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# roots

Botanic Gardens Conservation International Education Review

October 2009

Greening university minds  
Building an international encyclopedia of life  
La biodiversité à l'école du quartier  
Tree bark: a world to discover

International Year  
of Biodiversity



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Compiled by Chris Hobson, Roots index covers 15 editions of Roots from December 2000 to October 2007.



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Addressing global change:  
a new agenda for botanic gardens

13<sup>th</sup> - 18<sup>th</sup> June 2010, Dublin, Ireland



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#### Forthcoming Issues

Volume 7 Number 1 – Education and Horticulture  
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# It's the International Year of Biodiversity in 2010, but who's coming to the party?

## Editorial - English

While governments and organisations around the world are gearing up for the International Year of Biodiversity next year, there is scant evidence that the public at large are any the wiser. In a recent European Union survey for example, although a majority of people claimed to have heard of the term, barely a third of those questioned said they understood what biodiversity meant.

These are sobering statistics, given the imminence of 2010 and the importance that has been attached to it. This, after all, is the deadline by which governments around the world committed to achieve a significant reduction of the current rate of biodiversity loss at regional, national and global levels, for the benefit of all life on Earth. Sadly all the available evidence points to the contrary. Take Brazil, home to 62% of all Amazonian rainforest, where an average 18,100km<sup>2</sup> of forest per year was lost between 1988 and 2006. Or Africa, which during the same period lost an area of forest comparable to that for the whole of South America.

So how do we explain this apparently yawning gulf between scientific and public perceptions of biodiversity and, more importantly, how do we bridge it in order to engage our fellow citizens of this planet in the vital work at hand?

Perhaps the problem is one of terminology. After all many other scientific concepts have entered popular usage and are employed in everyday speech, even if we don't fully understand the science behind them.

## Editorial - Français

Pendant que les gouvernements et les organisations à travers le monde se préparent à l'Année mondiale de la biodiversité l'année prochaine, très peu de preuves attestent du fait que le grand public n'en soit pour autant plus avisé. D'après une enquête récente, conduite par l'Union européenne, même si la grande majorité des gens affirment en avoir entendu parler, à peine un tiers des personnes interrogées disent comprendre la signification du terme « biodiversité ».

Ces statistiques sont attristantes étant donnée l'imminence de l'année 2010, et l'importance qui lui a été attribuée. Après tout, cette date est un ultimatum que se sont donnés les gouvernements du monde entier pour réduire significativement la diminution de la biodiversité à l'échelle régionale, nationale et mondiale, dans l'intérêt de tous les êtres vivants. Malheureusement, toutes les données disponibles indiquent le contraire. Prenons l'exemple du Brésil, qui héberge 62% de la forêt tropicale amazonienne : en moyenne, 18.100 km<sup>2</sup> de forêt ont été perdus chaque année entre 1988 et 2006. L'exemple aussi de l'Afrique qui, au cours de cette même période, a perdu une surface de forêt équivalente à la surface totale de celle d'Amérique du Sud.

Alors, comment expliquer ce fossé gigantesque qui existe entre les perceptions du monde scientifique et celles du grand public sur la biodiversité et, plus important, comment le combler afin d'engager les citoyens de cette planète sur la voie du travail vital qui nous attend ?

## Editorial - Español

Mientras que gobiernos y organizaciones a nivel mundial se encuentran en los preparativos del Año Internacional de la Biodiversidad, el cual tendrá lugar el próximo año, existe poca evidencia de que la inmensa mayoría del público desconoce del tema. Por ejemplo, en una encuesta realizada recientemente por la Unión Europea, a pesar de que la mayoría de las personas encuestadas sostienen haber escuchado el término, apenas un tercio de las ellas dijeron entender el significado de biodiversidad.

Estos resultados son graves, dada la proximidad del año 2010 y la importancia que se le ha adjudicado al evento. Ésta a fin de cuentas, es la fecha límite para la cual los gobiernos de todo el mundo se comprometieron a lograr una reducción significativa en las tasas de pérdida de biodiversidad a escala regional, nacional y global, en pos de toda la vida en el planeta Tierra. Lamentablemente, toda la evidencia disponible señala lo contrario. Tomemos el caso de Brasil, que alberga el 62% del total de la selva amazónica, donde se han perdido 18,100 km<sup>2</sup> de selva por año, durante el período de 1988 y 2006. O el caso de África, que durante el mismo período perdió un área de selva comparable a la superficie de toda Sudamérica.

Frente a esto, ¿cómo explicar el profundo abismo entre las percepciones de los científicos y el público en general respecto a la biodiversidad, y más importante aún, cómo tender un puente entre estas diferencias, a fin de comprometer a nuestros queridos ciudadanos del planeta en la vital tarea que tenemos en nuestras manos?

We're all familiar with *greenhouse gases* and *climate change*, while we *Google* and *text* with the best of them. Maybe it's because, by way of a sort of terminological shorthand, these words or phrases effectively capture in the popular mind what may otherwise be impossibly complex concepts.

Although they cohere, more or less, around a common set of principles, the definitions of biodiversity are several and varied and each of us may well subscribe to a different interpretation. It's a conundrum that so far, to paraphrase Reed Noss, has meant that "a definition of biodiversity that is altogether simple, comprehensive, and fully operational ... is unlikely to be found." And it's hardly surprising, therefore, that the Holy Grail of popular acceptance of the concept and all it signifies remains elusive.

Which leads us on to another challenge, namely that of perceived relevance. The aforementioned EU study reported that most EU citizens saw no immediate personal impact of biodiversity loss, although a majority did expect it to affect their children. In the same vein, the UK's Department of Environment, Food and Rural Affairs (Defra) acknowledged that, although there was public concern about the natural environment, this was not generally translated into action to protect or improve the situation. Public attitudes were heavily influenced by demographic and geographic variables that made the task of changing opinion and behaviours both complex and difficult.

In the face of these gloomy prognostications, the challenge facing educators in getting the biodiversity message out to the general public may appear hopeless, even Sisyphean. But in fact nothing could be further from the truth; it just makes the job more urgent and important, and it is in this spirit that we celebrate the impressive work of our contributors to this issue of *Roots*.

Thus we hear from Valery López de los Monteros Giner, who reviews current research into the impact of the biodiversity education provided by Spanish botanic gardens. Valery highlights the excellent work being undertaken by the Spanish gardens and argues cogently for increased support in this field – a piece of advocacy that will

C'est peut-être un problème de terminologie. Après tout, de nombreux autres concepts scientifiques sont entrés dans l'usage populaire et sont aujourd'hui employés couramment, même si nous ne comprenons pas tous les détails scientifiques associés à ces termes. *Les gaz à effets de serre et les changements climatiques* sont des notions familières à tous, alors que nous sommes sur *Google* ou écrivons des *textos*. Ainsi, par le biais d'un usage terminologique sténographié, ces mots ou phrases sont évocateurs dans l'esprit du public, sans avoir besoin de fournir des explications qui feraient appel à des concepts extrêmement complexes.

Bien que toutes les définitions de la biodiversité tournent, plus ou moins, autour de principes communs, il en existe plusieurs, diverses et variées. Chacun d'entre nous peut donc s'attacher à une interprétation différente de ce terme. Jusqu'à ce jour, il a été impossible de trouver une définition unique, et en reprenant les termes de Reed Noss, « une définition de la biodiversité qui soit à la fois simple, intelligible et entièrement opérationnelle... ne sera probablement pas trouvée. ». Il n'est donc pas surprenant que le Graal que représente l'assimilation populaire de ce concept et de tout ce qu'il signifie, soit également insaisissable.

Cela nous amène à un deuxième défi : celui de la perception de son importance. Toujours selon la même étude de l'UE, la plupart des citoyens de l'Union ne voient pas d'impact négatif immédiat de la réduction de la biodiversité sur leur vie. Cependant, la majorité des personnes interrogées prévoient que cela aura des répercussions négatives pour leurs enfants. Dans le même esprit, au Royaume Uni, le Département de l'environnement, de la nourriture et des affaires rurales (Defra), constate que bien que le public se sente concerné par l'état de l'environnement, ce sentiment ne se traduit généralement pas par des actions de préservation ou d'amélioration de la situation. Dans ces études, les attitudes des personnes interrogées étaient grandement influencées par des variables démographiques et géographiques, ce qui rend la tâche de changer l'opinion et le comportement du public, à la fois complexe et difficile.

Quizá el problema sea terminológico. Después de todo, muchos conceptos científicos han entrado al uso popular y son utilizados en el vocabulario cotidiano, aún sin entenderse completamente su significado. Todos estamos familiarizados con los términos de *gases de efecto invernadero* y *cambio climático* ya sea que escribamos un texto o se naveguemos por Internet. Tal vez esto sea un modo de taquigrafía terminológica, que hace que estas frases capten la atención de las mentes de la población, que de otra forma sería imposible captar por la complejidad que encierran estos conceptos.

A pesar de que las definiciones de biodiversidad se relacionan más o menos con un grupo de principios o reglas, las definiciones existentes son tan variadas y diversas que cada uno de nosotros podría darle una diferente interpretación. Es un acertijo, para parafrasear a Reed Noss "una definición de biodiversidad que sea al mismo tiempo simple, amplia y operativa es poco probable de encontrar", por lo que no es de sorprender que el Santo Grial del concepto popular de gran aceptación junto a todos sus significados permanezca oculto.

Esto nos lleva a otro desafío de especial relevancia. El mismo estudio, realizado en los Estados Unidos, mostró que la mayoría de los ciudadanos estadounidenses no perciben un impacto personal inmediato con la pérdida de biodiversidad, sin embargo, la mayoría reconoció que sí puede afectar a sus hijos. En este mismo sentido el Departamento de Ambiente, Alimentos y Asuntos Agrarios del Reino Unido (DEFRA, por sus siglas en inglés), admitió que, a pesar de haber una preocupación generalizada por el ambiente natural, ésta no se veía reflejada en acciones para la protección y mejora de esta situación. Las actitudes del público se vieron altamente influenciadas por variables de tipo demográfico y geográfico, lo que hace del cambio de opinión y conducta un asunto difícil y complejo.

Frente a este sombrío pronóstico, el desafío que tienen los educadores de sacar el mensaje sobre la biodiversidad al público en general parece desalentador, hasta casi imposible. Pero,

find sympathetic ears throughout the botanic garden community.

From Italy, Professor Claudio Longo at Brera Botanic Garden in Northern Italy describes an innovative trail following the wonderful world of bark, in which visitors are encouraged to carry a stereo-microscope with them to assist their investigations.

Elsewhere in this issue Réjane Brun surveys biodiversity education in Bordeaux, while Suzanne Kapelari writes about alpine biodiversity and the impact of climate change on alpine plants. Marie Studer, from Harvard University's Museum of Comparative Zoology introduces the online Encyclopedia of Life (EOL), a massive, freely available, resource on global biodiversity issues.

As our contributors show, there is no shortage of energy or imagination invested in developing an understanding of biodiversity around the world and herein, surely, is the paradox that we all face as we approach 2010. No one doubts that a successful global public awareness campaign is imperative and urgent. It's also clear that so far this hasn't happened. So the stark challenge for governments, NGOs and gardens alike, throughout 2010 and beyond, is to find a lucid and compelling narrative that reaches beyond the boundaries of our institutions and captures the imagination of the world at large.

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Face à ces sombres prédictions, le défi auquel les éducateurs doivent faire face lorsqu'ils essayent de faire passer le message sur la biodiversité auprès du grand public, comme celui de Sisyphe, semble sans espoir. Mais, en réalité, rien n'est plus faux; cela ne fait que rendre cette mission plus urgente et plus importante, et c'est dans cet état d'esprit que nous saluons le travail impressionnant accompli par nos collaborateurs dans ce numéro de Roots.

Il en est ainsi de Valery López de los Monteros Giner, qui fait un bilan des recherches actuelles s'intéressant à l'impact de l'éducation sur la biodiversité mise en place dans les jardins botaniques espagnols. Valery souligne l'excellent travail entrepris par les jardins espagnols, et plaide avec ferveur pour une augmentation des aides dans ce secteur – un plaidoyer qui trouvera des sympathisants au sein de la communauté des Jardins botaniques. Provenant d'Italie, le Professeur Claudio Longo, du Jardin botanique Brera, situé au nord du pays, présente un sentier d'interprétation innovant sur le monde merveilleux des écorces, où les visiteurs sont invités à se munir d'un microscope afin de faciliter leur découverte.

Dans d'autres articles de ce numéro, Réjane Brun étudie l'enseignement de la biodiversité à Bordeaux, tandis que Suzanne Kapelari écrit sur la biodiversité alpine et sur les impacts qu'ont les changements climatiques sur la flore alpine.

Comme l'ont montré nos collaborateurs, l'énergie et l'imagination ne manquent pas pour développer les connaissances et la compréhension du public sur la biodiversité dans le monde entier. C'est ici que se trouve, assurément, le paradoxe auquel nous devons faire face alors que nous voyons se profiler l'année 2010. Personne ne contestera qu'une campagne mondiale de sensibilisation efficace est impérative et urgente. Il est également clair que, jusqu'à présent, cela ne s'est pas encore produit. Le défi suprême, commun à l'ensemble des gouvernements, des ONG et des jardins, est donc, au cours de l'année 2010 et au-delà, de trouver un récit clair et prenant qui toucherait un public situé hors de nos institutions et qui captiverait l'imagination du monde entier.

nada más lejos de la verdad, esto sólo hace que el trabajo de los educadores sea más importante y urgente, y es con este espíritu que queremos celebrar el impresionante trabajo de nuestros colaboradores en este número de Roots.

Así, tenemos a Valery López de los Monteros Giner, quien analiza el impacto de la educación sobre la biodiversidad desarrollada por los jardines botánicos españoles. Valery hace énfasis en el excelente trabajo llevado a cabo por los jardines españoles y argumenta de manera convincente la necesidad de un mayor apoyo económico para este rubro- una causa que tendrá buena acogida en toda la comunidad de jardines botánicos.

También desde Italia, el professor Claudio Longo del Jardín Botánico de Brera en el Norte de Italia, describe un novedoso sendero para descubrir el mundo maravilloso de la corteza de los árboles, en el cual se anima a los visitantes a llevar un microscopio estereoscópico consigo para ayudar a sus investigaciones.

En otra parte de éste número Réjane Brun examina como se enseña sobre biodiversidad en Bordeaux, mientras que Suzanne Kapelari escribe sobre la biodiversidad alpina y el impacto del cambio climático en este tipo de vegetación. Marie Studer, del Museo de Zoología Comparada de la Universidad de Harvard, presenta su Enciclopedia de la Vida en línea (EOL por sus siglas en inglés), un recurso masivo y gratuito sobre aspectos de la de biodiversidad del mundo.

Como lo han demostrado nuestros colaboradores, no hay escasez de energía o imaginación para promover el entendimiento sobre la biodiversidad alrededor del mundo y he aquí, seguramente, la paradoja que afrontamos conforme se acerca el año 2010. Nadie duda que una campaña acertada de conciencia pública a nivel global sea imperativa y urgente. También está claro que hasta ahora esto no ha sucedido. Así es que el gran desafío para las autoridades, las ONG's así como los jardines botánicos, durante el 2010 y después, es encontrar un discurso claro y persuasivo que llegue más allá de las fronteras de nuestras instituciones y cautive la imaginación del mundo entero.

# Building an international encyclopedia of life

## A biological moonshot

The Encyclopedia of Life has been called a 'biological moonshot' for its vision to create a centralized Web portal with a page for every living organism on Earth – and for succeeding in demonstrating proof of concept with the project well underway since the site went live in February 2008. 'Like flying to the moon, making one encyclopedia of all life is an old idea that technology might finally make possible,' (Milius, 2008).

As its user base grows, EOL continues to engage people everywhere with a greater number of enhanced species pages and is developing a comprehensive set of knowledge tools to navigate and mine EOL's increasingly rich content. This development brings new applications of EOL for many different end-users, from educators and students to conservation scientists and the general public.

The latest version of EOL's portal was unveiled in early 2009. In addition to new features, it now serves more than 160,000 authenticated species pages covering a greater breadth of biodiversity. While there are approximately 1.8 million known and named species today, scientists estimate another 10 to 30 million species yet to be discovered and named, and eventually added to EOL. Because of the enormous nature of the project and the desire to have international participation and

**Summary** The Encyclopedia of Life (EOL; <http://www.eol.org>) was established to make comprehensive, authenticated information about the world's biodiversity freely available over the Internet. EOL's portal includes more than 160,000 authenticated species pages, another 1.4 million base pages and links to 13 million pages of digitized biodiversity literature. The features available on the website make participation open to everyone. Users, including learners, educators, scientists and members of the public can contribute photos and videos via the EOL Flickr Group, apply tags to images and provide comments on the content.

In addition, Regional EOLs are a key feature. They typically serve species pages for the flora and fauna from a specific geographic area, using the language of the region and making this valuable information much more accessible.

The EOL provides an engaging and informative learning platform where learners and others can work together to help build this global resource and learn about biological diversity worldwide.

knowledge in constructing the EOL, the project has focused on building participatory and collaborative web tools for diverse audiences of all ages to contribute to this global resource.

Information, images, videos and other content coming in from various audiences is differentiated, so the end-users know the source of the information and whether or not it has been authenticated by the scientific community. If a user chooses to see 'all' information, they will notice that on each species page unauthenticated material is distinguished from authenticated with a yellow background for photos and text. Users can choose whether to view



Left: EOL has a content partnership with Mushroom Observer to increase information within the fungi section (Encyclopedia of Life)

Right:  
More than  
160,000 species  
pages are  
authenticated  
on EOL  
(Encyclopedia  
of Life)



unauthenticated content by using the slider on any species page or through the preferences menu on the top.

### Learning while building

The EOL can be incorporated into learning activities across ages and skill sets, while at the same time the learners are contributing to this global biodiversity initiative.

It can be used as a reliable reference for a wide range of information about species, including but not limited to life history, molecular biology and genetics and current conservation status and threats. All content and multi-media resources provided through EOL are either in the public domain or are served under a Creative Commons License (see <http://creativecommons.org/>). In nearly all cases, material available through EOL can be freely used by anyone, although in some instances you will need to contact the data partner if you wish to re-use the material for commercial purposes. These freely available resources can help increase learners' knowledge and understanding of particular species, and provide exposure to various analytical methodologies and the process of scientific discovery. The EOL gives access to an ever-expanding repository of information, including primary literature through our partnership with the Biodiversity Heritage Library (<http://www.biodiversitylibrary.org>).

Right:  
EOL provides  
access to  
primary  
literature and  
accurate,  
detailed images,  
all of which  
support  
environmental  
education  
(Encyclopedia  
of Life)

Through the participatory possibilities, such as uploading images and videos, and commenting and tagging data objects, EOL can serve as an interactive platform to better engage audiences to learn about biodiversity and to hone twenty-first-century skills.

Users are invited to join the EOL Flickr Group and post photos and videos to be served on the species pages (<http://www.flickr.com/groups/encyclope>

[dia\\_of\\_life/](http://www.flickr.com/groups/encyclope/dia_of_life/)). There are currently more than 1,300 members from around the world and more than 32,000 images and 300 videos posted. In addition to posting to the Flickr Group, users can also help identify images with the correct species names. This matching of images will allow the display of the photos on corresponding species pages and help add content to EOL.

The EOL Education group has also begun an initiative in which university students write species page descriptions under the direction of their professors. To date, positive responses have been received about this activity from both students and professors, with indications that contributing to a global endeavour such as EOL is highly motivating (<http://www.eol.org/content/page/education>). A pilot project focusing on fungi was developed with our content partner Mushroom Observer and more than 100 pages have been written by students.

### Around the world: making regional and global resources accessible

EOL continues to cultivate global partnerships by developing regional versions, a key feature of EOL outreach. They will typically serve species pages for the flora and fauna of a specific geographic area, using the languages of the region. Encyclopedia of Life is in various stages of discussion and

development with representatives of countries wishing to establish their own EOLs, including The Netherlands, Central America and China.

Naturalis, the National Museum of Natural History in the Netherlands, is partnered with EOL to create the first regional version. It will serve species pages on more than 35,000 native species of Dutch flora and fauna in the Dutch language. Hundreds of scientists at Naturalis and partner organizations are compiling species information, images and trend graphs into the Dutch Species Catalogue. This information will also be shared through the central EOL portal in English (<http://www.nederlandsesoorten.nl>).

Costa Rica's national biodiversity institute, INBio, is taking the initial steps to start an education-based regional EOL for Central America. INBio is exploring how their programme, Cyberhives (*Cibercolmenas* in Spanish), can be expanded for use in other Central American countries. Cyberhives is a methodology based on virtual communities of learning. It promotes the innovative use of science and information technology in the classroom, in Costa Rica's wild protected areas and in cyberspace, to generate experiences and projects that stimulate students to learn and build knowledge about their local biodiversity (<http://www.inbio.ac.cr/>).

In June 2009, EOL representatives signed a Memorandum of Understanding with members of the Chinese Academy of Sciences, who expressed their enthusiastic desire to work with EOL and engage in exchange visits of personnel. They are developing a Chinese regional EOL to serve information and literature about Chinese species. They are also planning to host a





full EOL mirror site for Asia and to translate the entire EOL into Chinese. They have begun significant high-quality digitizing of Chinese language biodiversity literature and are taking steps to join the Biodiversity Heritage Library consortium.

EOL will continue to expand its global partnerships, which will increase its ability to deliver and receive biodiversity information and allow learning and educational activities worldwide.

### Scanning and digitization: accessing biodiversity literature

Accessibility to primary literature and accurate, detailed images are critical to support educational activities across informal and formal science learning audiences. Biodiversity literature and images are made possible through EOL from the collections of the contributing libraries of the Biodiversity Heritage Library. More than 400,000 EOL species pages are linked to portions of these numerous texts.

BHL Europe has been funded by the European Commission to digitize and assemble biodiversity literature from several European libraries. This partner project will add significant biodiversity content and continue to make EOL more relevant on a global scale.

### Celebrating the International Year of Biodiversity

EOL looks forward to collaborating with institutions and individuals around the world to celebrate the International Year of Biodiversity. Through multiple efforts, EOL resources and tools to participate and access biodiversity content will continue to grow. Please let us know about how you use EOL in your learning activities or what you need in order to get started.

Please contact us at [education@eol.org](mailto:education@eol.org) or post a comment on our forum (<https://eol.uservoice.com>) under the Education section.

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### Résumé

L'Encyclopédie de la vie (EOL; [www.eol.org](http://www.eol.org)) a été réalisée afin de rendre librement disponibles sur Internet des informations complètes et authentifiées sur la biodiversité mondiale. Le portail de l'Encyclopédie de la vie compte plus de 160,000 pages d'espèces authentifiées, ainsi que 1,4 millions de pages modèles et de liens vers 13 millions de pages de documents informatisés sur la biodiversité. Les caractéristiques disponibles sur le portail de l'EOL permettent la participation de tous. Les utilisateurs, notamment les étudiants, enseignants, scientifiques et le grand public, peuvent fournir des photos et vidéos par le biais de l'EOL Flickr Group, ajouter des étiquettes aux images et apporter des commentaires sur le contenu.

De plus, un élément clé de l'EOL est l'existence d'EOL régionales. Elles gèrent généralement les pages d'espèces concernant la faune et la flore d'une zone géographique spécifique, dans les langues utilisées dans cette région, rendant ainsi ces informations beaucoup plus accessibles.

L'EOL propose une plateforme d'apprentissage engageante et instructive, où les étudiants et bien d'autres pourront travailler ensemble afin de contribuer à construire cette ressource internationale et diffuser d'avantage les connaissances sur la diversité biologique à travers le monde.

### Resumen

La enciclopedia de la vida (EOL; [www.eol.org](http://www.eol.org)) es una iniciativa para hacer mas entendible y de manera mas exacta, autentica, la información acerca de la biodiversidad mundial. Esta se encuentra de manera gratuita en la Internet. La pagina portal de la enciclopedia de la vida incluye mas de 160,000 especies, todas de ellas corroboradas y otro tanto de 1.4 millones de paginas base, con las que se encuentran ligas con unos 13 millones de literatura y bibliografía digitalizada de biodiversidad. La flexibilidad de EOL es tal que permite la participación de todo usuario, estos incluyen educadores, científicos, estudiantes y publico en general que



deseen participar y contribuir con fotografías, videos a través del grupo EOL Flickr, quienes proveen la conexión a las imágenes y comentarios del contenido de las mismas.

Existen también los portales regionales de la EOL cuentan con paginas de especies de la flora y fauna local de una área geográfica específica, la información es en el idioma local, haciendo mas valiosa la información y mucho mas accesible a un publico regional. Asimismo los portales regionales son una llave para entrar a la EOL global.

La EOL proporciona una manera interactiva y entretenida de información para el aprendizaje, donde los aprendices y otros usuarios pueden trabajar unidos para ayudar al engrandecimiento [enriquecimiento] de este recurso global para el conocimiento de la biodiversidad biológica mundial.

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Above: More than 32,000 images have been posted on EOL Flickr which are used to serve species pages. Users of EOL are also invited to identify images with the correct species name (Encyclopedia of Life)

# El valor de los jardines españoles en educación para la conservación de la biodiversidad

Abajo:  
Exposición de  
astronomía en el  
Jardín Botánico  
de Valencia  
(Jardín Botánico  
de Valencia)



**Resumen** Los jardines botánicos son espacios donde puede actuarse ampliando nuestros conocimientos y conciencias acerca de los impactos de la actividad humana sobre el medio, con el objetivo de mejorar nuestras capacidades para contribuir a la solución de los problemas medioambientales. Son herramientas fundamentales para cumplir los objetivos de la educación ambiental por ser, no solo puntos de referencia teóricos, sino también lugares para la acción.

El presente artículo es un resumen de un análisis sobre la educación ambiental en los jardines botánicos españoles. La motivación de esta investigación fue poner en valor el papel de los jardines botánicos en esta función educativa para la conservación de la Biodiversidad. Se inició teniendo pocos referentes de otras investigaciones análogas. Este informe es la síntesis de una primera etapa que ha consistido básicamente en “cartografiar” la situación actual de la educación en los jardines botánicos españoles, utilizando como indicadores fundamentales sus programas educativos.

## Centros de educación para la conservación de la biodiversidad

En los 500 años de historia de los jardines botánicos, estos han ido modificando sus objetivos y funciones para con la sociedad. De forma que en los tiempos actuales, de crisis ecológica, se les exige un nuevo reto: crear nuevos valores y convertirse en agentes dinamizadores que contribuyan, por medio de la *educación ambiental*, al desarrollo de nuevos modelos de sostenibilidad social y a la conservación del medio ambiente. Especialmente, los jardines botánicos deberían abanderar la lucha por la valoración y conservación de la Biodiversidad. La Biodiversidad,

entendida en su más amplio aspecto - diversidad de especies, genes y ecosistemas- debería ser el tema vertebrador de los programas de los jardines botánicos, de forma que se convirtieran en centros de educación y divulgación para llevar a cabo acciones concretas que luchen por la conservación de la Biodiversidad.

## Planteamiento de la investigación - modelo metodológico

Para el estudio de la educación ambiental en los jardines botánicos españoles, se realizó un análisis descriptivo de sus programas educativos (Novo, 1998). Es por tanto un trabajo de investigación

fundamentalmente de carácter descriptivo. Se escogió analizar la realidad objeto del presente estudio, mediante cuestionarios y entrevistas.

## Resultados

La media del número de visitantes de los jardines botánicos estudiados constituye un 15.6% de la población total de la localidad en la que está emplazado cada jardín, porcentaje relativamente bajo teniendo en cuenta que los jardines botánicos son normalmente de muy fácil acceso.

A continuación, se compararon el número total de visitantes de cada jardín botánico con el número de visitantes que realizaba alguna actividad educativa y se calcularon los porcentajes para cada jardín botánico analizado. La media de todos los jardines es de un 22.4%. Nos parece que la incidencia de los programas de educación en su entorno es baja puesto que, como media, solo un 15.6% de la población acude a los jardines y, de este 15.6% solo un 22.4% participa en un programa de educación.

El tema más tratado en la mayoría de los jardines botánicos españoles, es la conservación de la biodiversidad (91%).

La actividad más realizada por los jardines a lo largo de todo el año y para todos los públicos, son las visitas guiadas.

Si analizamos el tipo público a la que van dirigidas las distintas actividades, sin duda, la mayoría de ellas están destinadas a los “adultos en general”. Sin embargo, los talleres se ofertan más a los grupos escolares.

La evaluación de los programas educativos es una práctica habitual de los jardines botánicos. No hemos



Izquierdo:  
Concurso de  
pintura en el  
Jardín Botánico  
de la  
Concepción de  
Málaga (Jardín  
Botánico de la  
Concepción de  
Málaga)

tenido constancia de que se produzcan evaluaciones desde un punto de vista “interno”, es decir, desde el punto de vista del desarrollo mismo del programa, del marco en el que está inscrito, la impresión que tienen los educadores de su propio trabajo, la repercusión de los programas en el exterior, etc. Hay un fuerte componente de temporalidad laboral en el personal encargado de los programas educativos. Los educadores son contratados principalmente para las actividades de carácter temporal –realizadas sobre todo en primavera y otoño–.

La estructura más habitual de los departamentos de educación de los jardines botánicos, es de una o dos personas encargadas de la gestión de los programas educativos, y un grupo de monitores que son contratados temporalmente para llevar a cabo las actividades de esos programas.

La formación del personal muestra también una división entre quienes los dirigen o coordinan (que suelen ser biólogos), y los monitores (entre los que hay bastante variedad de formaciones). Esto puede ser debido a: que no existe un perfil claro de formación que conduzca a este tipo de trabajo; o que el trabajo de educador en un jardín botánico no tiene una consideración profesional, sino más bien una consideración de carácter temporal. Posiblemente se trate de una conjunción de ambos factores.

La cantidad dedicada por año a la educación en cada jardín botánico se mantiene fija en un 45,5% de los jardines mientras que varía en un 36%. La proporción de la dotación para educación con respecto a los presupuestos totales del jardín es, en la mayoría de los casos, menor del 15% y solo en dos casos de los once jardines estudiados, el porcentaje sube al 35%.

*“No sabía que la mesa fuera de su propiedad, -dijo Alicia-: está servida para más personas”*  
**Lewis Carrol**

## Conclusiones y propuestas optimizadoras

El discurso en torno a la educación ambiental tiene, como presupuesto implícito, una estructura del tipo instituciones – jardín botánico – público. Este presupuesto implícito está derivado posiblemente de una relación entendida de forma unidireccional: una institución crea y mantiene un jardín botánico que ofrece a un público. Evidentemente, la unidireccionalidad no es total puesto que el jardín recibe un feedback del público y la institución a su vez lo recibe del jardín. Sin embargo, nos parece que es una relación estática (y básicamente unidireccional). Se nos plantean dudas sobre si “el público” sólo es sujeto pasivo al que educar. También dudamos sobre si la “institución” no debe ser igualmente

Izquierdo: Los  
jardines  
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espacios donde  
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ampliando  
nuestros  
conocimientos y  
conciencias  
acerca de los  
impactos de la  
actividad  
humana sobre  
el medio (Jardín  
Botánico de la  
Concepción de  
Málaga)

Derecho: receptora de una cierta educación ambiental. En este caso, es una problematización cotidiana de las relaciones que establecemos con la "naturaleza" y entre los seres humanos. Sin ir quizás tan lejos, habría al menos que interrogarse sobre el uso de los recursos, las políticas urbanísticas, la producción de bienes, las relaciones de dominación, etc. Queremos señalar la importancia de las vivencias que pueden tenerse en los jardines botánicos. Estos espacios nos parecen lugares privilegiados para la educación ambiental. El aprendizaje que se lleva a cabo en ellos está lleno de posibilidades si sabemos sacar partido a las experiencias que pueden darse allí. Es posible partir de estas experiencias para construir relaciones diferentes de los habitantes de la ciudad con la naturaleza.

Vamos a hacer algunas propuestas que podrían optimizar el papel de los jardines botánicos como agentes dinamizadores de la educación ambiental. El grueso de nuestras propuestas conlleva una mayor implicación presupuestaria de las administraciones en la educación en los jardines botánicos. Sería necesario que los jardines resuelvan la situación de temporalidad y la falta de criterios claros en cuanto a la formación de los educadores en los jardines botánicos.

También sería interesante que comience a existir una investigación en educación ambiental llevada a cabo por los propios jardines botánicos. Aunque el intercambio de información que se produce en el BGCI y el AIMJB (Asociación Ibero-Macaronésica de Jardines Botánicos). nos parecen fundamentales, este tiene lugar con datos –sobre medio ambiente por un

lado y educación por otro- que no provienen de los jardines botánicos. Estos podrían convertirse en centros de producción específica de investigación en educación ambiental, del mismo que lo son en botánica. Nos parece importante señalarlo porque

sería el reconocimiento –institucional- del nuevo papel que juegan los jardines botánicos.

Asimismo, sería deseable que las instituciones locales tengan una relación más dinámica con los ciudadanos, de forma que el jardín botánico pueda servir de intermediario entre unos y otros, creando una relación bidireccional que sustituya a la actual relación unidireccional que existe entre la ciudadanía y las administraciones. Quizás esto pueda parecer alejado de los objetivos y fines de la educación ambiental y de los jardines botánicos pero, del mismo modo que hay una relación íntima entre el ser humano y la naturaleza, la hay entre la política llevada a cabo entre los humanos, y la que tenemos con la naturaleza.

*"No se si alguna vez les ha pasado a ustedes pero el jardín botánico es un parque dormido en el que uno puede sentirse árbol o prójimo siempre y cuando se cumpla el requisito previo, que la ciudad exista tranquilamente lejos"*

**Mario Benedetti**

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### Summary

Botanic gardens offer spaces for expanding our knowledge and consciousness about the impacts of human activity on the environment, with the aim of improving our capacities to contribute solutions to environmental problems. Botanic gardens are fundamental tools for fulfilling the objectives of environmental education – not only theoretical reference points but also places for



action. The motivation for this research was to place a value on the role of botanic gardens in education for conserving biodiversity. Using educational programmes as fundamental indicators, this article is an overview of the actual situation of education in Spanish botanic gardens.

### Résumé

Les jardins botaniques offrent des espaces pour amplifier notre savoir et conscience de l'impact des activités humaines sur l'environnement dans le but d'améliorer nos compétences pour contribuer au développement de solutions aux problèmes environnementaux. Les jardins botaniques sont des institutions essentielles pour réaliser les objectifs de éducation environnementale – en tant de point de repère théorique ainsi que en tant de lieux pour l'action. La motivation pour mener cette étude de recherche consistait d'attribuer une valeur au rôle des jardins botaniques dans l'éducation à la conservation de la biodiversité. En utilisant des programmes environnementaux comme indicateurs de base, cet article donne une vue d'ensemble de la situation actuelle de l'éducation dans les jardins botaniques espagnols.

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Abajo: El tema más tratado en la mayoría de los jardines botánicos españoles, es la conservación de la biodiversidad (Jardín Botánico de la Concepción de Málaga)



# Alpine biodiversity in a climate of change

**Summary** High alpine ecosystems are expected to react sensitively not only to climate change but also to changes in land use. The 21st century is predicted to be facing a significant increase in temperature that will bring about drastic changes in biodiversity on summit areas. Living between the timberline and the mountain top is naturally limited, but temperature change is already causing a rapid advance of the tree line. On the other hand, many farmers are ceasing to cultivate mountain pastures and that also leads to a loss of open space in these regions. Situated in the centre of the Alps, the Botanical Gardens at Innsbruck is dedicating its 2010 activities to call public attention to the many tiny species living in the alpine region (above 2000m). The focus is on the various adaptation mechanisms these dwarf plants have developed to tolerate extreme environmental conditions.

The effects of climatic warming and changes in land use have left clear fingerprints on the vegetation. Trees at the climatic tree line have never grown so fast as they do today, showing that they are not feeling the constraints of colder conditions. The reason trees reach the edge of their range at a lower altitude than shrubs, grasses or herbs has to do with their tall, aerodynamic open canopy structure and their ambient air conditions, which means they closely track air temperature, and they are now following the current trends of warming. In contrast, shrubs, grassland and fellfield vegetation engineer their own microclimate by means of small stature and compact growth forms. For these plants any warming of the climate will have less effect and the mosaic of microhabitats will mean local rearrangement rather



than an upslope migration (Körner, 2009). There is evidence that some alpine/nival plant species respond by spreading upslope, but others do not (Erschbamer, 2009).

Looking closely at the historic tree line one has to distinguish carefully between true elevational advances and infilling of the open terrain due to land use change. In the valleys, the ecological



impact of more and more land taken for settlement and transport purposes affects both soil function and the preservation of natural habitats as a basis of biodiversity, but at higher mountain regions we observe the opposite to be true. Here, many farmers are

no longer interested in alpine pasture farming, which is leading to infill of the open space by shrubs and trees and a loss of grassland habitat.

While the overall biodiversity of the whole alpine region may not be affected dramatically by climate and land use changes, we anticipate that the regional diversity will be. Lower mountain areas especially are expected

Above: University Botanic Gardens, Innsbruck is located in the heart of the Alps (University Botanic Gardens Innsbruck)

Left: Using magnifying glasses, children observe the structures of alpine plants (University Botanic Gardens Innsbruck)

Right: The thick leaves of *Sempervivum* sp. are linked to the children's water bottles (University Botanic Gardens Innsbruck)

to face a reduction of diversity due to the locally increasing competition caused by tree line elevation (Grabherr, 1994) and it is here, particularly, that endemic species may go extinct.

### Dwarf alpine project

At the heart of the Alps, the Botanical Gardens at Innsbruck, Austria, is planning its 2010 activities to direct public interest towards all those tiny species of the alpine region. We will take a close look at grassland and fellfield vegetation and we will introduce the public to the various adaptation mechanisms these dwarf plants have developed living in a harsh alpine habitat (Körner, 1999). Activity programmes will lead children and family groups through our garden to see, touch, taste and smell how alpine plants grow in an environment that humans usually only visit for a short time.

### A rucksack takes centre stage

A hiking tour up a mountain top is an adventure for all of us and in preparation we pack our rucksacks with some essential items to help us to endure this harsh environment. Children are invited to think about what they would take for a hiking tour, such as a water bottle, lunchbox, sun lotion and sunglasses, a rope, maybe a wind jacket and gloves in case the weather turns nasty. All these things go into the rucksacks and as we walk through the alpine garden we can link our choices to the adaptation mechanisms shown



by alpine plants. Looking at the effects of sun lotion, for example, we compare plants which have a tough epidermis and are covered in thin hairs on their leaves (pubescence) and stems. Furrowed leaves reflect sunlight and protect plants against harmful UV radiation. Pubescence also helps plants to limit transpiration so that they do not lose water too quickly. Other plants have red-tipped leaves and the red colour comes from anthocyanin, a chemical that protects against UV radiation, as does sun lotion.

Some alpine plants have particularly thick leaves in which they are able to store water – very useful on rocky

terrain where there is hardly any soil to hold the moisture. These thick leaves belonging to succulent plants can be likened to the water bottle we carry with us in case we become thirsty and there are no springs nearby.

To see how plants protect themselves against wind and cold weather, we compare our wind jacket and gloves to the typical dwarf habit and the cushion plant structure alpine plants often show. Nestling low on the ground and growing in a compact structure helps plants to keep their microclimate untouched by temperature changes on the outside. We use a thermometer to measure the temperature inside and on the surface of a cushion plant like *Silene acaulis* which shows how these plants keep their core temperature low even when the surface temperature is soaring on a hot day. On the other hand, the centre of the plant remains warm compared to its extremities on a freezing cold day. Keeping most of its biomass underground is another method of helping the plant to protect itself against low temperatures which could lead to frostbite. The underground parts can also be linked to the children's lunchboxes, because alpine plants often make use of their roots for storage.

Finally, the piece of rope is a useful analogy to show how cushion plants fix themselves between rocks on a steep mountain slope. Many alpine plants have thick, strong roots and the

Right: By comparing the inside and surface temperatures of *Silene acaulis*, students understand how alpine plants protect themselves against the weather (University Botanic Gardens Innsbruck)





cushion shape of the structure helps to balance the weight. One root does not have to bear the weight of the whole plant. There is a nice group activity to demonstrate this: the children gather around a loop made with one end of the rope. One person takes hold of the other end. As long as all the children are evenly distributed around the loop it is easy for the single person at the other end to hold steady. But if everyone pulls on one side, it is much more difficult for the single person to stand his/her ground.

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## Résumé

Les écosystèmes alpins sont sensibles non seulement aux changements climatiques mais également aux changements d'utilisation des terres. Des augmentations de température considérables sont prévues au cours du XXI<sup>e</sup> siècle, ce qui engendrera d'importants changements dans la composition de la biodiversité en zones alpines. La surface située entre la limite forestière et le sommet d'une montagne est restreinte, laissant peu de place aux variations altitudinales. Avec les changements de température, les espèces végétales avancent vers le haut de la montagne. De nombreux agriculteurs cessent également l'entretien des pâturages en montagne, menant à la diminution d'espaces ouverts dans ces régions. Situé au

cœur des Alpes, le jardin botanique d'Innsbruck a choisi de dédier ses activités de 2010 à la sensibilisation du public à toutes ces minuscules espèces qui vivent dans la région des montagnes alpines. Elles s'attacheront aux différents mécanismes d'adaptation que ces pentes ont développés afin de faire face à des conditions environnementales extrêmes.

## Resumen

Los ecosistemas alpinos son muy sensibles tanto al cambio climático como al cambio del uso del suelo. Las predicciones de incremento significativo en la temperatura para el siglo XXI producirán cambios muy drásticos en la composición de la biodiversidad principalmente en las regiones alpinas. El área entre la zona arbórea y la cima de las montañas es limitada, dejando muy poco espacio para un desplazamiento altitudinal. Con el cambio de temperatura las especies vegetales avanzarán montaña arriba. Muchos granjeros están deteniendo el cultivo de zonas de pastoreo de montaña y esto induce la reducción de espacios abiertos en las zonas alpinas.

El jardín Botánico de Innsbruck se localiza en el centro de los Alpes y ha decidido que este 2010 sea el año de actividades para crear conciencia pública acerca de todas las especies de pequeña talla que viene en la región montañosa alpina. El enfoque es en cuanto a los diversos mecanismos adaptativos que estas plantas han desarrollado para enfrentarse a las condiciones extremas del medio ambiente.

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Left: Children participate in an activity to show how cushion plants fix themselves between rocks on steep mountain slopes (University Botanic Gardens Innsbruck)

Left: Children are encouraged to link the contents of their rucksacks to the adaptation mechanisms shown by plants (University Botanic Gardens Innsbruck)

# La biodiversité à l'école du quartier

**Resumen** Le nouveau Jardin Botanique de Bordeaux s'implante en 2003 dans un quartier ouvrier de la Ville. Dès la construction, les éducateurs du Jardin Botanique travaillent avec les écoles du quartier, ponctuellement dans un premier temps, puis très vite mettent en place des projets annuels et communs à toutes les structures scolaires. L'équipe du Jardin Botanique et les enseignants des écoles du quartier travaillent ainsi en étroite collaboration. Ils naît une véritable dynamique très positive pour les enfants. D'année en année, les projets deviennent plus ambitieux scientifiquement et scénographiquement. Tous les ans, ils sont mis en valeur dans le Jardin ou les salles d'exposition, ce qui permet aux parents mais aussi aux riverains et aux bordelais d'être sensibilisés aux différentes notions abordées, et en particulier à celle de la biodiversité, sous-jacente à chaque projet. Aujourd'hui, ce sont les enseignants qui demandent des projets traitants de biodiversité et des enjeux écologiques de notre siècle.

## Historique

Dès la mise en oeuvre du Jardin, soit en 2002, les enseignants des écoles se sont adressés individuellement au Jardin Botanique, pour des animations ponctuelles. Le thème répondait bien souvent aux demandes du programme scolaire. Par différents biais, il était possible d'aborder la notion de biodiversité, mais ceci restait diffus.

Droite: Une vue  
du Jardin  
Botanique de  
Bordeaux  
(Jardin  
Botanique de  
Bordeaux)

## Etat des lieux

En 2003, la Ville de Bordeaux a ouvert un nouveau Jardin Botanique dans un quartier populaire. L'arrivée de cette structure scientifique, n'était pas forcément bien acceptée par la population qui avait, à cette époque, d'autres besoins en terme d'infrastructures. Très vite, l'équipe pédagogique du Jardin Botanique a travaillé avec les écoles du quartier. Ce dernier est classé Réseau de Réussite Scolaire (RRS, anciennement ZEP (Zone d'Education Prioritaire)) par le Ministère de l'Education, définissant ainsi une zone où la grande majorité de la population connaît des difficultés sociales, économiques et culturelles.







Gauche:  
Le nouveau  
Jardin Botanique  
de Bordeaux  
s'est implanté en  
2003 dans un  
quartier ouvrier  
de la Ville  
(Jardin  
Botanique de  
Bordeaux)

Dans tous les cas, les thèmes abordés ont toujours été définis en étroite collaboration avec les enseignants. Ceci a dès le début signifié que nous n'étions pas dans une démarche de « consommation » (il est en effet important de préciser que les animations sont gratuites pour les écoles de Bordeaux). De plus, nous obligeons les enseignants à avoir un projet. C'était pour nous l'assurance que l'animation « dirigée » allait s'intégrer dans une démarche pédagogique à plus long terme, d'autant plus profitable pour les enfants. Puis nous avons commencé à construire des projets de plus en plus longs. Enfin, en 2005 et à l'initiative des responsables du RRS, tous les représentants des écoles primaires se sont retrouvés autour d'une table avec ceux du Jardin Botanique pour évoquer un projet annuel commun à toutes les structures.

## Principe

Ce projet existe par la rencontre de deux projets qui se rejoignent:



- Celui des enseignants, qui ont comme objectifs:
  - d'améliorer les résultats et les parcours scolaires des élèves,
  - de leur permettre de construire des savoirs et des conduites scientifiques en observation directe,
  - d'entamer une réflexion sur le respect de la plante et de l'environnement.
- Celui du Jardin Botanique, dont les objectifs sont ceux définis par le BGCI :
  - montrer l'incroyable diversité du règne végétal et apporter connaissance des principales menaces et les conséquences des disparitions d'espèces
  - faire comprendre la complexité des relations que les plantes ont développées avec leur environnement
  - montrer l'importance des plantes dans notre vie : économiquement, culturellement et esthétiquement
  - faire connaître l'environnement local dans son contexte global
- Enfin, un objectif commun aux deux entités :
  - d'amener les enfants à s'approprier un lieu appartenant à leur quartier.

Chaque acteur connaît les objectifs et les contraintes de chacun. Le projet est défini et validé par tous en début d'année et inclut un bilan final et quelques intermédiaires. Ceci permet de garder le contact avec les enseignants sur le fond du projet, de répondre à leurs interrogations, de les accompagner et surtout, de maintenir une dynamique.



Le thème choisi, un calendrier est mis en place :

1. *Trois rencontres au Jardin Botanique.* Elles permettent de rencontrer les enfants, de leur présenter le projet, d'en discuter avec eux et de créer un lien. Ce sont les moments où l'on va les amener progressivement à observer, à comprendre et à s'approprier. C'est à partir de ce que les enfants auront vu et appris au Jardin qu'ils pourront faire leurs recherches en classe.
2. *Une rencontre en classe,* où les élèves présentent l'état d'avancement de leurs recherches, posent des questions pour éclaircir certains points... Le fait d'aller dans leur classe est important pour les enfants. Le lien entre leur école et le Jardin se renforce.
3. *Une rencontre commune avec toutes les classes au Jardin.* Un grand jeu sur le thème de l'année est organisé. Tous les enfants sont mélangés et répartis en équipe.

Au dessus:  
Les enfants du quartier et leurs parents, se sont vraiment appropriés le Jardin Botanique de Bordeaux (Jardin Botanique de Bordeaux)

Gauche:  
L'équipe du Jardin Botanique et les enseignants des écoles du quartier travaillent en étroite collaboration. Il naît une véritable dynamique très positive pour les enfants (Jardin Botanique de Bordeaux)

Années scolaires	Thèmes	Réalisations des enfants
2005/2006	<b>Les plantes médicinales</b> (action sur le système cardio-vasculaire, les bronches...) <i>Utilisation des plantes, intérêt de protéger la biodiversité</i>	<ul style="list-style-type: none"> <li>• Dépliant commun remis à tous les enfants</li> <li>• Panneaux explicatifs dans le Jardin</li> </ul>
2006/2007	<b>Les plantes alimentaires</b> (plantes aromatiques, sucrières...) <i>Utilisation des plantes, impact des cultures, intérêt de protéger la biodiversité</i>	<ul style="list-style-type: none"> <li>• Dépliant commun remis à tous les enfants</li> <li>• Panneaux explicatifs dans le Jardin</li> </ul>
2007/2008	<b>Les adaptations des plantes</b> (plantes aquatiques, plantes des dunes...) <i>Notion d'écosystème, biodiversité</i>	<ul style="list-style-type: none"> <li>• Dépliant commun remis à tous les enfants</li> <li>• Panneaux explicatifs dans le Jardin</li> <li>• Exposition de 4 mois au Jardin</li> </ul>
2008/2009	<b>Les arbres : la clé de détermination</b> (20 arbres du quartier) <i>Biodiversité à l'échelle d'un quartier</i>	<ul style="list-style-type: none"> <li>• Clé de détermination remis à tous les enfants</li> <li>• Exposition de 4 mois au Jardin</li> </ul>
2009/2010	<b>Les espèces envahissantes</b> <i>Notion d'écosystème, la biodiversité en danger</i>	Projet d'une exposition intégrée dans celle du Jardin Botanique sur le même thème

4. *L'inauguration de l'exposition*, rassemblant les enfants et leurs parents ainsi que les élus municipaux et les représentants de l'Inspection d'Académie.

### Thèmes

Depuis 2005, 5 classes du quartier de 5 écoles différentes (soit environ 125 enfants) participent chaque année au projet. Les enfants appartiennent au cycle 3 et ont donc entre 8 et 11 ans.

### Impact sur les partenaires, les enfants et le quartier

D'année en année, les thèmes deviennent plus complexes et le travail réalisé par les enseignants et les enfants plus élaboré.

Au moment du bilan du dernier projet, les enseignants ont avoué avoir « beaucoup souffert » cette année, car le thème était ardu et très scientifique. Mais ils avaient apprécié l'approche ludique. Ils ont de ce fait souhaité repartir sur un thème aussi complexe pour 2009/2010, qui couvre les notions de biodiversité et d'écosystème. Si l'équipe du Jardin Botanique avait

proposé ce thème pour les premiers projets, nul doute qu'elle n'aurait pas eu d'écho favorable. Mais après des années de travail en commun, d'évolution de la part des interlocuteurs, une certaine dynamique s'est installée et ces personnes ont envie d'aller plus loin.

Certains ont trouvé l'exercice très intéressant car ils se sont retrouvés dans la même situation d'apprentissage que les enfants. Ces derniers ont alors perçu le projet d'une manière différente et se sont réellement investis.

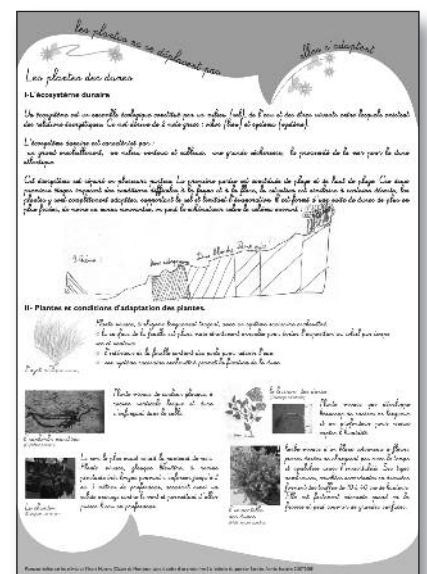
Le fait de permettre aux enfants d'exposer leurs réalisations pour le grand public donne de la valeur à leur travail. Détenteurs d'un savoir acquis au jardin et au cours de leurs recherches, ils sont en situation de transmission de connaissances vers d'autres enfants mais aussi et surtout, vers des adultes.

Le message passe ainsi beaucoup mieux vers les parents, les amis du quartier. Le fait de laisser les réalisations sur une longue période de temps, les incite à revenir souvent.

### Conclusion

Les enfants du quartier et par extension leurs parents, se sont vraiment appropriés le Jardin Botanique de Bordeaux. Grâce à ces projets, le Jardin Botanique participe à la sensibilisation et l'éducation des habitants d'un quartier à des notions de biodiversité. C'est un travail qui ne peut se faire qu'avec l'appui et l'investissement du

Droite:  
'Les plantes des dunes' - un panneau dans le jardin réalisé par les enfants (Jardin Botanique de Bordeaux)





Gauche: En 2005 tous les représentants des écoles primaires se sont retrouvés autour d'une table avec ceux du Jardin Botanique pour évoquer un projet annuel commun à toutes les structures (Jardin Botanique de Bordeaux)

corps enseignant, qui accompagne énormément les enfants et qui mobilise les familles. D'ailleurs, depuis maintenant deux ans, des projets similaires ont été initiés, toujours dans le quartier, avec des enfants de maternelle (cycle 2, 3-6 ans). Les enfants sont des vecteurs privilégiés pour montrer l'importance de la biodiversité, sa complexité et l'importance de sa préservation, à l'échelle internationale, nationale et d'un quartier.

## Summary

The new Bordeaux Botanical Garden was established in a working-class part of the city in 2003. Since its inception, educators have been working with schools in the neighbourhood. While activities were very site-specific in the early stages, joint annual projects have been initiated rapidly at all school levels. The staff of the botanic garden and the schoolteachers have worked in close collaboration. They have generated a particular dynamic which has had a very

positive effect on the schoolchildren. Year by year, the projects have become more ambitious from a scientific point of view. Furthermore, the projects are gaining in popularity among local residents allowing the parents to appreciate their children's activities and to become more aware of the various themes dealt with, in particular the concept of biodiversity that underpins every project. Today, it is the school teachers who are requesting projects tackling biodiversity and the ecological challenges of our century.

## Resumen

El año 2003 en una área popular de Bordeaux se inauguró el Jardín Botánico de esta ciudad. Desde su inicio el personal de educación ha estado trabajando con los profesores de las escuelas locales. Inicialmente las actividades eran muy específicas en cuanto al sitio, con la colaboración estrecha del personal del Jardín botánico y los profesores mismos, los

proyectos anuales se han incorporado rápidamente a todos los niveles escolares. De esta manera se ha generado una dinámica particular que ha tenido un efecto muy positivo en los estudiantes. Año con año, los proyectos se han tornado mas ambiciosos dentro del marco científico. Al mismo tiempo que se han hecho mas populares entre los habitantes del área; y uno de los resultados a enfatizar, es que los padres aprecian y se hacen mas concientes las actividades creativas de sus hijos estudiantes, sobre todo en el concepto de la biodiversidad que es la esencia de cada uno de los proyectos. Hoy en día, son los profesores escolares quienes solicitan proyectos que atañen a la biodiversidad y los retos ecológicos de nuestro siglo.

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# Potatoes don't grow on trees

**Summary** In this article we present a short scientific discussion based on some aspects of the biology of the potato: an active study of the plant that leads kindergarten children to make real discoveries.

A group aged three to five years old were shown a large number of potatoes and were encouraged to observe and handle them. Aspects of biodiversity were included in the discussions led by the teacher. Having planted potatoes in the vegetable garden, the children also used potatoes in indoor activities. And once the vegetative life-cycle had reached its natural end, with lots of new potatoes, the children made gnocchi – a return to the daily experience of potatoes as food.

Right: Children designed their own labels and used them to identify where they had planted their potatoes (Annastella Gambini)



aspects; looking at it from the point of view of a farmer we focus on growth and spread; from the point of view of the 'artist' we consider its

- children like potatoes, and generally have a positive attitude towards them
- potato plants have some peculiarities which are not obvious at first. An active study of the plant, consequently, allows real discoveries – for example, not everyone knows that potato flowers are rather beautiful.

## Introduction

If children become interested in an animal or plant they ask endless questions: 'How does it grow? How does it move? How does it live? What happens if...?' These are what one might call 'life questions', centring on the principal aspects of biology and with their roots in an approach based on experience and personal involvement (Chalufour & Worth, 2003). In this paper we present such an approach towards potato biology carried out at a kindergarten. The transformation of everyday items into study objects can take many forms: if we look at the potato from the point of view of the person who cooks or eats them, we learn about nutritional

physical peculiarities, and so on. In this project we made room for many of these aspects, always with the intent of presenting a short scientific exploration of some of the biology of this plant.

## The educational project

The project was designed for children aged three, four and five years. Potatoes were chosen for our study for the following reasons:

- every child is familiar with potatoes as food. This shows that any element of the everyday world can be a subject for study. It is more stimulating and involving to link our studies to daily life and also something everyone can relate to

The project was led by a small group acting through collective discussion. Group decisions had to reflect the opinions of all and were based on observation, exploration, questions, expectations and hypotheses, gathered and compared (Guichard, 1995). All the children participated in the research, each age group being assigned activities – the elder ones hoed, all ages made the dumpling dough and drew pictures, and so on. We made personal experience the basis of the entire project (Worth & Grollmann, 2003).

## What the children knew at the beginning

We began when the children were served boiled potatoes at lunch and asked them: 'What comes to your mind when you think of a potato?' Thus we heard the children's initial ideas, and also got them used to dealing with discussions, a valuable learning experience. Their answers (see below) made a clear link between the potato and food.

### The responses of children when asked 'what comes to your mind when you think of a potato?'

Potatoes volcano (Luca)  
 I enjoy eating them (Elena)  
 Fried potatoes (Michela)  
 Roast potatoes (Lara)  
 Sausage potatoes (Francesca)  
 Potatoes 'digimon' (Valentino)  
 Eat them (Irene)  
 French fries with ketchup (Lara)  
 Potatoes to peel (Elena)  
 Yellow (Norman)  
 Cooked potatoes (Beatrice)  
 Potatoes cooked in the oven (Nicolas)  
 To eat (Federico)  
 French fries (Mirco)

## An introduction to potatoes

The first time the children 'encountered' potatoes was very significant. It was centred on exploration and free play. Maria Arcà wrote, 'we must build a

setting (a sort of stage) where facts can demonstrate how they take place to whoever is looking and listening to them' (Arcà, 2005).

Inside the school gymnasium the children were presented with a large number of potatoes (more than 300), several different varieties and all different shapes and sizes – white, yellow, red, new, Egyptian, those grown by a local farmer and so on. The objective was to allow the children to observe the many differences that result from genetic variance in this one species (Gaston & Spicer, 2004). When we asked them to name their chosen potatoes they came up with an interesting list (see below). In the discussions that followed, aspects of biodiversity were highlighted.

### Nicknames the children gave their potatoes

bad potato  
 salami-potato  
 hairy-potato  
 potato with worms  
 nut-potato  
 little ball-potato  
 bulb-potato  
 planet-potato  
 banana-potato  
 snow man-potato  
 kiwi-potato  
 carrot-potato  
 peeled-potato

## Work in the vegetable garden: growing the potatoes

From the beginning the children knew they could sow the potatoes and watch them grow, so we took them into the garden to choose a suitable spot for planting. The children immediately took responsibility for the potato patch and getting it ready was important to them. The older children used small spades to dig the holes. While they worked, they discussed and compared what they were doing, and helped each other. Each child chose a potato, put it in a hole and covered it with soil.

Each child put a label where they had planted their potato. They were divided into shifts for watering the garden and each anxiously awaited his/her turn,



under the guidance of an adult – hypothesis and discussion were suspended, so this became a silent but valuable learning time. Some potatoes were also put aside in a dark damp place and checks made as they developed: one was sprouting later than the others, one had red sprouts, others long or short ones, still others had tiny leaves, and so on. Working in the garden, the children learned to distinguish between potato plants and weeds, saw worms and insects in the soil, and were able to imagine how all this life interacted. Eventually the plants sprouted: tiny leaves at first, but they grew and the flowers bloomed... yet though the children looked all around the leaves, they saw no potatoes. The teachers suggested they check what had happened to the original potatoes they had planted. Digging under each plant, the children found not one potato but many! That was very exciting and their patience had been well rewarded.

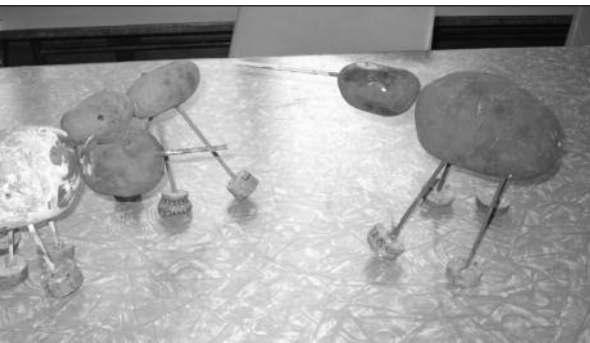
The magic life-cycle of a plant was thus completed (in part, since it was a vegetative reproduction, without pollination and consequent development of fruit and seeds). The integrity of the organism was revealed – potatoes originally seen only as food were shown to be the vital organ of a plant with all its life functions. Furthermore it was clear that in order to obtain a potato plant one always needs to start with a potato.

In class the teacher always pointed out differences between the tubers, underlining their biodiversity. Children

Above:  
 Children discovering that potatoes grow under the ground rather than around the leaves (Annastella Gambini)

Left:  
 A child discovering the difference between potatoes grown in the dark and in the light (Annastella Gambini)





Above:  
The project encouraged children to be creative with potatoes and make animals and characters that could be used in play (Annastella Gambini)

enjoyed the indoor activities, making colourful stamps out of the potatoes or characters or animals. Using the same item for scientific study and for play seemed to make the children feel more creative. And, finally the making of gnocchi signified that the children were 'back to a daily situation' after their 'scientific' work.

Plants are food for herbivores, which in turn can be food for carnivores that indirectly depend on plants. Energy reserves held by tubers and roots can be eaten by animals, or the plants themselves use them to aid growth in spring. Eating potatoes symbolizes the relationship between organisms and the fundamental interdependence which exists between all living things.

## Conclusion

As well as diversity between individuals of the same species, at the heart of this research, the children were exposed to other topics such as the life-cycle of plants and nutritional relationships. Waiting for the potatoes to grow the children recounted their feelings and told stories. They got used to discussion and made predictions and deductions about potential results (Corsaro & Molinari, 1990).

The project allowed every child a place in the group, and the chance to build collective experience and knowledge. They took part enthusiastically and were eager to gain knowledge. The discussions were sometimes slow to get going and had mixed results, but many were productive and rich in ideas. The children learned to wait patiently but attentively for progress. They learned respect for the unknown, for what they do not yet understand, and to be content to leave some questions for the future.

Right:  
The children were responsible for the potato patch and took turns to water (Annastella Gambini)

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## Résumé

L'état naturel des enfants est d'être curieux... comment ça pousse? Comment ça bouge? Comment ça vit? Que se passe-t-il si... De telles 'questions de la vie' sont fondées sur les principaux éléments de biologie. Le projet présenté ici a été mené par le département des Sciences humaines de l'Université de Milan-Bicocca en Italie. Il décrit comment les enfants d'âge préscolaire peuvent découvrir la biologie de la pomme de terre d'une manière créative et significative. Au début du projet, les enfants ont été encouragés à observer et manipuler des pommes de terre parmi une grande sélection étalée dans le hall de l'école. Ils ont également appris comment cultiver des pommes de terre dans le jardin potager et, par le biais du jardinage, ont étudié le cycle de vie de la pomme de terre. Pour conclure, les enfants ont préparé des gnocchis, une façon de faire le lien entre les pommes de terre et leur quotidien. Ils ont participé à ce projet avec grande passion, en découvrant les faits par

eux-mêmes et en se rendant compte qu'ils devraient attendre d'être plus âgés pour comprendre les réponses à certaines de leurs questions.

## Resumen

El Jardín Botánico Brera de la Universidad de Milán, Italia, invita a los jóvenes y los no tan jóvenes a recorrer un sendero. Cualquiera que sea la estación, el sendero en el jardín antiguo es para descubrir el maravilloso mundo de la corteza. Siendo que la corteza es la piel de los árboles. Esta puede ser lisa, arrugada, en lajas horizontales, estriada, partida, etc. pero tiene su trama, color y diseño particular a manera de placas, lajas, pecas y surcos. Cada árbol tiene su propia piel que lo protege, la cual también lo identifica y distingue entre otros. En la corteza también hay un sinnúmero de organismos vivos como lo son hongos, líquenes. También muchos otros que viven o pasan temporadas en la misma, como son el caso de los caracoles, arañas, insectos y hormigas, esto es todo un microcosmos a descubrir. Cada visitante puede llevar consigo un pequeño estereo microscopio el cual lo habilita a llevar a cavo su propia y meticulosa investigación. También se cuenta con guías que ayudan y orientan al publico a mirar las diferentes cortezas y usar su creatividad para visualizar mundos que se tornan maravillosos a los ojos, imaginando paisajes lunares o construyendo historias fantásticas. El sendero se puede considerar un viaje entre el arte y las ciencias, todo esto para descubrir lo fascinante de un árbol y su morfología.

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# The green theatre

**Summary** Glenveagh Castle Gardens in Donegal, Ireland, is a foliage-filled oasis nestled in a treeless, bog-dominated landscape situated in the Derryveagh mountains. The gardeners at Glenveagh have incorporated the native flora into this garden rather than push it aside. Conscious of the need to fuse the concepts of ‘garden’ and ‘nature’, Glenveagh staff engaged local craftspeople to create ‘biodiversity bags’ for their visitors. These bags, and their contents, embody the ecological identity of the garden. This article discusses the motivations for the project and considers why it is important for ‘bringing the biosphere home’ (Thomashow, 2003) to visitors.

At Glenveagh the concepts of ‘garden’ and ‘nature’ are fused. One of the rarest vegetation types in Ireland is indigenous oak woodland. The upper half of the garden is such a woodland – the under-storey flora found within (woodrush, ferns, mosses) integrates with the introduced plants and adds to their beauty. The gardeners at Glenveagh have made the native flora part of this garden instead of pushing it aside.

In his book *Bringing the Biosphere Home* (2003), Mitchell Thomashow states that ‘the biosphere will forever be an esoteric concept unless it receives the scientific, spiritual and artistic attention it deserves’. In developing the garden discovery bags



Left:  
A young boy  
discovering  
biodiversity in  
the Pleasure  
Gardens  
(Glenveagh  
Castle Gardens)

we have considered how a sense of place can be embodied in the educational tools we use to engage visitors with Glenveagh Castle Gardens and the wider landscape. Two local artists have been commissioned to work on the discovery bags – Eddie Doherty to weave the Donegal tweed, and Clare O’ Presco to design and make them.

Natural dyes from organic materials such as lichen, peat, and seaweed produce wonderful earthy tones. The

colour palette is sourced from the landscape; granite grey, garden greens and the various warm tones found in heather and bogland grasses provide the inspiration for these beautiful hand-woven fabrics.

Too often in heritage settings, the items that are used to engage with the site have a high environmental footprint, both in miles and materials. The materials in the garden discovery bags come from the garden whenever possible. Identification kits are made

from recycled handmade paper, viewfinders from bamboo and rhododendron. In this way we have opted for materials with a low carbon footprint, high biodegradability and that represent local cultural traditions. Forty garden discovery bags are being made and these will be used with both visiting school groups and families.

Glenveagh Castle Gardens have unique value as an example of a long-term ecologically sustainable relationship between human culture and natural biodiversity. From the poorest type of wet peaty soil, in one of the most inhospitable locations of the region, a garden of great beauty and fame has been established, supporting a team of skilled gardeners and drawing visitors from far and wide. The Nature and Outdoor Learning Centre was set up in 2004 and seeks to foster an understanding of the importance of conservation of our cultural and natural heritage; the Glenveagh garden discovery bags are part of this important conservation mission.

Right: Glenveagh Castle Gardens are situated in the heart of the Derryveagh Mountains in the north-west of Co. Donegal, Ireland (Glenveagh Castle Gardens)



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## Résumé

Les jardins du château de Glenveagh à Donegal, en Irlande, forment une oasis débordante de feuillages nichée dans un paysage où dominant les tourbières

Right: Donegal tweed is used to weave the discovery bags which are dyed using organic materials such as lichens, peat and seaweed (Glenveagh Castle Gardens)



et dépourvu d'arbres, située dans les montagnes de Derryveagh. Les jardiniers de Glenveagh ont intégré la flore indigène à ce jardin plutôt que de l'en écarter. Ayant conscience du besoin de fusionner les concepts de 'jardin' et de 'nature', le personnel de Glenveagh a engagé des artisans locaux pour créer des 'sacs de biodiversité' pour le public. Ces sacs, ainsi que leur contenu, symbolisent l'identité écologique du jardin. Cet article présente les motivations du projet et s'intéresse aux raisons pour lesquelles cette démarche est importante en vue de 'ramener la biosphère chez soi' (Thomashow, 2003) pour notre public.

## Resumen

Los jardines Glenveagh Castle en Donegal, Irlanda, representan un oasis verde en una área denudada de árboles, la marisma es lo que domina el paisaje de la zona situada en las montañas de Derryveagh. Estos jardines de Glenveagh han incorporado la flora nativa como tema central. Con la conciencia de la

necesidad de fundir los conceptos 'jardin' y 'naturaleza', el personal del jardín y los habitantes locales han fabricado para los visitantes 'bolsas de biodiversidad' las que enmarcan la identidad ecológica del jardín. El artículo describe al público los motivos del proyecto y señala el por qué es importante que integremos la biosfera a casa (Thomashow, 2003).

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# Tree bark:

## a world to discover

**Summary** An innovative project at Brera Botanic Garden, University of Milan, Italy, invites young and old alike, whatever the season, to follow a trail into the old garden to discover the wonderful world of bark. Bark is the tree's skin. It can be smooth, chapped, cracked, furrowed, wrinkled, and so on, but it has its own weave, colour and peculiar design of plates, chips, freckles and furrows. Each kind of tree has its special skin to protect it, which also identifies and distinguishes it. In or on the bark many creatures live or travel, such as fungi and lichens, snails, spiders, bugs and ants – a microcosm to discover. Visitors to Brera are offered a stereo-microscope to help them make a really detailed investigation. Guides assist visitors in examining the bark and encourage them to see strange worlds and lunar landscapes and to imagine fantastic stories. This interface between art and science is a revelation of trees and their morphology.



Left:  
A frame is attached to the trunk of *Diospyros lotus* to attract the attention of visitors. Magnifying glasses, in a basket at the base of the tree, allow visitors to observe the bark more closely (Brera Botanic Garden)

Our Botanic Garden of Brera in Milan is located in the very centre of town, close to the world-famous art gallery of the same name. It could be described as an old historic garden, with a touch of wilderness. The word 'old' may seem redundant if one is also describing the garden as historic. I don't think it is. A historic garden may be perfectly refurbished and restored so as to make it look new, whereas at Brera you really feel the history. Most probably this feeling has something to do with wilderness.

be present in some degree. This compromise was not planned in advance, but it has been accepted. Insufficient personpower? Maybe, but in my view it has more to do with the peculiarities of the garden itself. The main cause is probably the trees that dominate the tiny landscape of our botanic garden. Trees mean shade and shedding. In this shade not many plant species will thrive and the trees shed leaves, twiglets, flakes of bark, flowers, fruits, seeds – all the time and all over the garden.

It is a very relative wilderness. You could call it a sort of compromise between man and nature. Nature is allowed to

Is this touch of wilderness welcomed by visitors? Not all of them. Too many people look only at flowers and are seemingly unable to lift their gaze to the trees. Grander visitors are often scandalized and disgusted, but many ordinary people do like the garden. Also most foreign visitors like it, even those from Britain where, in my view, you can find the most beautiful gardens in the world.

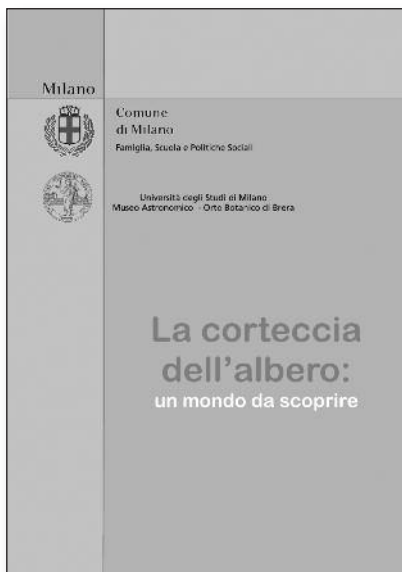
Let's go back to the trees. Trees always have something interesting and beautiful to show. As everyone knows, their aspect greatly changes with the seasons (at least in broad-leaved species) but one element is a constant, intriguing and beautiful at the same time, and this is the bark. Every tree

Far right: 'Bark' by Professor Claudio Longo was written to accompany the exhibition in Brera Botanic Garden (Brera Botanic Garden)

has its own distinctive bark. But please, don't look them up in books! You would forget the differences after a couple of minutes. Far better to look at them in real life, best of all in a botanic garden where you can find so many different species.

Here are some examples from our botanic garden. Caucasian wingnut (*Pterocarya fraxinifolia*), a very large tree at Brera, has a deeply furrowed bark. Close up it looks like the sort of landscape of canyons and ridges you can see from a plane (perhaps even a spaceship). In stark contrast the bark of the nettle tree (*Celtis australis*), grey and smooth, looks much like that of the beech, but here and there a wide open eye stares at you alarmingly (this is most probably a scar left by an old branch). Similar 'eyes' are found on the trunk of *Firmiana platanifolia* (a tree from the Far East). Its bark is grey and smooth too, but is also lined with vertical streaks of a vivid green. They indicate spots where the outer coating of bark is very thin so that the

Right: Activity booklet on bark prepared by the educational staff of the Comune di Milano (Brera Botanic Garden)



Right: Children exploring the bark of various trees in detail using stereomicroscopes (Brera Botanic Garden)



underlying green tissue shows through. In the date-plum (*Diospyros lotus*) the bark is divided into quadrangular tablets, quite like a bar of chocolate. Another interesting bark is that of the Japanese larch (*Larix kaempferi*) that flakes off in large rectangular scales, each one composed of many layers, grey on the outside and reddish brown on the inside. Last but not least in this short compilation is the plane tree (*Platanus* sp.) whose trunk, seen from a distance, looks rather like a military uniform. Everybody is familiar with it, but take a closer look and you will discover an enormous variety of patterns and hues reminiscent of abstract painting (Paul Klee perhaps?) Pure beauty!

Right: Materials used in educational activities for children to discover the wonder of bark (Brera Botanic Garden)

The best time for looking at bark is in winter, when the sunshine can fall unhindered on the trunk and when there are fewer other features to distract the eye. Different details may be highlighted according to the direction of the light, just as on the stage of a theatre.

Bark should be appreciated not only with our eyes, but with our other senses. Touch is especially important. Bark may be smooth or rough (there are different types of roughness) and these tactile properties may differ as you slide your hands down the trunk's surface, encountering fractures or lenticels, scales or swellings.

Other sensations may be interesting. The bark of *Firmiana* (the one with the green stripes) feels distinctly cooler than that of any other tree, probably because the insulating layer is thin and heat flows more easily from our hands to the trunk. The thick bark of *Pterocarya fraxinifolia* or *Dyospiros lotus* feels much warmer.

Even the sense of smell may be involved. Trunks and branches of plane trees, poplars, and walnut trees emit very particular fragrances, especially after rain. These are very small details, but becoming familiar with them can be a first step towards familiarity with the wider natural world.

Each tree's bark is a microcosm, a miniature ecosystem. For some organisms it provides shelter, for others a resting place, for others a means of transit. You find a solitary spider, a swarm of ants marching in a column, or the silvery trace of a snail. In February the dark bark of some trees, especially the large lime tree (*Tilia tomentosa*), accumulates enough solar radiation to warm up quite a bit and then large groups of firebugs (*Pyrrhocoris apterus*) appear on it, to warm up in their turn. If they were cats or dogs instead of insects I would say 'lazily basking in the sunshine'. Seen from afar they appear like bloodstains.

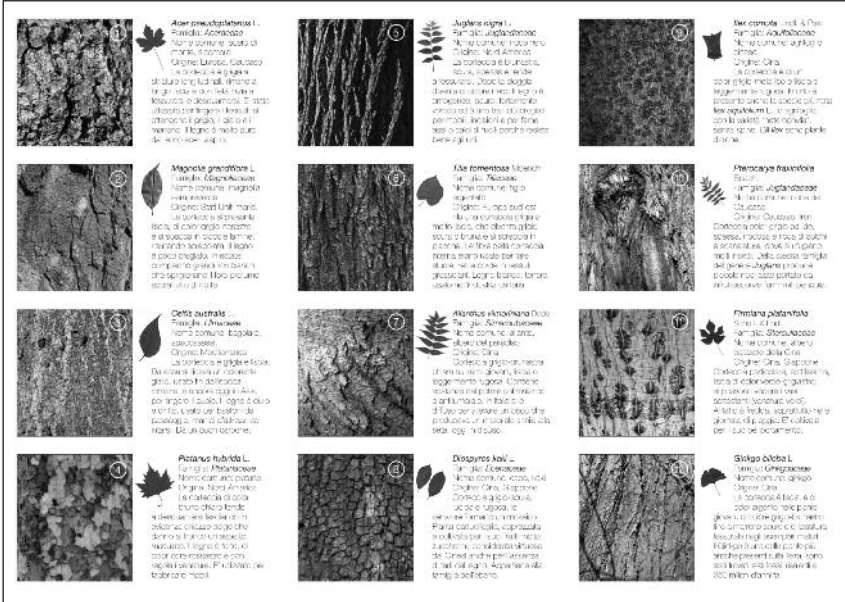


Children greatly appreciate these signs of animal life, as they do all the other minute details of the bark. Our botanic garden has organized specially for primary school children a bark observatory, using the stereomicroscope. With the aid of this instrument their imaginative fantasies can roam in a fantastic landscape.

One final consideration. Our modern world is not a very good place to live in, and this is partly due to important people who lead the political or economic destiny of nations. Mostly male, middle-aged, well-dressed and ultra serious, they seem to have few occasions for relaxation or amusement. Could they not have some fun with a little programme on bark? Gazing into a deep crevice with a small red bug crawling along inside, or feeling a wonderful sense of relaxation while gently caressing the cool bark of *Firmiana*? 'Botanic fun for busy VIPs' – our little garden of Brera is too small and uninfluential to launch such a scheme. But perhaps a larger garden could try. Any offers?

**Résumé**

Un parcours novateur à travers le jardin botanique de Brera, de l'Université de Milan en Italie, invite aussi bien les jeunes que les anciens, quelle que soit la saison, à suivre une piste dans le vieux jardin pour découvrir le monde merveilleux de l'écorce. L'écorce est la peau de l'arbre. Elle peut être lisse, craquelée, fissurée, sillonnée, ridée, etc., mais elle a sa propre trame, sa propre couleur et un motif particulier constitué de plaques, d'ébréchures, de taches et de rides. Chaque arbre a sa propre peau pour se protéger, qui permet également de l'identifier et de le distinguer. Sur l'écorce vivent nombre d'habitants, tels que des champignons et des lichens. Bien d'autres êtres vivants y résident ou y passent, notamment des escargots, araignées, insectes et fourmis – un microcosme à découvrir. Chaque visiteur peut apporter un stéréomicroscope lui permettant de réaliser ses recherches sur les arbres de manière approfondie. Les guides aident également le public à observer l'écorce et à faire fonctionner leur imagination pour visualiser des



Left: Visitors are able to explore the bark of 12 trees using this self-guided leaflet (Brera Botanic Garden)

mondes extraordinaires, des paysages lunaires et des histoires fantastiques. Ce parcours est un voyage entre l'art et les sciences, menant à découvrir l'arbre et sa morphologie.

**Resumen**

El jardín Botánico Brera de la Universidad de Milán, Italia, invita a los jóvenes y los no tan jóvenes a recorrer un sendero. Cualquiera que sea la estación, el sendero en el jardín antiguo es para descubrir el maravilloso mundo de la corteza. Siendo que la corteza es la piel de los árboles. Esta puede ser lisa, arrugada, en lajas horizontales, estriada, partida, etc. pero tiene su trama, color y diseño particular a manera de placas, lajas, pecas y surcos. Cada árbol tiene su propia piel que lo protege, la cual también lo identifica y distingue entre

otros. En la corteza también hay un sinnúmero de organismos vivos como lo son hongos, líquenes. También muchos otros que viven o pasan temporadas en la misma, como son el caso de los caracoles, arañas, insectos y hormigas, esto es todo un microcosmos a descubrir. Cada visitante puede llevar consigo un pequeño estereo microscopio el cual lo habilita a llevar a cavo su propia y meticulous investigación. También se cuenta con guías que ayudan y orientan al publico a mirar las diferentes cortezas y usar su creatividad para visualizar mundos que se tornan maravillosos a los ojos, imaginando paisajes lunares o construyendo historias fantásticas. El sendero se puede considerar un viaje entre el arte y las ciencias, todo esto para descubrir lo fascinante de un árbol y su morfología.

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Left: A group of children explore the thick bark of *Diospyros lotus* which feels surprisingly warm (Brera Botanic Garden)

# Greening university minds

The major project, University and Environment (Universidad y Medio Ambiente – UMA) at BUAP was initiated in 2007 and began its activities in 2008. One of its objectives is to create an environmentally aware culture among the students. The University Botanic Garden developed the UMA workshop, in which all the university students could participate. Apart from their great importance as nature reserves, botanic gardens are also useful as educational tools that contribute to the development of the individual and can therefore be used to achieve another of our objectives for UMA.

The Botanic Garden at BUAP consists of 11 hectares with different types of vegetation representative of Puebla State – 1000 plant species, more than

100 bird species, and other elements that make visitors aware of nature and the need to value and respect it. Its location on the campus makes it an ideal space for the workshop University and Environment, one of the main objectives of which is to help develop responsible and aware individuals.

The four-hour workshop included topics such as water, soil, green spaces, atmosphere, Global Climate Change, and the very serious problems arising from waste generation. Each topic was discussed with reference to its biological, social and economic importance, the current environmental situation, the sustainable use of natural resources and health, and ways of alleviating the problems. The workshop served to promote exchanges of opinion between the students and to encourage them to think seriously about environmental degradation.

In the introductory part of the workshop, there was a presentation of UMA and its objectives. A video showed the beauty of different Mexican landscapes and contrasted this with the environmental threats they face. After this came an 'all in' activity that showed how every part of the ecosystem forms an integrated whole,

**Summary** These days the state of the environment is worrying and consciously or unconsciously we humans are having a negative impact upon it. To address this situation, in 2008, Benemerita University in Puebla (Benemerita Universidad Autónoma de Puebla – BUAP) supported a series of activities with the objective of creating an environmentally aware culture in the university community. Together with staff from the Education Department, our Botanic Garden developed a workshop entitled University and Environment, aimed at students of Culture and Ethics. The Botanic Garden is located in the main university campus and is an ideal site for environmental education. One workshop was given for lecturers and 40 more for the 1300 undergraduates.

Right: Puebla University students receiving their certificates confirming that they have taken the UMA course. Left: Dr. Enrique Barrada, Director for Public Awareness of Science at the University, centre: Dr. Jaime Diaz, Education Officer in Puebla municipality (Botanic Garden archive)



and how each has an effect on the others. In this way all the subjects included in the workshop were linked together.

The workshop was developed with the collaboration of students of Biology and Environmental Engineering and also students from the UPAEP (Universidad Popular Autónoma del Estado de Puebla). All the students, and the education staff in the garden, had several meetings and practical sessions for training and feedback before beginning the workshop. The target audience were students reading Culture and Ethics, a course that includes Environmental Protection as a compulsory element.

The workshop was given first to the lecturers of Culture and Ethics and following this to the students. In order to get feedback and improve the results of the workshop they all completed a questionnaire afterwards and this resulted in several changes being implemented. The positive feedback showed that those attending the workshop had had a very satisfactory experience. Both content and activities motivated the students to consider the problems of the environment and how it might be protected.

The interest in and success of the workshop show us that we need to continue working at the university level, both in order to increase awareness of environmental problems within the university and to contribute to the development of individuals who will remain committed to the sustainable use of natural resources.

## Résumé

Aujourd'hui, l'état de l'environnement est inquiétant et, consciemment ou inconsciemment, nous les humains avons un impact négatif sur cet espace dans lequel nous vivons. Pour aborder cette situation, en 2008, l'Université de Benemerita à Puebla (Benemerita Universidad Autónoma de Puebla – BUAP) a appuyé le développement d'une série d'activités, dans l'objectif de créer une culture consciente de l'environnement au sein de l'université. En collaboration avec des membres du département de l'éducation, notre



Left: Dr. Maricela Rodríguez-Acosta (above left), with Biology students Adriana Moreno Crispín (above right), Blanca Fabiola Pérez (bottom left) and Michelle Xicotencatl (bottom right) proudly display Oak seedlings propagated in the garden that will be used to reforest the University Campus (Allen J. Coombes)

jardin botanique à mené un atelier intitulé 'Université et environnement' pour les étudiants de Culture et éthique. Le jardin botanique se trouve sur le site principal de l'université et présente un lieu idéal pour l'éducation environnementale. Un atelier pour les enseignants et une quarantaine d'ateliers pour les 1300 étudiants ont été organisés à ce jour.

## Resumen

La situación ambiental actual es preocupante y de manera consciente o inconsciente, estamos generando un impacto negativo hacia el ambiente.

Ante esta situación la Benemérita Universidad Autónoma de Puebla en el 2008, planteó realizar una serie de actividades con el objetivo de desarrollar una cultura ambiental en la comunidad universitaria. En este sentido, el personal del departamento de educación del Jardín Botánico, implementó el taller "Universidad y medio ambiente", dirigido a

estudiantes universitarios de la asignatura Cultura y ética. El Jardín Botánico se encuentra en el principal Campus de la Universidad, lo que lo convierte en un espacio ideal para contribuir en la educación ambiental de la comunidad universitaria. Se impartió un taller a los docentes y 40 talleres a 1300 estudiantes universitarios.

**Herbario y Jardín Botánico**  
**Amparo Bélgica Cerón Carpio, Head of Education, Botanical Gardens, BUAP**  
**Licet Olguín Hernández and Karina A. Cue Hernández, student participants in UMA**  
**Maricela Rodríguez-Acosta, UMA Coordinator**

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# Resources

## Resources

### Go Wild! - 101 Things To Do Before You Grow Up

Go Wild is a fantastic new book that offers up ideas of 101 things to do outdoors before you grow up. Go Wild is from the same people who brought us Nature's Playground which we featured in a previous Roots (see Roots 3:2). Aimed at families, particularly those with children from 8-16, the book is full of challenging ways to interact with nature. Adventures such as building shelters and foraging for foods offer an eye to a world that seems to have been lost for many of today's urban children. The website is also worth a look, [www.goingwild.net](http://www.goingwild.net). It has activity ideas and tips for making sure that children's time in the wild is safe as well as fun.

*Fiona Danks and Jo Schofield, 2009, Frances Lincoln, London, UK, 160pp. ISBN-10: 0711229392*

*Frances Lincoln Ltd, 4 Torriano Mews, Torriano Avenue, London NW5 2RZ, UK [www.franceslincoln.com](http://www.franceslincoln.com)*

### Stuffed and Starved: Market, Power and the Hidden Battle for the World Food System

Raj Patel's critique of the world food system is a hugely informative read on the injustices of current practice. As the title suggests this book proposes that there is something fundamentally wrong if we have millions of overweight

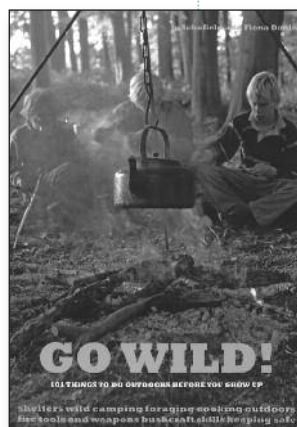
## Disponible

### Go Wild! - 101 Things To Do Before You Grow Up

Go Wild est un nouveau livre extraordinaire qui propose mille et une choses à faire en extérieur pour les jeunes. Il est écrit par les auteurs de "Nature's Playground" que nous avons présentés dans Roots 3:2. Destiné aux familles, en particulier avec des enfants de 8 à 16 ans, ce livre propose plein d'activités stimulantes à faire dans la nature. Construire un abri ou chercher de la nourriture sont des aventures qui ouvrent à un monde qui semble avoir disparu pour les enfants des villes d'aujourd'hui. Le site Internet vaut également le détour : [www.goingwild.net](http://www.goingwild.net). Il contient des idées d'activités et des conseils pour assurer que les enfants soient en toute sécurité dans la nature, tout en passant un bon moment.

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## Recursos

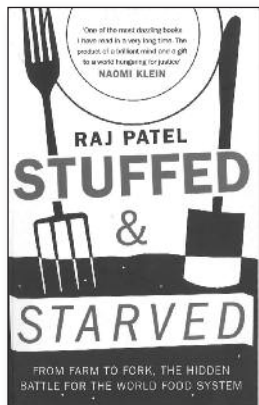
### Go Wild! - 101 Things To Do Before You Grow Up

Go Wild es una nueva y fantástica publicación que brinda ideas para realizar 101 actividades al aire libre ... ¡jantes de crecer! Los autores de Go Wild también produjeron Nature's Playground, libro que ya presentamos en un número anterior (vea Roots 3:2). Dirigido a las familias, especialmente a aquellas con niños de 8 a 16 años, este libro contiene una variedad de divertidas y desafiantes maneras de

interactuar con la naturaleza. Aventuras como la construcción de albergues y la búsqueda de alimentos, brindan la oportunidad de asomarse a un mundo que parece haberse perdido para muchos niños en las ciudades de hoy. Recomendamos ampliamente explorar el sitio web de Going Wild ([www.goingwild.net](http://www.goingwild.net)). Ahí encontrará ideas, actividades y consejos para que niñas y niños disfruten de su tiempo en el medio silvestre de manera segura y divertida.

*Fiona Danks and Jo Schofield, 2009, Frances Lincoln, London, UK, 160pp. ISBN-10: 0711229392*

*Frances Lincoln Ltd, 4 Torriano Mews, Torriano Avenue, London NW5 2RZ, UK [www.franceslincoln.com](http://www.franceslincoln.com)*



people in the world whilst millions do not have enough to eat. It is full of startling stories and analysis of the injustices but also offers some inspiring stories of resistance and alternative ways that could make the food system work in favour of

everyone. It also comes from a writer from the 'developing world'. This is refreshing as so much of our critical literature seems to come from western writers. Well worth reading and will make you seriously think about what you are going to eat the next time you are trapped in a queue at the supermarket.

*Raj Patel, 2007, Portobello Books Ltd., London, UK, 448pp.*

*ISBN: 9781846270109*

*Portobello Books, 12 Addison Avenue, London W11 4QR, UK.*

*www.portobellobooks.com*

### **The Earth Only Endures: On Reconnecting With Nature and Our Place In It**

Jules Pretty's latest work is a beautifully written look at the ever increasing estrangement of humans and nature. The book focuses on people's important connections with nature and how those connections are being lost. Rather than writing a doomsday book Pretty offers us some hope, although his optimism requires a major rethink about how we interact with the world. Modern lifestyles of lower consumption and the need to become more local are key if the earth and humanity are to overcome the major environmental challenges that we currently face. An inspiring book that will leave you pondering some very important questions.

*Jules Pretty, 2009, Earthscan Ltd., London, UK. 287pp*

*ISBN-10: 184407613X*

*Earthscan, Dunstan House, 14a St. Cross Street, London EC1N 8XA, UK.*

*www.earthscan.co.uk*

### **Gavés et affamés: le marché, le pouvoir et le combat secret pour le système alimentaire mondial**

La critique du système alimentaire mondial de Raj Patel est une lecture extrêmement instructive sur les injustices de ce système. Comme l'indique le titre, ce livre stigmatise le fait, fondamentalement injuste, qu'il y ait des millions de personnes obèses dans le monde alors que des millions d'autres meurent de faim. Il présente plein d'histoires incroyables et analyse ces injustices, il relate également des récits exaltants de résistance et propose des chemins alternatifs qui permettraient que le système alimentaire mondial profite à tous. L'auteur nous vient d'un « pays en voie de développement » ce qui est également réjouissant car la littérature critique semble souvent venir d'auteurs occidentaux. Il vaut la peine d'être lu et vous fera sérieusement réfléchir sur ce que vous allez manger, la prochaine fois que vous serez coincés dans une queue au supermarché.

*Raj Patel, 2007, Portobello Books Ltd., London, UK, 448pp.*

*ISBN: 9781846270109*

*Portobello Books, 12 Addison Avenue, London W11 4QR, UK.*

*www.portobellobooks.com*

### **La Terre ne fait que supporter : se reconnecter avec la nature et y retrouver notre place**

Le dernier livre de Jules Pretty, magnifiquement écrit, est un regard sur la fracture toujours croissante entre les humains et la nature. Le livre traite des liens essentiels entre les gens et la nature, et notre déconnexion croissante. Plutôt qu'un regard morbide, Pretty nous offre l'optimisme, mais un optimisme qui nous demande de revoir totalement nos interactions avec le monde. Les modes de vie et de consommation actuels, et la nécessité de revenir au local sont deux questions clés que l'humanité doit résoudre si elle veut relever les défis environnementaux d'aujourd'hui. Un livre stimulant qui vous fera réfléchir sur des questions primordiales.

*Jules Pretty, 2009, Earthscan Ltd., London, UK. 287pp*

*ISBN-10: 184407613X*

### **Stuffed and Starved: el mercado, el poder y la batalla oculta por el sistema alimentario mundial**

La crítica de Raj Patel al sistema alimentario mundial es una lectura con amplia información sobre las injusticias de dicho sistema. Como lo sugiere el título, este libro afirma que algo está fundamentalmente equivocado si por una parte existen en el mundo millones de personas con sobrepeso, mientras que por otra, millones más no disponen de alimento suficiente. El libro presenta sorprendentes historias y análisis de estas injusticias, pero al mismo tiempo expone otros casos de la resistencia y de las formas alternativas que pueden hacer que el sistema alimentario mundial funcione a favor de todos. Por ser un libro cuyo autor proviene del "mundo en desarrollo", su lectura resulta refrescante, si se piensa que la mayoría de nuestra literatura crítica es de escritores occidentales. La próxima vez que esté atrapado en la cola del supermercado, la lectura del libro le hará pensar seriamente en lo que usted va a comer.

*Raj Patel, 2007, Portobello Books Ltd., London, UK, 448pp.*

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### **Sólo la Tierra perdura: Sobre el contacto con la naturaleza y nuestro lugar en ella**

El más reciente libro de Jules Pretty presenta una visión bellamente escrita, sobre el paulatino alejamiento entre los seres humanos y la naturaleza. El libro se centra en la importancia que tienen para las personas el contacto con la naturaleza y en nuestra creciente desvinculación que experimentamos. Más allá de mostrar un panorama desalentador, el libro de Pretty nos ofrece optimismo. Sin embargo se trata de un optimismo que motiva a repensar las formas en las que interactuamos con el mundo. Los modelos de consumo de nuestros días y la necesidad de ser más locales, son dos de los principales argumentos si la Tierra y la humanidad van a superar los principales retos ambientales que actualmente enfrentan. Un libro inspirador que le dejará meditando sobre cuestiones muy importantes.

## Ecological Literacy: Educating Our Children for a Sustainable World

The Centre for Ecoliteracy in Berkeley has produced this wonderful book that focuses on the importance of education being ecologically literate. The book is a collection of essays and studies of real life projects by partners of the Centre for Ecoliteracy. Producing healthy school meals from produce grown in a school garden is one of the cases given. This teaches children of life and energy cycles as well as connecting them with the food they eat. There are many more examples and ideas about how to connect education and the environment. This book is a valuable resource for educators as well as parents in offering great ideas and practical examples for developing more ecoliterate children.

*Ecological Literacy: Educating Our Children for a Sustainable World*  
M K Stone, 2005, University of California Press, USA. 296pp  
ISBN-10: 1578051533  
University of California Press, 2120 Berkeley Way, Berkeley, CA 94704-1012, USA. [www.ucpress.edu](http://www.ucpress.edu)

## Websites

<http://www.countdown2010.net/>



2010 countdown is a news and information sharing website raising awareness of biodiversity news and events leading up to the International Year of Biodiversity in 2010. It has a regularly updated news section, links to other related sites and the success stories of the work done so far. The Biodiversity Year Schedule of Events 2010 (BYSE) is a calendar that announces all public events in Europe regarding taxonomy/biodiversity.

*Earthscan, Dunstan House, 14a St. Cross Street, London EC1N 8XA, UK. [www.earthscan.co.uk](http://www.earthscan.co.uk)*

## Éducation à l'Environnement: éduquer nos enfants pour un monde durable

Le Centre pour l'éducation à l'environnement (« Ecoliteracy ») de Berkeley a publié ce livre merveilleux qui traite de l'importance pour l'éducation de prendre en compte les connaissances en écologie. C'est une collection d'études et de rapports sur des projets concrets de partenaires du Centre. L'un des cas proposés est la production de repas scolaires sains réalisés avec les produits du jardin d'une école. Les enfants apprennent des choses sur les cycles de la vie et de l'énergie, et rétablissent un lien avec ce qu'ils mangent. Il contient plein d'autres exemples et idées pour associer éducation et environnement. Ce livre est un outil précieux pour les éducateurs ainsi que les parents, proposant de bonnes idées et des exemples pratiques pour que les enfants développent leurs connaissances en écologie.

*Ecological Literacy: Educating Our Children for a Sustainable World*  
M K Stone, 2005, University of California Press, USA. 296pp  
ISBN-10: 1578051533  
University of California Press, 2120 Berkeley Way, Berkeley, CA 94704-1012, USA. [www.ucpress.edu](http://www.ucpress.edu)

## Sites Internet

<http://www.countdown2010.net/>

Le « Compte à rebours 2010 » est un site de partage d'informations présentant des nouvelles et des manifestations sur la biodiversité, menant à l'Année internationale de la biodiversité en 2010. Il comprend une partie Actualités, régulièrement mise à jour, des liens vers d'autres sites semblables et le récit des réussites dans les travaux entrepris jusqu'à maintenant. L'Agenda des manifestations de l'Année de la biodiversité 2010 est un calendrier de tous les événements publics en Europe concernant la taxonomie et la biodiversité. Sont inclus les

*Jules Pretty, 2009, Earthscan Ltd., London, UK. 287pp  
ISBN-10: 184407613X  
Earthscan, Dunstan House, 14a St. Cross Street, London EC1N 8XA, UK. [www.earthscan.co.uk](http://www.earthscan.co.uk)*

## Alfabetización ecológica: Educando a Nuestros Niños para un Mundo Sostenible

El Centre for Ecoliteracy en Berkeley ha producido este maravilloso libro que se centra en la importancia de que la eco-alfabetización en la educación. El libro es una colección de ensayos y estudios de casos y proyectos reales, presentados en el Centre for Ecoliteracy. La producción de alimentos escolares sanos a partir de productos cultivados en un huerto escolar es uno de los casos expuestos. Esto enseña a los niños los ciclos de vida y de la energía, al tiempo que los relaciona con los alimentos que consumen. Hay más ejemplos e ideas para vincular educación y medio ambiente. Se trata de un recurso valioso para educadores y padres de familia, con buenas ideas y ejemplos prácticos para el desarrollo y la formación de niñas y niños eco-alfabetizados.

*Ecological Literacy: Educating Our Children for a Sustainable World*  
M K Stone, 2005, University of California Press, USA. 296pp  
ISBN-10: 1578051533  
University of California Press, 2120 Berkeley Way, Berkeley, CA 94704-1012, USA. [www.ucpress.edu](http://www.ucpress.edu)

## Sitios Web

<http://www.countdown2010.net/>

2010 Countdown (Cuenta regresiva 2010) es un sitio web de noticias e intercambio de información para la sensibilización sobre la biodiversidad y los acontecimientos que tendrán lugar en el 2010, Año Internacional de la Diversidad Biológica. Tiene una sección de noticias que es actualizada regularmente, enlaces a otros sitios relacionados e historias de éxito obtenidas hasta la fecha. En el Calendario de Eventos del Año Internacional de la Diversidad Biológica 2010 (BYSE) se anuncian todos los eventos públicos que tendrán lugar en



Exhibitions, workshops, teaching activities are all included and you are encouraged to upload your own events. It has a large and growing database of information that can be searched by country, date or institution. They publish a bi-monthly newsletter and many of the articles on the site can be translated into other languages.

<http://www.ted.com/>

Do you like inspiring speeches, seeing the world's leading lights talk about the world's most important issues, or just being entertained? Then beware of TED because it could take up a lot of your time. TED is an annual conference with the slogan 'Ideas worth Spreading'. The website collects inspiring speeches from the conference and all around the world for free viewing. It has some magnificent speeches on the environment and conservation and the many issues concerning it. Jonathan Drori's speech on the Millennium Seed Bank and Michael Pollan's speech from a plant's eye view are just two of the clips well worth watching. Informative and inspiring!

[www.biodiversity911.org](http://www.biodiversity911.org)

Biodiversity911 has been developed by the WWF as an educational resource for teachers and to show the importance of biodiversity conservation to children. With plenty of clear concise information and activity ideas it is a great starting place for educators wanting to develop lessons on biodiversity. Fun and colourful games and quizzes encourage learning about



expositions, ateliers, animations... et vous êtes encouragés à mettre vos propres manifestations en ligne. Le site comprend une large et croissante base de données sur laquelle vous pouvez effectuer des recherches par pays, date ou institution. Un bulletin bimensuel est publié, et de nombreux articles du site peuvent être traduits dans d'autres langues.

<http://www.ted.com/>

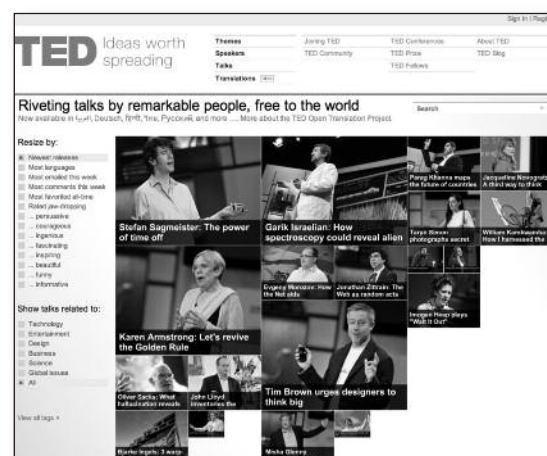
Vous aimez les discours exaltants, écouter les grands de ce monde parler de sujets importants, ou simplement vous distraire? Alors, prenez garde car TED pourrait bien occuper tout votre temps. TED est une conférence annuelle dont le slogan est "Ideas worth Spreading". Le site collectionne les discours exaltants de conférences du monde entier à visionner en accès libre. Il présente des discours magnifiques sur l'environnement et l'écologie, et de nombreuses discussions se rapportant à ce sujet. Le discours de Jonathan Drori sur le Millenium Seed Bank et celui de Michael Pollan sur le point de vue d'une plante sont deux clips qui valent la peine d'être vus. Instructif et stimulant!

[www.biodiversity911.org](http://www.biodiversity911.org)

« Biodiversity 911 » a été développé par le WWF comme un outil pédagogique pour les enseignants, et montre l'importance de la conservation de la biodiversité pour les enfants. Avec de nombreuses informations claires et concises et des idées d'activités, c'est un bon départ pour les éducateurs désirant préparer des leçons sur la biodiversité. Les enfants resteront des heures à apprendre des choses sur l'importance de la biodiversité avec des jeux et questionnaires amusants et plein de couleurs. La partie sur « Comment agir » présente des idées pratiques pour tous, y compris les enfants, pour aider à entretenir et protéger la biodiversité. C'est un site excellent à l'intention des éducateurs et parents qui veulent motiver de jeunes enfants, et peut-être aussi se motiver eux-mêmes pour protéger la biodiversité.

Europa relacionados con la taxonomía y la biodiversidad. Incluye exposiciones, talleres, actividades de enseñanza y le invitan a dar a conocer en él sus propios eventos. Tiene una amplia y creciente base de datos de información que se pueden buscar por país, fecha o institución. Además publican un boletín bimensual; muchos de los artículos en el sitio pueden ser traducidos a otros idiomas.

<http://www.ted.com/>



¿Le gustan los discursos inspiradores, ver a los grandes motivadores hablar sobre los asuntos más importantes del mundo o simplemente entretenerse? Entonces tenga cuidado con TED porque puede ocupar mucho de su tiempo. TED es una conferencia anual con el lema "Difundir ideas es valioso". El sitio web compila y pone a disposición gratuita, discursos inspiradores presentados en esta conferencia y en todo el mundo. Tiene magníficas charlas sobre conservación y medio ambiente y las muchas cuestiones que lo afectan. La charla de Jonathan Drori sobre el Millennium Seed Bank y la de Michael Pollan sobre el punto de vista de las plantas son sólo dos de los clips que vale la pena ver. ¡Un sitio informativo e inspirador!

[www.biodiversity911.org](http://www.biodiversity911.org)

Biodiversity911 (Biodiversidad911) ha sido desarrollado por el WWF como un recurso educativo para maestros, con el objetivo de mostrar la importancia de conservar la biodiversidad a los niños. Con una gran cantidad de información clara y concisa, las ideas para

the abundance and importance of biodiversity. The taking action section has practical ideas for everybody, including children, to help look after our world.

[www.informalscience.org](http://www.informalscience.org)



Informal science is an online community and resource centre for informal learning projects, research and evaluation. It has two main functions. Firstly it is a database of information, a search of botanic gardens for example will bring you a number of results on research and projects in botanic gardens. Secondly it is a networking site. You can create a profile and connect with other users, which is excellent for making contacts, sharing ideas and research, and finding information from respected sources.

<http://www.stumbleupon.com>

Stumble Upon is a search engine with a difference. It is peer rated so the results of your search are websites that have been recommended by other users. The recommendation is done by simply giving a positive 'thumbs up' click if you are taken to a website that you think is worth others viewing. The photo galleries are particularly good and the results of a botanic garden photo search were some stunning shots from around the world. A good way to search for interesting news and informative websites or just while away an hour or two.

[www.informalscience.org](http://www.informalscience.org)

« Informal science » est une communauté en ligne et un centre de ressources sur les projets pédagogiques, de recherche et l'évaluation informels. Ce site a deux fonctions principales. Tout d'abord, une base de données qui permet, par exemple, de trouver des informations sur les projets et études dans les jardins botaniques en effectuant une recherche. Ensuite c'est un site pour développer des réseaux. Vous pouvez vous inscrire et échanger avec les autres utilisateurs, génial pour établir des contacts et partager des idées et projets de recherche. Un site excellent qui permet aux éducateurs de trouver des informations venant de sources reconnues.

<http://www.stumbleupon.com>

« Stumble Upon » est un outil de recherche avec une particularité: les résultats de votre recherche sont recommandés par les autres utilisateurs. Pour recommander un site, il suffit de cliquer sur un petit « J'aime » si vous pensez qu'il vaut le détour. Les galeries de photos sont particulièrement bien, et le résultat d'une recherche sur les photos de jardins botaniques donne des clichés fantastiques du monde entier. Un bon moyen de chercher des informations et sites intéressants, ou simplement de perdre une heure ou deux de façon instructive.



desarrollar actividades son un buen punto de partida para los educadores que quieran desarrollar lecciones sobre diversidad biológica. Divertidos juegos y coloridas actividades mantendrán ocupados a los niños por horas, al tiempo que aprenden sobre la abundancia y la importancia de la diversidad biológica. La sección de adopción de medidas tiene ideas prácticas para todos, incluidos los niños, para ayudar a mantener y proteger la biodiversidad. Es un excelente sitio para educadores y padres para inspirar a los niños más pequeños, y quizás a ellos mismos, sobre la protección de la vida en nuestro planeta.

[www.informalscience.org](http://www.informalscience.org)

Informal Science (Ciencia informal) es una comunidad en línea y un centro de recursos para proyectos de aprendizaje informal, investigación y evaluación. Tiene dos funciones principales: en primer lugar, es una base de datos de información. Una búsqueda de jardines botánicos, por ejemplo, le llevará una serie de resultados de investigaciones y proyectos que tienen lugar en los jardines botánicos. En segundo lugar, es un sitio para la formación de redes. Usted puede crear un perfil y conectarse con otros usuarios; es ideal para hacer contactos y compartir ideas e investigaciones. Un lugar excelente para que los educadores lo visiten y encuentren información de fuentes confiables.

<http://www.stumbleupon.com>

Stumble Upon es un motor de búsqueda con una diferencia: es evaluado por pares, por lo que muestra sitios recomendados por otros usuarios. Al visitar un sitio web, la recomendación se hace simplemente dando clic en el icono "pulgares arriba" si usted cree que vale la pena que los demás lo vean. Las galerías de fotos son particularmente buenas. Por ejemplo la búsqueda fotos en jardines botánicos arrojó impresionantes fotografías de jardines de todo el mundo. Una buena forma de buscar novedades y sitios web de interés o simplemente para navegar una hora o dos.

# How to join Botanic Gardens Conservation International and help us to save plants from extinction

**Established in 1987, BGCi links more than 500 botanic gardens and conservation organizations in 115 countries, working together to save PLANTS FOR THE PLANET.**

**BGCi's INSTITUTION members receive numerous benefits:**

- Opportunities for involvement in joint conservation and education projects
- Tools and opportunities to influence global conservation policy and action
- Botanic Garden Management Resource Pack (upon joining)\*
- Regular publications:
  - *Cuttings* – newsletter on botanic gardens and plant conservation (2 per year)
  - *BGjournal* – an international journal for botanic gardens (2 per year)
  - *Roots* – Environmental Education Review (2 per year)
  - A wide range of publications and special reports
- Invitations to BGCi congresses and discounts on registration fees
- BGCi technical support and advisory services

Institution Membership		£ Stlg	US \$	€ Euros
A	BGCi Patron Institution	5000	8000	7500
B	Institution member (budget more than US\$2,250,000)	750	1200	1000
C	Institution member (budget US\$ 1,500,000 - 2,250,000)	500	800	650
D	Institution member (budget US\$ 750,000 - 1,500,000)	350	550	450
E	Institution member (budget US\$ 100,000 - 750,000)	185	300	250
F	Institution member (budget below US\$100,000)*	85	130	115

\*Generally applies to institutions in less developed countries

**INDIVIDUAL members and donors**

support BGCi's global network for plant conservation, and are connected to it through our publications and events. Membership categories include:

- Regular publications:
  - *Cuttings* – newsletter on botanic gardens and plant conservation (2 per year)
  - *BGjournal* – an international journal for botanic gardens (2 per year)
  - *Roots* – Environmental Education Review (2 per year)
- Invitations to BGCi congresses and discounts on registration fees

Individual Membership		£ Stlg	US \$	€ Euros
J	Conservation donor ( <i>BGjournal</i> , <i>Roots</i> and <i>Cuttings</i> reports and more)	250	400	350
K	Associate member ( <i>Cuttings</i> and <i>BGjournal</i> )	40	65	50
L	Associate member ( <i>Cuttings</i> and <i>Roots</i> )	40	65	50
M	Friend ( <i>Cuttings</i> ) available through online subscription only ( <a href="http://www.bgci.org">www.bgci.org</a> )	10	15	15

Corporate Membership is available; please contact BGCi at [info@bgci.org](mailto:info@bgci.org) for further details.

\*Contents of the Botanic Garden Management Resource Pack include: *Darwin Technical Manual for Botanic Gardens*, *A Handbook for Botanic Gardens on the Reintroduction of Plants to the Wild*, *BGjournal* - an international journal for botanic gardens (2 past issues), *Roots* - Environmental Education Review (2 past issues), *The International Agenda for Botanic Gardens in Conservation*, *Global Strategy for Plant Conservation*, *Environmental Education in Botanic Gardens*, additional recent BGCi reports and manuals. *BG-Recorder* (a computer software package for plant records) available on request.

Payment may be made online at [www.bgci.org/worldwide/members/](http://www.bgci.org/worldwide/members/), or by cheque (payable to Botanic Gardens Conservation International) or VISA/MasterCard sent to BGCi, Descanso House, 199 Kew Road, Richmond, Surrey, TW9 3BW, U.K or Fax: +44 (0) 20 8332 5956.

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Institution Name (if applicable) .....

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Telephone .....

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Website .....

Membership category (A-M) ..... Annual rate .....

VISA/Mastercard number .....

Credit card expiry date ..... Security code/CSV number (last 3 digits) .....

Signature ..... Print name .....

I would like to make a donation to BGCi. Amount .....

Please clearly state your name (or the name of your institution) on all documentation. Please contact [info@bgci.org](mailto:info@bgci.org) for further information. Individuals in the U.S. can make tax-deductible contributions online at [www.justgive.org](http://www.justgive.org) or by contacting [usa@bgci.org](mailto:usa@bgci.org). BGCi is a registered charity and company, limited by guarantee, in England and Wales, and in the U.S. as a 501(c)(3) non-profit organization.

## International Diploma in Botanic Garden Education



The next *International Diploma in Botanic Garden Education* is being run from 20 September to 22 October 2010. Organized by BGCI and the Royal Botanic Gardens, Kew, this five week course aims to equip participants with the skills and strategies needed to communicate effectively with their varied audiences. By the end of the course, participants will have an understanding of all the aspects required to create an education master plan for their site.

The emphasis of the course is on interactive learning and the application of skills to the participants' working context, with lectures, workshops, seminars, practical activities and field visits. Topics covered include: theory and development of environmental education, identification of target audiences, project planning, interpretation principles and practices, lifelong learning strategies, fundraising, marketing, networking and evaluation.

Visit the RBG Kew website ([www.kew.org/education/bge.html](http://www.kew.org/education/bge.html)) or the BGCI website ([www.bgci.org/conservation/diploma\\_course\\_outline](http://www.bgci.org/conservation/diploma_course_outline)) for more information and application details – deadline for submission of applications is 31st March 2010.

BGCI is also seeking funding to offer scholarships for the International Diploma course. Applicants must be from developing countries, have proficiency in conversational and written English, and be knowledgeable of appropriate technical terms. Contact BGCI's education department to receive an application form ([education@bgci.org](mailto:education@bgci.org)). The deadline for scholarship applications is 28 February 2010.



### Testimonials

*I loved the variety, energy, and pace of the International Diploma in Botanic Garden Education Course. Participating in the course improved my knowledge relating significance of education in botanic gardens in relation to plant conservation and sustainability. Also, the course made it possible to develop contacts and communication channels with other professionals working in related areas and also to build friendships. It was a very well organised course with fantastic tutors.*

Dilan Bayindir, Nezahat Gokyigit Botanic Garden,  
Istanbul, Turkey. International Diploma 2008.

*"This course is a MUST for anybody out there who is conducting environmental education in botanical gardens ....your conservation site will definitely echo out conservation messages clearly and effectively if you know how to get messages out. This course is that tool."*

Endo Guav, Forestry Research Institute, Papua New Guinea.  
International Diploma 2006.

*The Diploma Course is superb! It encompasses an engaging mixture of theoretical and experiential programmes and provides you with a huge opportunity to obtain knowledge and skills from botanic gardens and different educational centres in the UK. Your garden can quickly embrace what you learn.*

Orlik Gómez García, Jardín Botánico Francisco Javier Clavijero,  
Mexico. International Diploma 2008.