPV, explique comment il a développé cette méthodologie et comment les enseignants peuvent s'en inspirer pour améliorer l'apprentissage des enfants à travers divers thèmes et sujets.

Le livre offre une introduction et les grandes lignes des SPV qui peuvent aussi être appliquées par les éducateurs de jardins botaniques qui souhaiteraient inciter les jeunes à des observations approfondies des plantes.

Phillip Yenawine, 2013, Harvard Educational Publishing Group, Cambridge USA
 ISBN-10: 1612506097
 ISBN-13: 978-1612506098

3. Concevoir, faire, jouer: développer la nouvelle génération d'innovateurs « STEM*»

L'apprentissage actif et par la pratique est de plus en plus présenté comme la méthode d'éducation la plus efficace. Ce livre est une compilation d'études de cas qui explorent des méthodes novatrices pour insuffler et éveiller les enfants aux sujets liés aux STEM, en mettant l'accent sur l'interdisciplinarité. Ce livre est sur cohérent avec le Cadre pour l'éducation scientifique du Conseil national de recherche, et met en valeur la façon dont les professionnels de l'éducation, dans de nombreux secteurs, des écoles aux musées, utilisent de nouvelles méthodes créatives pour attiser la curiosité naturelle des enfants, et les amener à réfléchir sur les sciences, la technologie et l'ingénierie. *STEM : sigle de Science, technology, engineering and mathematics: sciences, technologies, ingénierie et mathématiques

Margaret Honey and David Kanter, 2013, Routledge, Oxon UK
 ISBN-10: 041553920X
 ISBN-13: 978-0415539203

4. Une collaboration avec la Nature

L'artiste écossais Andy Goldsworthy utilise uniquement des matériaux naturels, qui peuvent être aussi bien des feuilles ou de la neige, pour réaliser des

co-creador del contenido de las EPV, Philip Yenawine, discute cómo desarrolló esta metodología, así como la manera en que los profesores pueden, y están, utilizándola para mejorar el aprendizaje de los niños en una serie de temas y tópicos. El libro ofrece una introducción y resumen de EPV que también pueden ser aplicadas por los educadores de jardines botánicos a quienes le gustaría animar a los jóvenes a llevar a cabo observaciones cercanas de las plantas.

Phillip Yenawine, 2013, Harvard Educational Publishing Group, Cambridge USA
 ISBN-10: 1612506097
 ISBN-13: 978-1612506098

3. Diseñar, crear, jugar: Creciendo con la próxima generación de innovadores STEM

El aprendizaje activo y el aprendizaje práctico cada vez más se muestran como los métodos de enseñanza más eficaces. Este libro es una recopilación de estudios de caso que exploran formas innovadoras para inspirar e involucrar a los niños con los temas de STEM, con un enfoque basado en la interdisciplinaria. El libro está alineado con el Marco del Consejo Nacional de Investigación para la Educación de las Ciencias, y muestra las maneras en que los profesionales de la educación, en una variedad de sectores, desde las escuelas a los museos, están utilizando nuevas metodologías creativas para hacer despegar la curiosidad natural de los niños y hacerlos pensar en la ciencia, la tecnología y la ingeniería.



Margaret Honey and David Kanter, 2013, Routledge, Oxon UK
 ISBN-10: 041553920X
 ISBN-13: 978-0415539203

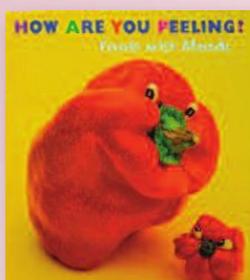
4. Una colaboración con la Naturaleza

El artista escocés Andy Goldsworthy utiliza sólo materiales naturales, desde de hojas hasta nieve, para producir esculturas en un rango de escalas. Las obras de Goldsworthy pretenden integrarse a su entorno, dejándolo sin perturbaciones una vez que regresan a

temperature rises. This book is a classic collection of 120 colour photographs which showcase the artist's work and can provide inspiration to garden educators about the ephemeral art that visitors can create using plant material.

Andy Goldsworthy, 1990, Harry N. Abrams, New York USA
ISBN-10: 0810933519
ISBN-13: 978-0810933514

5. How are you peeling? Foods with Moods

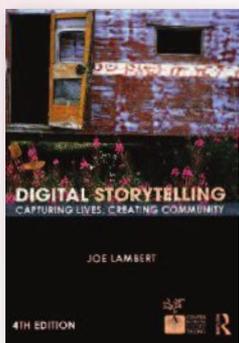


This whimsical book contains a collection of fruit and veg which have been brought to life. With the addition of some peas for eyes even the most uninspiring little vegetable can be

transformed into a funny-faced friend. This book provides educators with simple and cheap ideas for children's activities which look at plants in an exciting way. Informal education works best when it is fun and the ideas in this book are sure to get kids engaged with fruit and veg and encourage them to learn about plants and where their food comes from.

Saxton Freymann and Joost Elffers, 2004, Scholastic, London UK
ISBN-10: 0439598419
ISBN-13: 978-0439598415

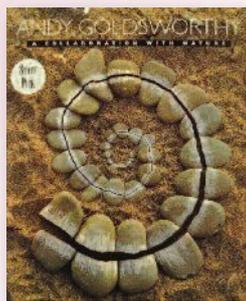
6. Digital story telling: Capturing lives, creating community



The Centre for Digital Storytelling (CDS), over the years, has transformed the way in which members of the scientific, art and education community think and act when it comes to story, media, culture and the power of personal stories in

creating change. This book provides ideas about how educators can engage people with expressing their own personal stories about plants. Co-

sculptures de tout format. Les œuvres de Goldsworthy visent à exalter leur environnement tout en le laissant intact lorsqu'elles retournent à leur état naturel, comme par exemple de grandes structures de glace qui fondent et coulent goutte à goutte au fur et à mesure que la température augmente. Ce livre est une collection classique de 120 photographies en couleur qui mettent en valeur le travail de l'artiste et peut donner l'inspiration aux éducateurs de jardins botaniques sur l'art éphémère que les visiteurs peuvent créer à partir de matériel végétal.



Andy Goldsworthy, 1990, Harry N. Abrams, New York USA
ISBN-10: 0810933519
ISBN-13: 978-0810933514

5. Comment pelez-vous? Aliments de toutes les humeurs

Ce livre fantaisiste contient une collection de fruits et de légumes qui ont été portés à la vie. Avec l'ajout de quelques pois pour les yeux, même le plus insipide petit légume peut être transformé en un drôle d'ami. Ce livre, qui permet de voir les plantes de manière passionnante, offre aux éducateurs des idées simples et peu coûteuses d'activités pour les enfants. L'éducation informelle est plus pertinente lorsqu'elle est amusante et les idées de ce livre permettront à coup sûr de réconcilier les enfants avec les fruits et légumes et de les encourager à apprendre plus sur les plantes et d'où vient leur nourriture.

Saxton Freymann and Joost Elffers, 2004, Scholastic, London UK
ISBN-10: 0439598419
ISBN-13: 978-0439598415

6. Histoires numériques révélatrices : récolter des vies, créer des communautés

Le Centre des contes numériques (CCN) a, au fil des années, transformé la façon dont les membres des communautés scientifiques, artistiques et de l'éducation pensent et agissent en ce qui concerne les contes, les médias, la culture et l'importance des histoires

su estado natural. Por ejemplo, grandes estructuras hechas de hielo que se funden y gotean a medida que sube la temperatura. Este libro es una colección clásica de 120 fotografías en color que exhiben la obra del artista y puede servir de inspiración a los educadores de los jardines botánicos acerca del arte efímero que los visitantes pueden crear utilizando material vegetal.

Andy Goldsworthy, 1990, Harry N. Abrams, New York USA
ISBN-10: 0810933519
ISBN-13: 978-0810933514

5. ¿Cómo descascaras? Alimentos con humor

Este libro contiene una caprichosa colección de frutas y verduras que han cobrado vida. Con la adición de algunos guisantes o chícharos como ojos, incluso la verdura más aburrida puede ser transformada en un amigo de rostro gracioso. El libro proporciona ideas simples y baratas a los educadores para desarrollar actividades para niños en las que las plantas son vistas de un modo emocionante. La educación informal es más eficaz cuando es divertida y las ideas que proporciona este libro aseguran que los niños se vinculen con frutas y verduras, y los anima a aprender más sobre las plantas y de dónde provienen sus alimentos.

Saxton Freymann and Joost Elffers, 2004, Scholastic, London UK
ISBN-10: 0439598419
ISBN-13: 978-0439598415

6. Cuentacuentos digital: Captura vidas, creando comunidad

A través de los años, el Centro para la Narración Digital (CDS por sus siglas en inglés), ha transformado la forma en que los miembros de las comunidades científica, artística y educativa piensan y actúan cuando se trata de crear historias, sobre los medios de comunicación, la cultura y el poder que las historias personales tienen para crear un cambio. Este libro ofrece ideas a los educadores para vincular a las personas con la expresión de sus propias historias personales relacionadas con las plantas. El co-fundador del Centro, Joe Lambert,

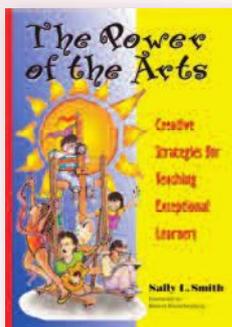
founder of the CDS, Joe Lambert, describes the history and methods of his digital storytelling practices, outlining the '7-steps' approach to identifying, assembling and sharing stories, as well as discussing the applications of storytelling and providing resources for budding storytellers.

Joe Lambert, 2013, Routledge, Oxon UK
ISBN-10: 0415627036
ISBN-13: 978-0415627030

7. The power of the arts: creative strategies for teaching exceptional learners

This book is designed with practitioners in mind, for those looking for an alternative method for teaching academic subjects to students with disabilities. With case studies illustrating the potential of this approach, the book contains step by step instructions enabling readers to deliver activities and use art to access learning. Many of the activities have been designed by the artist-teachers of the Lab School, founded by Sally Smith, in Washington, which is a school widely known for its innovative curriculum and its success in enabling learning for those who learn differently from.

Sally L. Smith, 2001, Brookes Publishing Company, Baltimore USA
ISBN-10: 1557664846
ISBN-13: 978-1557664846



Web links/Websites

1. Cornell Garden-Based Learning - resources for gardeners and educators

<http://gardening.cce.cornell.edu/for-educators/lessons/>

This website, managed by the Department of Horticulture and Cooperative Extension at Cornell University, offers educators with inspiring, research-based gardening resources to support engaging, empowering, and relevant learning experiences for children, youth, adults, and communities. One of the featured projects is *Dig Art! Cultivating Creativity*

personnelles pour créer le changement. Ce livre propose des idées sur la façon dont les éducateurs peuvent inciter les publics à exprimer leurs propres histoires personnelles sur les plantes. Co-fondateur du CCN, Joe Lambert décrit l'histoire et les méthodes de cette pratique d'histoires numériques révélatrices, expose l'approche en sept étapes permettant d'identifier, d'assembler et de partager des histoires, discute des applications de la narration et fournit des ressources pour les jeunes conteurs.

Joe Lambert, 2013, Routledge, Oxon UK
ISBN-10: 0415627036
ISBN-13: 978-0415627030

7. Le pouvoir des arts : des stratégies créatives pour enseigner à des apprenants exceptionnels

Ce livre a été conçu une méthode alternative pour l'enseignement des matières scolaires à des étudiants handicapés. Avec des études de cas illustrant le potentiel de cette approche, le livre contient des instructions étape par étape permettant aux lecteurs de réaliser des activités et d'utiliser l'art pour accéder à la connaissance. Beaucoup de ces activités ont été conçues par les artistes-enseignants de l'Ecole labo, fondée par Sally Smith, à

Washington, école connue pour son programme novateur et son succès dans la formation des personnes qui apprennent différemment des autres.

Sally L. Smith, 2001, Brookes Publishing Company, Baltimore USA
ISBN-10: 1557664846
ISBN-13: 978-1557664846

Liens internet/ Sites

1. L'apprentissage par les jardins à Cornell – des ressources pour les jardiniers et les éducateurs

<http://gardening.cce.cornell.edu/for-educators/lessons/>

Ce site, géré par le Département d'horticulture et de développement coopératif de l'Université de Cornell,

describe la historia y los métodos de sus prácticas de narración digitales, destacando el enfoque de los "7 pasos" para identificar, reunir y compartir historias, y a la vez discutir las aplicaciones de la narración y la provisión de recursos para cuentacuentos en formación.

Joe Lambert, 2013, Routledge, Oxon UK
ISBN-10: 0415627036
ISBN-13: 978-0415627030

7. El poder de las artes: estrategias creativas para enseñar a estudiantes excepcionales.

Este libro está diseñado por profesionales de la enseñanza, y está dedicado a todos aquellos que buscan un método alternativo para la enseñar materias académicas a estudiantes con capacidades diferentes. Con estudios de caso que ilustran el potencial de este enfoque, el libro contiene instrucciones paso a paso para permitir a los lectores llevar a cabo actividades y utilizar el arte como medio de aprendizaje. Muchas de las actividades han sido diseñadas por los artistas-docentes de la Lab School, fundada por Sally Smith, en Washington, misma que es una escuela muy conocida por su innovador plan de estudios y por ser exitosa en poner el aprendizaje al alcance de aquellas personas que aprenden de manera diferente de los demás.

Sally L. Smith, 2001, Brookes Publishing Company, Baltimore USA
ISBN-10: 1557664846
ISBN-13: 978-1557664846

Sitios Web / Enlaces Web

1. Cornell Garden-Based Learning – recursos para jardineros y educadores.

<http://gardening.cce.cornell.edu/for-educators/lessons/>

Este sitio web, administrado por el Departamento de Horticultura y Extensión Cooperativa de la Universidad de Cornell, de Estados Unidos, brinda inspiración a los educadores, recursos para la jardinería basadas en la investigación para apoyar la participación, el empoderamiento y las experiencias de aprendizaje relevantes para niños, jóvenes, adultos y



in the Garden. *Dig Art!* Integrates gardening with the arts and the arts based activities, available online, will help to teach ecological literacy and inspire new enthusiasm for garden-based learning.

2. The International garden festival at the Reford Gardens, Quebec, Canada

<http://www.refordgardens.com/english/festival/edition.php>



The International Garden Festival is one of the leading garden festivals in the world. It has been running since 2000 and it is a unique forum for innovation and experimentation. As an artistic and tourism event it also gives the opportunity to the public to discover inspiring spaces bringing together the visual arts, architecture, design, landscape and the environment. Visit the Reford Gardens website to explore the Festival's gardens, created since 2000, and get ideas about how to create landscapes that integrate art and plants and invite visitors to think of the relationship between humans and nature from a different perspective, at your site.

3. The Campaign for Drawing

<http://www.campaignfordrawing.org/>

'Drawing is a means of obtaining and communicating knowledge' according to John Ruskin, a great Victorian philosopher and artist, who inspired the founding of

propose aux éducateurs des ressources stimulantes sur le jardinage pour faire vivre des expériences d'apprentissage passionnantes, valorisantes et pertinentes à des enfants, des jeunes, des adultes et des communautés. L'un de projets présentés est *Creusez l'art ! Cultivez la créativité au jardin*. *Creusez l'art !* associe le jardinage avec les arts. Les activités artistiques disponibles en ligne permettent d'enseigner l'écologie et amènent un nouvel enthousiasme pour l'apprentissage lié aux jardins.

2. Le Festival international du jardin aux Jardins de Redford, Quebec, Canada

<http://www.refordgardens.com/english/festival/edition.php>

Le Festival international du jardin est l'un des plus importants festivals de jardin dans le monde. Organisé depuis l'an 2000, c'est un forum unique pour l'innovation et l'expérimentation. En tant qu'évènement artistique et touristique, il permet également au public de découvrir des lieux d'inspiration qui associent à la fois les arts visuels, l'architecture, le design, le paysage et l'environnement. Visitez le site pour explorer les jardins du festival créés depuis l'an 2000 et trouver des idées pour créer, sur votre site, des paysages qui intègrent l'art et les plantes et invitent les visiteurs à réfléchir aux relations entre les humains et les plantes avec un autre point de vue.

3. La campagne pour le dessin

<http://www.campaignfordrawing.org/>

« Le dessin est une façon d'acquérir et de communiquer des connaissances », selon John Ruskin, grand philosophe et peintre de l'époque victorienne. Visitez le site de l'organisation pour trouver des ressources sur comment utiliser le dessin pour l'apprentissage, la réflexion, la créativité et l'implication sociale et culturelle de tous dans un jardin botanique et toute autre institution culturelle.

Si vous êtes inspirés, vous pourriez également envisager d'accueillir un évènement du « Big Draw » - le Grand dessin- sur votre site. Le Grand dessin est un festival annuel organisé au cours du mois d'octobre par

comunidades. Uno de los proyectos destacados es *Dig Art! Cultivar la creatividad en el Jardín*. *Dig Art!* integra las actividades propias de la jardinería con las artes y actividades basadas en artes. Está disponible en línea y contribuirá a la alfabetización ecológica e inspirar un nuevo entusiasmo hacia el aprendizaje basado en jardines.

2. Festival Internacional de Jardines en Redford Gardens, Quebec, Canadá

<http://www.refordgardens.com/english/festival/edition.php>

El Festival Internacional de Jardines es una de los principales fiestas sobre jardines en el mundo. Tiene lugar desde el año 2000 y es un foro único para la innovación y la experimentación. Como evento artístico y turístico también da la oportunidad al público de descubrir los espacios inspiradores que reúnen a las artes visuales, la arquitectura, el diseño, el paisaje y el medio ambiente. Visita el sitio web de Redford Gardens para explorar los jardines del Festival creados desde el año 2000, y encontrar ideas sobre cómo crear paisajes que integren el arte y las plantas, e inviten a los visitantes a pensar en la relación que se establece entre los humanos y la naturaleza, desde una perspectiva diferente, en tu propio sitio.

3. La Campaña para Dibujar

<http://www.campaignfordrawing.org/>

“El dibujo es un medio de obtener y comunicar el conocimiento”, según John Ruskin, un gran artista y filósofo victoriano, que inspiró la fundación “Campaña para Dibujar” en el Reino Unido. Visite el sitio web de esta organización para encontrar recursos sobre cómo se puede utilizar el dibujo para fomentar el aprendizaje, el pensamiento, la creatividad y el compromiso social y cultural para todos en un jardín botánico u otras

instituciones culturales. Si te inspiras, considera la posibilidad de incluir en tu sitio web uno de los eventos Big Draw (Gran Dibujo). Éste es un festival anual que tiene lugar durante todo octubre en más de 100



the Campaign for Drawing charity in the UK. Visit the charity's website to find resources on how you can use drawing for learning, thought, creativity and social and cultural engagement for all at a botanic garden and other cultural institutions. If you get inspired you may also consider hosting at your site a Big Draw event. Big Draw is an annual festival running throughout October in over 100 organisations, including botanic gardens, across the UK and twenty other countries offering events for all ages and abilities.

4. Communicating ecology through art: what Scientists think <http://www.ecologyandsociety.org/vol17/iss2/art3/>

Acknowledging the difficulty of generating public engagement in ecological issues, researchers David Curtis, Nick Reid and Guy Ballard integrate performances and exhibitions into the National Ecological Conference. The researchers then surveyed conference attendees and received many positive results suggesting that the communicative possibilities of the arts are increasingly being recognised within the scientific community.

5. United Nations Environment Programme. Music and Environment Initiative http://www.unep.org/music_env/about.asp

A collaboration between the United Nations Environment Programme (UNEP) and the United Nations Educational Scientific and Cultural Organization (UNESCO), this initiative brings together music industry professionals, events and groups, from musicians and recording labels to venue and festivals. The website provides examples of music festivals and artists who not only work sustainably but also aim to raise environmental awareness amongst their attendees. There are also resources for those planning events to support them in reducing their carbon footprint.



plus de 100 organisations, y compris des jardins botaniques, au Royaume-Uni et dans vingt autres pays, proposant des événements pour tous les âges et toutes les compétences.

4. Communiquer l'écologie à travers l'art : ce que pensent les scientifiques <http://www.ecologyandsociety.org/vol17/iss2/art3/>

Prenant en compte la difficulté à impliquer le public sur des questions environnementales, les chercheurs David Curtis, Nick Reid et Guy Ballard intègrent des performances et des expositions dans la Conférence nationale sur l'écologie. Les chercheurs ont ensuite questionné les participants à la conférence et reçu de nombreuses réponses positives qui suggèrent que le potentiel de communication des arts est de plus en plus reconnu par la communauté scientifique.

5. Initiative pour la musique et l'environnement du Programme des Nations Unies pour l'environnement http://www.unep.org/music_env/about.asp

Une collaboration entre le PNUE (Programme des Nations Unies pour l'environnement) et l'UNESCO (Organisation des Nations Unies pour l'éducation, les sciences et la culture), cette initiative rassemble des professionnels de l'industrie de la musique, des événements et des groupes, depuis des musiciens et des maisons de disques jusqu'aux lieux de spectacles et festivals. Le site fournit des exemples de festivals de musique et d'activités qui, non seulement travaillent de manière soutenable, mais visent également à sensibiliser leurs publics à l'environnement. Il y a également des ressources pour ceux qui programment des événements afin de les aider à réduire leur empreinte carbone.

6. Projets d'art environnemental dans l'enseignement agricole et rural www.tes.co.uk/Download.aspx?storycode=6069679&type=X&id=6466821

Le livret de ressources contient un certain nombre d'activités qui peuvent être menées en extérieur. Les activités

organisations, incluyendo los jardines botánicos, tanto en el Reino Unido como en otros veinte países que ofrecen eventos para todas las edades y habilidades.

4. Comunicando la ecología a través del arte: lo que los científicos piensan <http://www.ecologyandsociety.org/vol17/iss2/art3/>

Reconociendo la dificultad de generar la participación del público en los temas ecológicos, los investigadores David Curtis, Nick Reid y Guy Ballard integraron espectáculos y exposiciones en la Conferencia Nacional de Ecología. Más tarde, los investigadores encuestaron a varios asistentes a la conferencia y recibieron muchos resultados positivos que sugieren que las posibilidades comunicativas de las artes son cada vez más reconocidos dentro de la comunidad científica.

5. Programa de las Naciones Unidas para el Medio Ambiente. Iniciativa Música y Medio Ambiente. http://www.unep.org/music_env/about.asp

Una colaboración entre el Programa de las Naciones Unidas para el Medio Ambiente (PNUMA) y la Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura (UNESCO). Esta iniciativa reúne a profesionales de la industria de la música, eventos y grupos, desde músicos y sellos discográficos, hasta lugares y festivales. El sitio web proporciona ejemplos de festivales de música y de artistas que no sólo trabajan de forma sostenible sino que también tienen como objetivo aumentar la conciencia ambiental entre sus asistentes. También hay recursos para aquellos que planean eventos para apoyarlos en la reducción de su huella de carbono.

6. Proyectos de arte ambiental: educación rural y agricultura (FACE) www.tes.co.uk/Download.aspx?storycode=6069679&type=X&id=6466821, <http://www.face-online.org.uk/>

El sitio de FACE (por sus siglas en inglés) contiene una serie de actividades que se pueden llevar a cabo en entornos al aire

6. Environmental art projects: Farming and Countryside Education (FACE) Environmental Arts

www.tes.co.uk/Download.aspx?storycode=6069679&type=X&id=6466821,
<http://www.face-online.org.uk/>

FACE's teaching resource booklet contains a number of activities that can be used in outdoor settings. The activities develop skills of observation and description – in one, for example, students are asked to draw 'sound maps' in an outdoor space, which encourages them to focus on what's around them and develop their listening skills. There are also links to artworks by environmental artists which can be with students in class. Once a (free) log in account has been created on the TES connect website, FACE's resource booklet can be accessed and downloaded for free.

7. Science on stage

<http://www.britishcouncil.org/talkingscience-centres-science-on-stage.htm>

The British Council's Science on Stage is a collection of divergent projects which use stage mediums to explore science or the ethical questions raised by science. Birch Tree, for example, perform pieces for 7 to 11 year olds which combine storytelling with songs and music, about science and natural history, mixing facts, humour and folklore. For an older audience, Y Touring Theatre Company mix live performances with facilitated debate and digital voting technology to stimulate reflection and conversation about science and society, taking their shows on tour round the UK. There's also a 'science open-mic night' to stimulate new science communication partnerships.

développent des compétences d'observation et de description – par exemple, les élèves sont invités à dessiner une carte sonore d'un espace extérieur, ce qui les encourage à se concentrer sur ce qui est autour d'eux et à développer la qualité de leur écoute. Il y a également des liens vers des œuvres d'art d'artistes « environnementaux » qui peuvent être utilisées en classe. Après un enregistrement (gratuit) en ligne effectué sur le site, le livret de ressources peut être consulté et téléchargé gratuitement.

7. Sciences en scène

<http://www.britishcouncil.org/talkingscience-centres-science-on-stage.htm>

« Sciences en scène » du Conseil britannique est une collection de projets divergents qui utilisent la scène pour explorer les sciences ou les questions éthiques autour des sciences. Le Bouleau, par exemple, propose des pièces pour les 7 à 11 ans qui associent contes, chants et musique sur les sciences et l'histoire naturelle, mêlant faits, humour et folklore. Pour un public plus âgé, la compagnie de théâtre Y Touring associe le spectacle vivant avec des débats animés et des techniques de vote électronique pour stimuler la réflexion et les échanges sur les sciences et la société. Ils partent en tournée avec leurs spectacles à travers le Royaume-Uni. Une soirée « scène ouverte sur les sciences », pour stimuler de nouveaux partenariats en communication scientifique, est également présentée.

libre. Las actividades buscan desarrollar las habilidades de observación y descripción - por ejemplo, se les pide a los estudiantes que dibujen "mapas de sonido" en un espacio al aire libre, lo que les anima a concentrarse en lo que está a su alrededor y a desarrollar sus habilidades para escuchar. También hay enlaces con obras de arte hechas por artistas ambientales, quienes además pueden estar con los alumnos en clase. Se requiere crear una cuenta de acceso (gratuita) en el sitio web de TES; una vez registrado en la página de TES, es posible obtener acceso al folleto de recursos de FACE y descargarlo de forma gratuita.

7. Ciencia en el Escenario

<http://www.britishcouncil.org/talkingscience-centres-science-on-stage.htm>

"Ciencia en el Escenario", del Consejo Británico, es una colección que incluye proyectos divergentes que utilizan medios escénicos para explorar la ciencia o las cuestiones éticas planteadas por la ciencia. "Abedul", por ejemplo, es una obra que presenta piezas para niños de 7 a 11 años, combinando la narración con canciones y música acerca de la ciencia y la historia natural, la mezcla de hechos, humor y folklore. Para un público de más edad, "Y Touring Theatre Company" mezcla presentaciones en vivo, incluyendo debates facilitados y tecnología de votación digital para estimular la reflexión y la conversación acerca de la ciencia y la sociedad, llevando sus espectáculos en giras por todo el Reino Unido. También hay una "noche científica de micrófono abierto" para estimular nuevas alianzas para la comunicación de la ciencia.

Botanic Gardens Education Network

Does your work involve inspiring people about plants and are you keen to share your ideas and learn more? Then join Botanic Gardens Education Network (bgen) and attend the bgen 2014 Conference



Learning for Sustainable Development; what have we learnt and where are we going?

5-7 November, 2014 at Paignton Zoo Environmental UK

- Planet Botanics: making the case for 'green' activities
- How to achieve knowledge and behaviour change with emotional engagement
- Understand your visitors - why the psychology of their values matter to your work
- Food for thought: bucket loads of food growing ideas for activities
- Practical ways to get schools composting
- Games for visitors encouraging behaviour change for biodiversity conservation
- 'Speed Making' session - a fast paced chance to swap practical activity ideas

bgen membership offers the chance to share and improve skills, knowledge and resources, through training workshops, an annual conference and other networking events, and an email newsgroup for rapid responses to queries.

For more information and to join contact info@bgen.org.uk or visit www.bgen.org.uk



Call for contributions!

Roots 12:1 Marketing for public engagement

Are you a botanic garden marketing genius? Yes!? Then we want to hear your story...

Botanic gardens have a responsibility to cater for a wide audience from all walks of life. Simply developing appropriate resources, services and activities is not enough. They must use creative and **effective techniques** to reach and inform the public about what they have to offer. From promotion to engagement, the next issue of Roots will discuss marketing in botanic gardens.

We will showcase some examples of innovative **marketing methods** and **strategies** and discuss how and why they should be adapted and **targeted** to suit specific **audiences**. We will highlight effective collaborations between marketing and education departments as well as considering how marketing can be integrated into **public engagement activities**.



This issue will include ideas from a wide range of perspectives, from marketing departments and companies, to educators, education departments and garden directors. To achieve this **we need your help!** Please pass on the call to all those creative marketing bright sparks you know.

To be featured in Roots please contact:
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