Botanic Gardens Conservation International Education Review

roots

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Science and Culture

Misterio en el Botánico

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Forthcoming Issue
Volume 9 Number 1 – Children's Play Areas in Botanic Gardens
Last submission date – 10 January 2012
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First word
Science and Culture

ENGLISH

Roots is moving with the times, so welcome to our first, full colour, downloadable version. From now on we'll be able to deliver Roots directly to your inbox, wherever you are in the world. Indeed, as we embrace the power of modern technology, challenging old practices and encouraging new, our choice of theme could not be more apt – or timelier.

Botanic gardens occupy a key cultural, educational and societal role. In this image, children investigate vegetables in a project run by the Trento Museum of Natural Sciences, Italy (Picture courtesy of MTSN, Italy)

FRANÇAIS

Roots évolue avec le temps : bienvenue à notre première version entièrement en couleur et téléchargeable. Désormais, nous pourrons vous livrer Roots directement dans votre boîte de réception, où que vous soyez dans le monde. En effet, au moment où nous adoptons les pouvoirs des technologies modernes, mettant en question les anciennes pratiques et encourageant les nouvelles, notre choix de sujet ne pouvait être plus approprié, ou opportun.

Science et Culture sont des mots chargés de sens et qui, apparemment, semblent représenter différentes parties du spectre conceptuel. Toutefois, même une analyse des plus rapides révèle leur lien étroit et la tension dynamique qui existe entre eux.

Et il est rare que ce paradoxe apparent ne soit mieux représenté en termes organisationnels que dans les jardins botaniques. De nombreux jardins, peut-être même la plupart d'entre eux, se considèrent principalement comme des institutions scientifiques. Il est indéniable que leurs équipes scientifiques ont considérablement contribué à notre compréhension de la biologie végétale et des écosystèmes. Peu de gens contesteraient également le fait que les jardins botaniques occupent une place clé en termes culturels, éducatifs et sociétaux, tel qu'ils sont organisés en matière de recherche, d'apprentissage, de développement durable et, bien entendu, de loisirs. À cet égard, il peut être considéré qu'ils sont le miroir des sociétés qui les accueillent, reflétant leurs valeurs et leurs aspirations.

ESPAÑOL

Roots se está actualizando, así que bienvenidos a nuestra primera versión descargable a todo color. A partir de ahora podremos entregarte tus números de Roots directamente en tu bandeja de entrada, en cualquier parte del mundo. De hecho, ya que estamos adoptando el poder de la tecnología moderna desafiando viejas prácticas y alentando nuevas, el temas seleccionado para este número no podía ser más apropiado – o sincrónico.

Ciencia y cultura son palabras fuertes lo que significa que frente a esto, se inscriben en diferentes partes de un amplio espectro conceptual. Sin embargo, incluso el examen más superficial revela su estrecha relación y la tensión dinámica que existe entre ambas.

Y rara vez es mejor esta aparente paradoja incorporada organizativamente en los jardines botánicos. Muchos jardines, quizá la mayoría, se ven a sí mismos principalmente como instituciones científicas. Sin duda sus investigadores han hecho grandes contribuciones a la comprensión profunda de la biología vegetal y los ecosistemas. Sin embargo, pocos podrían argumentar, que los jardines botánicos ocupan un papel clave cultural, educativo y social organizados como los son para la investigación, el aprendizaje, la sustentabilidad y por supuesto para la recreación. En este sentido, se puede decir que los jardines botánicos son un espejo de las sociedades que los cobijan, reflejando sus valores y aspiraciones.

Lo anterior nos lleva a una pregunta intrigante y urgente: si la actividad humana está provocando la degradación

Science and Culture are words heavy with meaning that, on the face of it, may appear to sit in different parts of the conceptual spectrum. However even the most cursory examination uncovers their close relationship and the dynamic tension that exists between them.

And seldom is this apparent paradox better embodied organisationally than in botanic gardens. Many gardens, perhaps even the majority, see themselves primarily as scientific institutions. Unquestionably their scientists have made profound contributions to our understanding of plant biology and ecosystems. Yet few would argue, either, that botanic gardens occupy a key cultural, educational and societal role, organised as they are for research, learning, sustainability and, of course, leisure. In this respect they may be said to hold a mirror to their host societies, reflecting their values and aspirations.

Which brings us to an intriguing and urgent question: if human activity is leading to environmental degradation and an unsustainable future for the planet, how do institutions located at the crossroads of science and culture challenge these destructive behaviours and offer attractive and sustainable alternative models of living?

The easy assumption that people fed a regular diet of scientific information about the looming ecological crisis will simply modify their behaviour accordingly, cannot be supported by the evidence. More varied and imaginative strategies are called for and, as this latest issue of Roots demonstrates, there is no shortage of ideas.

According to Stephen Webster of Imperial College, London, the modern cultural bias towards institutional transparency forces the scientific community to engage with the public as never before. He argues that non-scientific opinion on such diverse issues as the orientation of research, the future of energy policy, the design of museum galleries and even the role of botanic gardens has become influential. While considerable academic energy has been invested in measuring the success of this cultural dialogue, botanic gardens have reportedly been slower than other institutions to embrace a public-centred identity. With so many examples to hand,

Ceci nous conduit à une question intrigante et urgente : si les activités humaines mènent à la dégradation de l'environnement et à un avenir non durable pour la planète, comment les institutions situées à la croisée de la science et de la culture font-elles face à ces comportements destructeurs et comment proposent-elles des modèles de vie différents, qui soient attrayants et durables ?

L'hypothèse facile selon laquelle les personnes alimentées régulièrement par un régime d'informations scientifiques concernant la crise écologique menaçante changeront simplement leur comportement en conséquence ne peut être cautionnée par les faits. Davantage de stratégies diverses et imaginatives sont requises et, comme le démontre ce dernier numéro de Roots, les idées ne manquent pas.

Selon Stephen Webster de l'Imperial College (Londres), la tendance culturelle moderne à une transparence institutionnelle oblige la communauté scientifique à s'engager auprès du public comme jamais auparavant. Il affirme que les opinions non scientifiques concernant des questions aussi variées que l'orientation de la recherche, l'avenir des politiques relatives aux énergies, la conception des galeries de musée, voire le rôle des jardins botaniques, sont devenues déterminantes. Alors que des efforts académiques considérables ont été déployés pour mesurer la réussite de ce dialogue culturel, les jardins botaniques auraient été plus lents que d'autres institutions dans leur adoption d'une identité axée sur le public. Stephen Webster suggère qu'avec autant d'exemples à leur disposition, les jardins ont de vastes opportunités pour élaborer leurs propres modèles d'engagement auprès du public.

Dans une étude de popularité des plantes botaniques menée par le Jardin botanique de l'université de Vienne, Autriche, les plantes médicinales et les épices arrivaient en tête des préférences globales des visiteurs, et les plantes ornementales et celles utilisées dans le secteur industriel suscitaient le moins d'intérêt. Des variations préférentielles en fonction de l'âge ont également été détectées, les élèves étant en général moins intéressés que les adultes par les

del medio ambiente y un futuro insostenible para el planeta, ¿de qué manera las instituciones ubicadas en el cruce de la ciencia y la cultura desafían estas conductas destructivas y ofrecen modelos alternativos y atractivos para una vida sustentable?

La sencilla suposición de que las personas alimentadas con una dieta regular de información científica sobre la inminente crisis ecológica simplemente van a modificar su comportamiento de manera adecuada, no puede ser apoyada por evidencias. Se requiere de estrategias más variadas e imaginativas, y como lo muestra este último número de Roots, no hay escasez de ideas.

De acuerdo con Stephen Webster del Imperial College de Londres, el sesgo cultural moderno hacia la transparencia institucional obliga a la comunidad científica a tener una participación pública como nunca antes. Argumenta que la opinión no científica sobre temas tan diversos como el rumbo de la investigación, el futuro de la política energética, el diseño de las salas de museo e incluso el papel de los jardines botánicos se ha vuelto muy destacado. Si bien se ha destinado una considerable energía académica para medir el éxito de este diálogo cultural, se ha reportado que los jardines botánicos se han visto más lentos que otras instituciones en la adopción de una identidad centrada en el público. Con diversos ejemplos a la mano, Stephen Webster sugiere que los jardines botánicos cuentan con amplias oportunidades para desarrollar sus propios modelos de participación pública.

En una encuesta de popularidad sobre la plantas realizada por el Jardín Botánico de la Universidad de Viena, Austria, las plantas medicinales y las especias encabezaron las preferencias de los visitantes en general, mientras que las plantas ornamentales y las que se utilizan en la industria atraen menos interés. También se detectaron variaciones preferenciales de acuerdo con la edad ya que los alumnos se mostraron menos interesados que los adultos en las plantas "útiles" aunque el grupo de plantas estimulantes y las productoras de drogas a base de hierbas ¡mostraron una notable excepción! Michael Kiehn y colegas

Stephen Webster suggests, gardens have ample opportunities to develop their own models of public engagement.

In a popularity survey of botanical plants conducted by the University of Vienna Botanic Garden, Austria, medicinal and spice plants topped overall visitor preferences, while ornamental plants and plants used in industry attracted less interest. Preferential variations according to age were also detected, with pupils generally less interested than adults in 'useful' plants, although the group of stimulant herbal drugs proved a notable exception! Michael Kiehn and his colleagues describe how researchers targeted four sample groups as they bid to establish how and with what plants they could encourage an interest in botany and overcome 'plant blindness'.

Over half of the entire human population now lives in towns and cities, UN estimates suggest, with increasing industrialisation and a headlong dash to urbanisation, especially in the developing world, forcing the pace. Such demographic and societal changes pose immense challenges to those organisations, like botanic gardens and nature reserves, operating at the intersection of nature and society. And among the most urgent challenges facing educators working with urbanised children and young people is how to imbue them with an understanding of their place in the natural world. David Jeffreys of Earthscope outlines the Growing Schools Gardens initiative, a network of pioneering English gardens that is attempting to tackle this question head-on.

Crime scene investigation is the name of the game for two Spanish gardens aiming to make plant science both fascinating and accessible for children. Staff at Madrid's Royal Botanic Garden and the University of Valencia Botanic Garden, Spain, have created a murder mystery challenge set in a virtual botanic garden. Designed to be played on-line or *in situ* at a botanic garden, garden staff and visitors are murder suspects and clues can be found among the pollen, plants and fruits. Madrid's Irene Fernandez de Teja and Valencia's Maria Jose Carrau sets the scene!

Steve Meredith from Adelaide Botanic Garden, Australia, reports on the Message Sticks secondary schools

plantes 'utiles', bien que le groupe des drogues stimulantes à base de plantes ait constitué une exception notable ! Michael Kiehn et ses collègues décrivent la manière dont des chercheurs ont ciblé quatre groupes représentatifs alors qu'ils proposaient d'établir comment et avec quelles plantes ils pourraient stimuler un intérêt envers la botanique et surmonter « la cécité envers les plantes ».

Plus de la moitié de la population humaine totale vit à présent dans les villes, selon les estimations des Nations-Unies, phénomène accompagné d'une industrialisation accrue et d'une ruée vers l'urbanisation, particulièrement dans les pays du sud, qui forcent l'allure. De tels changements démographiques et sociétaux lancent de vastes défis à ces organisations, comme les jardins botaniques et les réserves naturelles, qui opèrent à la croisée de la nature et de la société. L'un des défis les plus urgents auxquels sont confrontés les éducateurs qui travaillent avec des enfants et des jeunes issus d'urbanisations consiste à leur insuffler une compréhension de leur place dans le monde naturel. David Jeffreys de Earthscope décrit l'initiative des Growing Schools Gardens, un réseau de jardins anglais pionniers qui tente de traiter ce sujet de manière directe.

Recherches sur la scène du crime est le nom d'un jeu conçu par deux jardins espagnols qui visent à rendre la botanique plus fascinante et accessible aux enfants. Les animateurs du Jardin botanique royal de Madrid et du Jardin botanique de l'université de Valence, Espagne, ont créé un jeu de romans policiers qui se déroule dans un jardin botanique virtuel. Ce jeu est conçu pour être joué en ligne ou in situ dans un jardin botanique, et le personnel et les visiteurs du jardin sont les suspects du meurtre. Des indices peuvent être trouvés parmi les fruits, les plantes et le pollen. Maria Jose Carrau, du jardin de Valence, et Irene Fernandez da Teja du Jardin Botanique Royale de Madrid situent le décor !

Steve Meredith du Jardin botanique d'Adélaïde présente un compte-rendu du projet de Bâtons de messagers des écoles secondaires, créé pour encourager les jeunes à partager, à travers les histoires et l'art, ce que cela signifie pour eux de vivre dans

describen cómo los investigadores se centraron en un muestreo de cuatro grupos para definir cómo y con qué plantas podrían estimular el interés por la botánica y superar la "ceguera hacia las plantas".

Más de la mitad de toda la población humana vive en pueblos y ciudades. Las estimaciones de la ONU sugieren que la creciente industrialización puede estar a la cabeza de la acelerada urbanización especialmente en los países en desarrollo incrementando este ritmo. Estos cambios demográficos y sociales plantean enormes desafíos a organizaciones como los jardines botánicos y reservas naturales ya que operan en la intersección de la naturaleza y la sociedad. Y entre los desafíos más urgentes que enfrentan los educadores que trabajan con niños y jóvenes de zonas urbanas está el cómo impregnarlos para que comprendan su lugar en el mundo natural. David Jeffreys de Earthscope describe la iniciativa Cultivando Jardines Escolares, una red pionera de jardines ingleses que está tratando de abordar de frente esta cuestión.

Investigando la escena del crimen es el nombre de un juego en dos jardines botánicos españoles con el objetivo de hacer de la botánica una ciencia accesible y divertida para los niños. Personal del Real Jardín Botánico de Madrid y del Jardín Botánico de la Universidad de Valencia, España, han creado el reto de descubrir un misterioso asesinato en un jardín botánico virtual. Diseñado para poderse jugar en línea o in situ en un jardín botánico, el personal del jardín botánico y sus visitantes son sospechosos del crimen y las pistas se pueden encontrar entre el polen, las plantas y las frutas. ¡María José Carrau del Jardín Botánico de Valencia y Irene Fernandez de Teja de Real Jardín Botanico de Madríd montó la escena del crimen!

Steve Meredith de los Jardines Botánicos de Adelaida reporta sobre su proyecto de escuelas secundarias Notas y Mensajes desarrollado para promover y compartir entre los jóvenes a través de cuenta cuentos y arte su entendimiento y el significado de vivir en el ambiente mediterráneo del sur de Australia. Desarrollada en un festival juvenil de arte, esta exposición única representada

project, developed to encourage young people to share, through storytelling and art, their understanding of what it means to live in the Mediterranean environment of South Australia. Developed during a youth arts festival, the unique display of 24 poles depicted stories about the interconnectedness of plants, water, fire, culture, lifestyle and sustainability. And from Rio de Janeiro Botanic Garden, Brazil, comes news of a range of educational initiatives that helped to heighten public awareness of conservation and sustainability in line with Article 13 of The Convention on Biological Diversity (CBD).

Through its world class programme of exhibitions and lively public events, London's celebrated Wellcome Collection explores the links between medicine, life and art. In this exclusive interview for Roots, Ken Arnold, Wellcome's Head of Public Programmes, describes the imaginative journeys he and his team undertake as they create the Collection's exhibitions.

Even closer to home, with the London 2012 Olympic Games in mind, the Fairchild Challenge/BGCI Global Competition is promoting its conservation message by linking plants from around the world to the Games. Students are encouraged to research their country's plant biodiversity and represent it through the creation of an Olympic wreath.

It is clear from these articles that scientific and cultural energies are being harnessed successfully around the world, in botanical institutions and elsewhere, to promote messages of sustainable change. With the clock counting down towards midnight, however, the question remains: how swift and radical must we be to secure the fundamental changes in attitudes and behaviour that are essential to our planet's future wellbeing?

Julia Willison

l'environnement méditerranéen du sud de l'Australie. Créée pour être présentée lors d'un festival local d'art pour les jeunes, la remarquable exposition de 24 bâtons a dépeint des histoires liées à l'interconnexion entre les plantes, l'eau, le feu, la culture, le mode de vie et le développement durable.

En provenance du Jardin botanique de Rio de Janeiro nous viennent des nouvelles concernant une série d'initiatives éducatives conçues pour améliorer les connaissances du public en matière de conservation et de développement durable, en accord avec l'Article 13 de la Convention sur la diversité biologique (CDB).

Au travers de son programme d'expositions et d'évènements publics animés de classe mondiale, le célèbre musée Wellcome Collection de Londres explore les liens qui existent entre la médecine, la vie et l'art. Dans cet entretien exclusif pour Roots, le Dr Ken Arnold, chef des programmes publics du Wellcome Collection, décrit la démarche imaginative effectuée par lui et son équipe pour créer les expositions du musée Collection.

Encore plus près de chez nous, en référence aux jeux Olympiques de Londres 2012, le Défi mondial du Fairchild Challenge / BGCI valorise son message lié à la conservation en associant aux jeux des plantes du monde entier. Les étudiants sont encouragés à faire des recherches sur la biodiversité végétale de leur pays et à la représenter par la création d'une couronne Olympique. Ce concours est ouvert à tous les jardins botaniques. Pour de plus amples informations, veuillez consulter www.bgci.org/education/fair2

À partir de ces articles, il est clair que des efforts tant sur le plan scientifique que culturel sont exploités avec succès de par le monde, dans les établissements botaniques et ailleurs, afin de valoriser des messages liés au changement durable. Alors que le compte à rebours est lancé, toutefois, la question suivante demeure : à quel point nous faut-il être rapides et radicaux pour ancrer les changements fondamentaux d'attitudes et de comportements qui sont essentiels au bien-être futur de notre planète ?

en 24 mástiles mostraban historias sobre la interconexión de las plantas, agua, fuego, cultura, estilo de vida y sustentabilidad.

Del Jardín Botánico de Río de Janeiro llega la noticia de una serie de iniciativas educativas destinadas a aumentar la conciencia pública sobre la conservación y la sustentabilidad de acuerdo al Artículo 13 de la Convención sobre Diversidad Biológica (CDB).

A través del programa de exhibiciones y eventos públicos de nivel mundial, la célebre Colección Wellcome de Londres, explora los vínculos entre la medicina, la vida y el arte. En esta entrevista exclusiva para Roots, el Dr. Ken Arnold, Director de Programas Públicos de la Colección Wellcome, describe los viajes imaginativos que él y su equipo emprenden cuando crean una exhibición de la Colección.

Incluso más cerca de casa con los Juegos olímpicos de 2012 en mente, el programa Fairchild Challenge/BGCI Global Competition están promoviendo su mensaje de conservación mediante la vinculación de las plantas de todo el mundo con los Juegos. Los estudiantes son alentados a investigar acerca de la biodiversidad de su país representando a las plantas a través de una corona olímpica. Organizados por los jardines botánicos este concurso está abierta a todos. Para más información consulte el sitio web www.bgci.org/education/fair2

Se desprende claramente de estos artículos que las energías científica y cultural se están aprovechando con éxito en todo el mundo tanto en las instituciones botánicas como en otros lugares para promover mensajes para el cambio hacia la sustentabilidad. Con el reloj en cuenta regresiva hacia la medianoche, sin embargo, la pregunta sigue siendo: ¿cómo asegurar de manera rápida y radical los cambios fundamentales en actitudes y comportamientos que son esenciales para el bienestar futuro de nuestro planeta?

Science communication and botanic gardens
old roots, new growth

Every scientific institution sees itself as a guardian of reliable and valuable knowledge. However, the modern cultural turn towards transparency is forcing them to find a lay voice with which to engage with the public. **Stephen Webster** of Imperial College, London, argues that while botanic gardens have been slower than other institutions to embrace a public-centred identity, there are plenty of examples to learn from to develop their own distinct style of public engagement.

In this article I examine general developments in the field of science communication over the last few decades. I will interpret relations between science and the public in the light of recent calls for botanic gardens to renew their emphasis as places of public as well as scientific value (BGCI, 2010). While it is plainly true that botanic gardens should be energetic in their plans to engage the interest of their visitors, I will argue that the traditional virtue of botanic gardens, which I take to be a quiet and steadfast assertion of the value of plants, should not be neglected. Gardens should look for a balance between their historic mission as a repository of scientific information, and their desire now to be places for debating contemporary ecological anxieties. In finding that balance curators and interpreters will find much of value in studying the successes and failures of other public science institutions, and the trends of science communication more generally.

During the 'Nature Live' talks at the Natural History Museum, London (NHM) scientists communicate their research to the public (Picture courtesy of NHM)

All science institutions with a public interface embody a tension. On the one hand they identify themselves as places that grow and conserve scientific knowledge, and therefore embrace the classic research qualities of orderliness and introspection. On the other hand such institutions must be intelligently-open minded and aware of their visitors' expectations. Museums, science discovery centres and botanic gardens appeal to and indeed transform many

For many people, the quiet, the lack of computers and the marvelous fact of plants growing are, the most attractive aspects of gardens (Picture courtesy of Coimbra Botanic Garden, Portugal)

different people who arrive largely unannounced, and hope to be educated and momentarily diverted into new trains of thought.

It is tempting to imagine an institution can combine easily its duties to science and its duties to the public. Did not Sir Francis Bacon, the 17th century pioneer of scientific method, rule that science was for the benefit of humanity? However the relation between scientific and public duties is complex, and can be antagonistic. Science seems open to the world in its role as a generator of practical knowledge, as a tool for solving global problems, as the source of health advances. Crudely speaking, science embodies two personalities. It has an outward facing gaze, an interest in the messiness and chance of ordinary life and an awareness of the concept of trust. It has also an austere and disciplined turn of mind, which marshals all of nature into order, classification and mechanism, and which has special respect for the concept of knowledge. Botanic gardens illustrate these two cultures. They are places for doing science, and they are places for showing science. The roles are distinct but once recognised can be made to work together. Through the work of UCL scientist Dr Beau Lotto, London's Science Museum now has visitors doing science (see www.lottolab.org/news-article.asp?newsid=44). Next door on Exhibition Road, Natural History Museum scientists describe their work to visitors, and take questions (see www.nhm.ac.uk/visit-us/darwin-centre-visitors/index.html). What is essential, if the science communication is to be effective, is for the institution to admit the existence of its two personalities.

The great philosopher Sir Karl Popper was pointing towards the same idea when he wrote: "I regard scientific knowledge as the best and most important kind of knowledge – though I am far from regarding it as the only one" (Popper, 1992). The skill of the communicative botanic garden, following Popper, will be in finding the right balance between different sorts of knowledge.

In developing a history of these ideas we can see 1985 as an important year for the relationship between institutions, scientific knowledge and public trust. This was when the prestigious British science organisation the Royal Society published its report on science communication, *The Public Understanding of Science* (Royal Society, 1985). The report was produced by a committee of Royal Society fellows, including the broadcaster and naturalist Sir David Attenborough, and was chaired by Walter Bodmer. The Bodmer report identified a lack of public knowledge of the facts and processes of science, and suggested that this 'scientific illiteracy' was harmful both for citizens and for science. Citizens were harmed by their ignorance of science, because they might not be able to make informed choices about scientific and technological issues that affected them, such as the development of nuclear power. In the report's words the public "… is very vulnerable to misleading ideas on, for example, diet or alternative medicine".

Running through the Bodmer report is the theme Karl Popper spoke so clearly about: when it comes to scientific impacts on society, the most important form of knowledge is that of the scientists. It is their know-how which is transforming and improving the world. In the Bodmer report, the role of the public is by contrast constrained and centres on their responsibility to understand the facts and, by implication, the value of science. Overall, science is depicted as actively progressive, the public as passive and lagging behind.

I am not suggesting that this kind of argument is over-simplistic about the nature of science: the Bodmer report recognises that scientific knowledge is often in flux, that technology is frequently controversial, and that science and social policy are in relation. The over-simplification lies in the view given of people generally, whose opinions on scientific issues are worthwhile only to the extent that they have absorbed enough scientific knowledge.

We can now get to the heart of the matter and to a series of vital questions. When it comes to organising the provision of a botanic garden, what space is there for forms of knowledge that are not scrupulously scientific – for art, for religion, for activities such as cooking and gardening? How easy, indeed, is it for the scientific, and the non-scientific, to get along? In what ways can a garden make use of its visitors' lay understanding of plants and their role in nature?

Challenging though these questions might be, a botanic garden seems to be precisely the place where the scientific, the social and the personal might make common cause. We expect the plants to be sternly marshalled in orderly fashion,

Botanic gardens have the opportunity to pick the science communication tools that suit them. In this image a student examines fern spores during an education visit to Innbruck University Botanic Garden, Austria (Picture courtesy of Innbruck University Botanic Garden, Austria)

and are not surprised to see campaigning exhibitions on biodiversity or climate change. But we also expect to see children running between the beds, ice cream on sale, and benches for simply thinking. Unlike almost any other science institution botanic gardens are open to the sky, directly appeal to our sense of nature, and are a retreat from urban noise. Many of the plants in a botanic garden are familiar, are included in our diet, trigger memories, or are simply incredibly striking.
In short a botanic garden shouldn't have too much difficulty finding many ways to draw in its visitors.

In the years after Bodmer a view has grown among science communicators that they'll do their job better if they recognise the public as very heterogeneous. Many people have a profound understanding of matters involving science. The truth of this is shown by those patient groups who amass vast quantities of information – and questions – about treatments. Science communicators are more effective if they recognise the lay public as often rather experienced in many of the things science sees as its subject matter. Someone may not have a PhD level understanding of atmospheric chemistry, but can have an intimate knowledge of the health effects of air pollution.

By 2000, the question of public trust in science, rather than public knowledge of science, had come to seem vital. Various controversies involving science and technology revealed in the most public way that scientific knowledge often struggles to find a unified and settled voice. The explosion of the Chernobyl nuclear power station in 1986, and most especially the British government's volte face in 1996, reversing its previous assertion that bovine spongiform encephalopathy (BSE – mad cow disease) could not pass to humans (The BSE Inquiry, 2000), shed new light on the fallibility of scientific advice. High-profile news stories about the impact of genetically-modified crops, a fresh look at nuclear power stations as clean energy, and the increasingly alarming signs of global warming, were all issues that strained the ability of science to reach a final view, but which needed extensive public buy-in for plausible policy decisions. In timely fashion the UK's upper legislative chamber, the House of Lords, reported in 2000 that in the relationship between science and society, trust is as important as knowledge (House of Lords, 2000).

As the House of Lords emphasised, trust is a matter of relationship, and so it called for dialogue between science and the public. A new term – the public engagement of science and technology – became orthodox. Particularly in government circles, ascience policy planning began to involve public polling, focus groups, and with the arrival of the internet, on-line fora. Museums and science centres re-doubled their efforts to understand their visitors. And in the concept of 'co-curation' visitors found themselves drawn into the planning of new exhibitions.

People experience plants in different ways – at the Eden Project, UK, people are encouraged to examine different fibres (Picture courtesy of Sarah Kneebone)

For botanic gardens aligning themselves with all these new developments, I suggest there are three principles to consider. Firstly, celebrate the scientific work of the garden as central to its identity. Secondly, when actively expanding work with visitors, investigate and take seriously the different ways people experience plants – through their gardens, their textiles, their literature, their culture. Finally, keep in mind the most obvious and for many the most attractive aspect of gardens – their quiet, their lack of computer monitors, and the marvellous fact of plants simply growing. To conclude, botanic gardens now have an excellent opportunity to pick the science communication tools that suit them, so renewing their mission as guardians and advocates of the world's plants.

The explosion of the Chernobyl nuclear power station in 1986 shook the public's trust in science, demonstrating the importance of communication. Here you can see the abandoned city of Pripyat, Ukraine, with Chernobyl station in the distance (Picture courtesy of Jason Minshull)

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RÉSUMÉ

Chaque discipline scientifique, et chaque institution scientifique se voit avant tout comme un gardien d'un savoir fiable et précieux. Ce fait historique qui remonte en Europe au 17ème siècle a été constamment renforcé par de nombreux exemples de services rendus par la science, aussi bien dans les dispensaires, les pâturages que les champs de batailles. Cependant la culture moderne recherche la transparence institutionnelle et force à de nouvelles habitudes pour la science et ses institutions. La science doit se soucier du grand public et, spécifiquement, doit trouver dans le contact avec les profanes les clefs pour répondre à des sujets aussi divers que l'orientation de la recherche, la conception de galeries de Muséums, le futur de la politique énergétique ou le rôle des jardins botaniques. Un nombre très important d'expertises académiques ont eu pour but de mesurer le succès de ce dialogue culturel, mais les jardins botaniques, auraient été plus lents que d'autres institutions à adopter une identité « centrée sur le public ». Disposant de nombreuses expériences, les jardins botaniques ont maintenant l'opportunité de développer leur style propre dans l'engagement du public.

RESUMEN

Cada disciplina e institución científica por sí mismas, son por sí mismas como un guardián de valioso e infalible conocimiento. Es un hecho histórico, que desde el Siglo XVII, Europa ha estado a la cabeza debido a la cantidad de ejemplos con utilidad científica, en clínica, pasturas o el campo de guerra. Los jardines botánicos también forman parte de este patrimonio. Sin embargo, la cultura moderna se torna hacia la transparencia institucional forzando a la ciencia y sus instituciones a un nuevo habito. La ciencia debe atraer al público, y en especial, el papel de los jardines botánicos es encontrar las pautas vitales a los numerosos temas y su orientación en la investigación, diseño museológico, el futuro y política energética. Una cantidad considerable de experiencias académicas se han dedicado a medir el éxito de este dialogo cultural pero se dice que los jardines botánicos han sido más lentos en comparación con otras instrucciones en integrar una identidad centrada en el publico. Con numerosos ejemplos en mano, los jardines tienen ahora la oportunidad de desarrollar un estilo propio para involucrar al público.

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¿Quien lo hizo?

Detectives españoles en busca de rastros en el jardín

Dos jardines botánicos españoles recurren al crimen para acercar a los niños la ciencia de las plantas de una manera fascinante. El personal del Real Jardín Botánico de Madrid y del Jardín Botánico de la Universidad de Valencia ha creado un misterioso caso de asesinato ocurrido en un jardín botánico virtual. El personal del jardín y los visitantes son sospechosos de asesinato y las pistas se encuentran entre el polen, las plantas y los frutos.
El misterio corre a cargo de **Irene Fernández de Tejada** en Madrid y **Maria José Carrau** en Valencia.

El visitante cuenta con un manojo de llaves y seis cajas con cerradura. En su búsqueda de la llave que abre el almacén de productos químicos recorrerá el centro de investigación y el Jardín Botánico (Picture courtesy of Jardín Botánico de la Universidad de Valencia y Real Jardín Botánico de Madrid)

Introducción

Una de las principales funciones de un Jardín Botánico moderno es mejorar la cultura científica de las personas que nos visitan. Pero determinados colectivos son difíciles de atraer y nosotros queremos que el conocimiento que se genera en nuestras instituciones llegue a cuantas más personas mejor. Por este motivo, los jardines botánicos de dos ciudades españolas, el Real jardín Botánico (CSIC) de Madrid y el Jardín Botánico de la Universidad de Valencia, y gracias a la financiación de la Fundación Española para la Ciencia y la Tecnología (FECYT), nos pusimos de acuerdo para llevar a cabo una novedosa y original propuesta. El objetivo fundamental era atraer visitantes tanto a los jardines en sí como a nuestras páginas webs y ofrecerles una divertida experiencia con la que aprender botánica sin darse cuenta. A esta propuesta la llamamos "*Misterio en el Botánico*".

¿Qué es "*Misterio en el Botánico*"?
Se trata de una actividad interactiva a modo de juego de pistas. "*Esta mañana, los periódicos de toda la ciudad informan sobre un extraño suceso…*" Así comienza la historia en la que el público se verá involucrado. Un misterioso asesinato en el que las siete pistas localizadas conducen a seis sospechosos relacionados con el Jardín (el director, una jardinera, un visitante, la de seguridad, el de la limpieza y una investigadora). Con la ayuda de un mapa y un bloc de detective, los participantes tendrán que resolver el misterio mientras se trabajan distintos aspectos relacionados con el mundo vegetal y la investigación científica. Concretamente, los objetivos fundamentales que se persiguen son los siguientes:

1. Dar a conocer el Jardín de una manera diferente.
2. Acercar el funcionamiento del Real Jardín Botánico (CSIC)/Jardí Botanic de Valencia como centros de investigación.
3. Transmitir conocimientos acerca del mundo vegetal.
4. Suscitar interés por las plantas.
5. Promover el uso de los cincos sentidos.

El juego cuenta con dos modalidades: una con paneles interactivos instalados en el propio Jardín, para jugar in situ, y una aplicación web para aquellos que no puedan desplazarse hasta aquí. Ambos se ofrecen bilingües, en español/inglés en el Jardín de Madrid y valenciano/español en el de Valencia.

El público al que está dirigido son principalmente escolares de 10 a 14 años, pero también pueden disfrutar de él familias y público general.

Elementos:

A. Folleto: Se entrega de forma gratuita en la taquilla del Jardín. Presenta la trama y a los personajes. Además lleva un mapa del Jardín con la situación de los distintos paneles y un bloc de detective donde ir apuntando el resultado de las averiguaciones.

B. Paneles: Un total de 9 paneles en los que se presenta la trama y a los personajes, se localizan las pistas y se resuelve el misterio.

El público tiene que encontrar a qué especie vegetal pertenece al polen. Deben visitor los árboles donde se encuentran colgando unas enormes maquetas de pólenes (Picture courtesy of Universidad de Valencia y Real Jardín Botánico de Madrid)

Uno de los paneles en los que se presentan los sospechosos del Misterio en el Botánico (Picture courtesy of Universidad de Valencia y Real Jardín Botánico de Madrid)

Pistas y contenidos teóricos que se trabajan: Las diferentes pistas suponen los elementos necesarios para descubrir al asesino, y a la vez funcionan como vehículo para introducir los temas que hemos considerado importantes que se deben dar a conocer.

1.-EL POLEN; El panel trabaja aspectos como qué es el polen, partes, tipos, función y sistemas de dispersión. Un tipo concreto de polen ha sido encontrado en la víctima ¿Qué otros sospechosos han estado en contacto con ese mismo polen? Para poder contestar el público debe encontrar a qué especie vegetal pertenece, para lo cual debe recorrer los árboles cercanos observando sus ramas, donde se encuentran colgando unas enormes maquetas de pólenes (cada una en su árbol correspondiente).

2.- LAS HUELLAS. Unas pisadas localizadas junto al cadáver nos dan la excusa para trabajar aspectos como las huellas de la naturaleza, qué es un fósil y cómo se forma. El juego invita la participante a deslizar la pisada encontrada sobre la suela de los zapatos de los distintos sospechosos.

3.- EL FRUTO: enganchados en la ropa del cadáver y de algunos de los sospechosos aparecen unos frutos muy característicos. Para conocer el nombre de dichos sospechosos el visitante debe observar los frutos (reales) instalados en cajas adheridas al panel y relacionarlos con su método de dispersión. ¿Qué es un fruto?, sus partes, funciones que desempeña y sistemas de dispersión son algunos de los aspectos que se trabajan en esta parada.

4.-LA HOJA; Impresa sobre la piel de la víctima se encuentra la silueta de una hoja. ¿A qué árbol pertenece? En este panel se explican las partes de una hoja, formas, nerviación, el uso de una clave dicotómica y los nombres científicos. El visitante tiene a su disposición una sencilla clave de identificación y las fichas de distintos árboles.

5.-LA SEMILLA; En las ranuras de la suela del zapato de la víctima se encuentran unas semillas. Los nombres de los sospechosos relacionados se encuentran bajo un árbol muy especial del Jardín. En este panel se trabajan el concepto de ecosistema, planta amenazada, Libro rojo y Lista UICN.

6.- EL COMPUESTO QUÍMICO; Restos de un compuesto químico se han encontrado en el estómago de la víctima. Qué es un compuesto químico? El visitante cuenta con un manojo de llaves y seis cajas con cerradura. En su búsqueda de la llave que abre el almacén de productos químicos recorrerá los distintos departamentos con los que cuenta un centro de investigación como un Jardín Botánico.

7.- EL INSECTO, El papel de los animales en los ecosistemas y su relación con las plantas son los aspectos a trabajar. Un curioso escarabajo escondido en la ropa de la víctima es la pista que se utiliza como hilo conductor. El visitante tendrá que relacionar tres animales diferentes con sus acciones y los beneficios que provocan en las plantas.

C. Aplicación web: al igual que en los paneles el juego se ofrece en las páginas de nuestro jardines (www.rjb.csic.es y www.jardibotanic.org), con la posibilidad de jugar en español o inglés en Madrid y valenciano o español en Valencia. Los contenidos que se trabajan son los mismos y las actividades a realizar similares. Al finalizar el juego puedes descargarte tu propio diploma de detective personalizado.

Conclusiones

Aunque el trabajo ha sido duro el resultado está siendo muy positivo. La actividad ha tenido una gran aceptación por el público, que no duda en felicitarnos y demandarnos más actividades de este tipo. Hemos conseguido sorprender a nuestros visitantes habituales y atraer a otros que nos han venido a ver sólo gracias a esta actividad. Las páginas web han recibido también numerosas visitas y ¡ya tenemos un montón de detectives! En cuanto a los equipos de educación implicados, a pesar de la distancia que nos separa, hemos logrado un trabajo conjunto y nos hemos enriquecido con formas de trabajo diferentes a las nuestras.

Folletos producido para el Misterio en el Botánico, presentando el crimen y los sospechosos y un mapa de donde están las pistas (Picture courtesy of Universidad de Valencia y Real Jardín Botánico de Madrid)

Idea original y contenidos

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Web de soporte;

- Fundación Biodiversidad; www.fundacion-biodiversidad.es/
- UCN, International Union for Conservation of Nature, helps http://www.uicn.es/
- http://www.unesco.org/new/es/unesco/

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Una pancarta sobre el projecto en el Centro de Visitantes en el Jardín Botánico de Valencia (Picture courtesy of Universidad de Valencia y Real Jardín Botánico de Madrid)

SUMMARY

At dawn a man walking his dog found a body in a wasteland near his home. The police confirms the body is male and of Caucasian origin. He has dark hair, weighs 75Kg and is approximately 1.80m in height. No documentation was found on his body however traces of plant debris and chemicals were present. Tracks found in the surrounding area, suggest the crime scene could have been the Botanic Garden. A list of suspects is quickly assembled of botanic garden staff and visitors who have plant residue on their clothing and were in the vicinity of the crime scene during the time of the alleged murder.

This is the opening scenario for an educational mystery game developed by the Royal Botanic Garden, Madrid and the University of Valencia Botanic Garden, Spain - two gardens, located in two geographically separated cities. By using online and digital resources they have been able to create a parallel world in which distances do not exist.

The clues contained in the murder mystery, consist of components of plants, pollen and fruit. The mystery game is also about students understanding the concepts of biological control and red lists. Designed to play on-line or in-situ in a botanic garden, this game aims to make science accessible and plants attractive to school children. The gardens believe it offers an effective and creative way to popularize science.

RÉSUMÉ

A l'aube, un homme qui promène son chien trouve un cadavre dans un terrain vague à côté de chez lui. La police confirme que le corps est celui d'un homme d'origine caucasienne. Il a des cheveux noirs, pèse 75 kg et mesure environ 1,80 m. Aucun papiers n'a été trouvé sur lui, en revanche quelques débris végétaux et des produits chimiques étaient présents. Des traces trouvées aux alentours suggèrent que la scène du crime pourrait être le jardin botanique. Une liste de suspects est rapidement constituée parmi les membres du jardin botanique et les visiteurs qui ont des restes de plantes sur leurs vêtements et qui étaient présents aux alentours de la scène du crime au moment supposé du meurtre.

Ceci est le scénario d'ouverture d'une enquête pour un jeu éducatif mis au point par le Jardin botanique royal de Madrid et le jardin botanique de l'Université de Valence en Espagne, deux jardins situés dans des villes géographiquement séparées. A l'aide des ressources numériques et de ressources en ligne, ils ont créé un monde virtuel où les distances n'existent pas.

Les indices du roman policier correspondent à des parties de plantes, du pollen et des fruits. Par le biais de ce jeu les concepteurs souhaitent également que les étudiants comprennent les principes du contrôle biologique et des listes rouges. Conçu pour être joué en ligne ou sur place dans un jardin botanique, ce jeu à pour but de rendre la science accessible et de rendre les plantes intéressantes pour les scolaires. Les concepteurs pensent qu'il propose un moyen efficace et créatif de populariser les sciences.

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Youngsters
with a stake in the future

Message Sticks is an exciting secondary schools project in which students share, through storytelling and art, their understanding of what it means to live in South Australia. Developed during a youth arts festival and delivered in a uniquely Australian way, the stories describe the interconnectedness of plants, water, fire, culture, lifestyle and sustainability in the Mediterranean area of the South Australian (SA) landscape. **Steve Meredith** and **Cat Stone** from Adelaide Botanic Garden explain.

Message Sticks offered the public an opportunity to read and think about environmental issues (Picture courtesy of Adelaide Botanic Garden)

Learning by design

The seeds of this project were sown four years earlier through the design development process used to build the SA Water Mediterranean Garden in the Adelaide Botanic Garden. The design premise was to build a garden that would have a multiplicity of educational and interpretive uses rather than simply being a display of plants from the Mediterranean zones of the world. At the forefront of this process was our education and interpretation team, working with the landscape architects and horticultural staff to develop a garden that was not only beautiful but would also provide multi-level learning opportunities for both public and schools visitors.

Some of the key interpretive ideas and storylines integrated into the design included:

Ephemeral water – here today, gone tomorrow
Plants in Mediterranean zones have adapted to seasonal water. So should we.
Gardens for the future – sustainable landscapes
Cities and people need sustainable gardens in public and private spaces.
Fire & Dry – surviving the dry and fire
People and plants have to adapt to fire and its long-term effect on lives and landscape.

Threats – the natural environment in danger
Wild plant populations are under threat because Mediterranean environments are attractive places to live and farm.
Culture – food, symbolism, traditional peoples and plant knowledge
There are many fascinating stories that connect plants, people and culture in Mediterranean climates around the world.

Art storylines

With such a rich palette of storylines the garden's design provided plenty of relevant and wide-ranging artistic, interpretive opportunities for the student artists participating in the Message Sticks project. Some of the complementary themes students developed through their work after visiting the Mediterranean garden included:

- Water – natural ephemeral cycles of wet and dry, abundance, drought.
- Water for human needs, water for the environment.
- Spotting plant adaptations that are useful for developing water-wise gardens.
- Understanding fire, a constant threat during long, dry summers.
- Endangerment, Mediterranean environments are good places to live but at what environmental cost?
- Sustainability through garden design – Mediterranean landscapes, why have them, what are the constraints and what do they look like?

Students were highly motivated to participate in the project because their work would be displayed in the botanic garden (Picture courtesy of Adelaide Botanic Garden)

A total of 46 student artists plus their art teachers, from three local disadvantaged high schools, participated in the production of 24 Message Sticks (Picture courtesy of Adelaide Botanic Garden)

- Mediterranean lifestyle, people and culture including indigenous perspectives.
- Global Mediterranean environments, Chile, Mediterranean Basin, California, South Africa. How are they the same? How are they different?
- Climate changes and possible futures.

Developing the exhibition

A total of 46 student artists plus their art teachers, from three local disadvantaged high schools, participated in the production of 24 Message Sticks.
The students and teachers visited the Botanic Garden for an introduction to the overarching exhibition theme of 'Learning to live in and with our Mediterranean environment'. Students also spent time drawing inspiration and meaning from the garden space with a highly respected community artist, John Whitney, who specialises in working with young people. Over the next four weeks John assisted students at their schools, developing their research, artworks and accompanying 'artist statements' ready for placement in the garden as a part of 'Come Out', the local youth arts festival.

A magnet for visitors

Student works ranged from the super realistic to the abstract and emblematic. The imaginative, thought-provoking pole artworks added an architectural splash of colour to the garden and were a magnet for thousands of visitors, who could view the exhibition from a distance while having coffee on the overlooking plaza, or interrogate individual works more closely while meandering through the Mediterranean garden. In particular, many visitors spent time reading the artists' statements, which not only assisted them in interpreting the artworks but also provided subtle environmental messages about the surrounding living exhibition space, sustainability and the local Adelaide environment.

Alex, Jacob and Tyler from Ocean View College wrote in their statement:

'The Mediterranean environment that exists in South Australia revolves around a delicate balance between the warm summers and the wet cool winters, allowing our diverse plant life to exist.

In the case that our climate changes dramatically we have shown a representation of what we think the landscape will look like.'

Over three and a half thousand students also visited the exhibition, using the artworks as a stimulus for thinking about the nexus between plants, people, water, sustainability and the future. One school in particular was so impressed by the exhibition concept that they developed and installed a similar project for permanent display in their own school grounds.

What's the message?

What were some of the outcomes of having an environmentally themed art exhibition by young people on display in a botanic garden?

The project reaffirmed that when botanic gardens see young people as a part of their genuine cultural constituency many benefits can follow. Firstly, students were highly motivated because they had a 'real world' end point for their work, in this case having their art displayed in a high profile institution as a part of a cultural festival. Secondly, the general public loved the opportunity to see young people's work on display and being provided, through the artists' statements, with an insight into their thinking on environmental issues. Thirdly, the project highlighted the power of marrying the arts with environmental understanding in order to capture the hearts and minds of those producing and those viewing the works.

From a garden design and development perspective, the artworks significantly added to the interpretive power of the garden space during the display, so strengthening the number of learning opportunities and the variety of cultural and interpretive uses a garden can have when the original design is based on education and interpretation.

A thought provoking statement produced by one of the artists and attached to their message stick during the local youth arts festival (Picture courtesy of Adelaide Botanic Garden)

RÉSUMÉ

« Bâtons de messagers » est un projet éducatif pour les élèves du secondaire mis au point par le Jardin botanique d'Adélaïde afin d'encourager les jeunes à partager leurs histoires et leurs connaissances, à travers l'art, sur ce que cela signifie de vivre dans un environnement méditerranéen.
La remarquable exposition de bâtons artistiques, créée tout spécialement pour être présentée lors du festival local d'art pour les jeunes, est composée de 24 bâtons qui dépeignent des histoires liées à l'interconnexion entre les plantes, l'eau, le feu, la culture, le mode de vie et le développement durable dans la zone méditerranéenne qui constitue une partie du paysage du sud de l'Australie. Ce large éventail d'idées à été dynamisé grâce au design éducatif et interprétatif de l'espace d'exposition du jardin botanique : le jardin méditerranéen des eaux du sud de l'Australie, récemment aménagé.

RESUMEN

Los postes mensaje son un proyecto del Jardín Botánico de Adelaide dirigido a estudiantes mayores de las escuelas secundarias, en éste, se motiva a los jóvenes a compartir sus historias y entendimiento de qué significa vivir en el Mediterráneo a través del arte. Este extraordinario proyecto artístico, fue desarrollado específicamente como una de las muestras para el festival local de artes; consistió en 24 postes mostrando historias interconectando plantas, agua, fuego, cultura, estilo de vida y sustentabilidad en el paisajismo de la zona mediterránea del Sur de Australia (SA). Este barrido de ideas permitió el apuntalamiento educacional y diseño interpretativo del espacio dentro del Jardín Botánico en el relativamente reciente creado Jardín Acuático Mediterráneo del SA.

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Linking Brazilian culture and science for sustainability

Carmen Silvia de Lemos Menezes Machado, Rio de Janeiro Botanic Garden, Brazil, discusses two exhibitions that helped raise public awareness of conservation and sustainability in line with Article 13 of The Convention on Biological Diversity (CBD) and the Global Strategy for Plant Conservation (GSPC).

Introduction

The concern about conservation, sustainable use and equal sharing of benefits from biodiversity is central to the aims of the Convention on Biological Diversity (CBD). In 2002, signatories to the CBD took a significant step forward to meet this target by establishing the Global Strategy for Plant Conservation (GSPC). The main objective of the GSPC is to halt the loss of plant biodiversity.

Brazil, a country whose biological and cultural diversity is widely recognized, contains seven distinct biomes of global significance. These biomes include a wide variation of ecosystems and are distributed among five geographical regions. They have their own individual climates, flora and fauna and a high degree of hydrological and mineral diversity. Tragically, the abuse of natural resources by humans is causing environmental damage to these biomes. The consequences are seen to bypass national borders and indifferently impact on people in geographically distant regions, even on different continents.

A panel from the Crave for Water exhibition which explored the relationship of the Macacos river with the Rio de Janeiro arboretum (Sergio) (Picture courtesy of Carmen Machado)

Article 13 of the CBD deals with concerns about raising public consciousness about the importance of conservation and sustainable use of biodiversity. Rio de Janeiro Botanic Garden has put considerable effort into developing educational projects that will foster the interest and awareness of its audience in the importance of biodiversity and the consequences of its loss worldwide. These projects are aimed at the regular visiting public of the Garden which is currently around 600,000 people a year. And within projects, the Garden offers a range of educational activities aimed at stimulating interaction between the public and the resources of its arboretum. Consequently the Garden finds that visitors are increasingly contacting staff for more information during and following their visit. The Garden tries to encourage understanding and support for environmental principles and concepts by emphasizing the importance of vegetation, biodiversity conservation, scientific research and sustainable development. It believes that care and concern in the transmission of scientific information can stimulate a new way of thinking and acting, with programmes

that expand visitors' understanding. The following two projects, relating individual species to their role in the environment, exemplify this thinking.

Planting history

This project involved displaying elements of the living and photographic collections as well as historical texts about the Garden and the city of Rio de Janeiro. The exhibition was inaugurated in October 2004 and remained in the arboretum area of the Garden for one year. Its success resulted in the exhibition being rebuilt in 2006 for the Week of Science and Technology, a free week-long event held annually in Brazil during October and organised by the Ministry of Science and Technology. The exhibition provided scientific information about the plants as well as information about their commercial and medicinal use.

Spread out through the arboretum, the exhibition caught the attention of visitors and encouraged them to look at the features of the arboretum in a different way. The exhibition, which touched on topics such as deforestation, reforestation and human pressure, was attended by over 77,000 visitors between October and November 2004 and by more than 290,000 people in 2005. Undertaking this initiative not only offered an unprecedented experience in the Botanic Garden, but also laid the foundation for further projects to contribute to the development of knowledge related to plants, their use and importance, and of course their relationship with humans.

Crave for water

This second project addressed water usage and conservation, particularly with respect to the city. It focused on the change of direction of the city's rivers and on their adaptation and expansion. Visitors are often unaware of how the riverbeds in Rio de Janeiro have been deflected and channelled to avoid flooding and to optimize the use of certain areas for the development of the city – resulting in a changed landscape.

Verónica standing next to a panel from Planting History, which touched on topics such as deforestation and was attended by over 300,000 visitors between 2004 and 2005 (Picture courtesy of Social environmental centre)

The exhibition used signboards along the Macacos river (which crosses the whole Garden) and explored its relationship with the arboretum, its fauna and flora, and with the city of Rio de Janeiro, including information about the conservation of ciliar woods that protect riverbanks and the quality of the water. The Rio dos Macacos exhibition provided the garden with an excellent opportunity to talk to the public about the need to reshape the arboretum and reorganize its flowerbeds and alleys in order to solve problems related to floods within the Garden. The exhibition was inaugurated on September 19, 2007 to coincide with International Day of Clean Water. Over 349,000 people visited the exhibition which was also shown in other institutions in Rio de Janeiro, including the Museum of the Republic, the Army Historical Museum and Copacabana Fortress.

Conclusion

With these and other public experiences in the Botanic Garden we are aiming to create an awareness of a new sustainable way of life – alongside other botanic gardens around the world, where such educational activities supported by the CBD and GSPC aim to minimize the loss of biodiversity, an issue of vital concern to all of us.

Notes

Article 13. Public Education and Awareness – The Contracting Parties shall: (a) Promote and encourage understanding of the importance of, and the measures required for, the

Panorama of the arboretum at the Rio de Janeiro Botanic Garden (Picture courtesy of Rio de Janeiro)

Panel explaining the conservation of cilia woods that protect the riverbanks and quality of water (Picture courtesy of Carmen Machado)

conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes; and (b) Cooperate, as appropriate, with other States and international organizations in developing educational and public awareness programmes, with respect to conservation and sustainable use of biological diversity. http://www.cbd.int/convention/articles.shtml?a=cbd-13

Currently JBRJ is the headquarters of the National Center for Plant Conservation (CNCFLORA) which has among its tasks, coordination, generation, evaluation and access to information about species on the Brazilian Official List of Endangered Species of Flora, as well as being an international reference for plants in Brazil (Martinelli, 2009; Heizer, 2010, p. 209).

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RÉSUMÉ

L'article 13 de la Convention sur la diversité biologique (CDB) porte sur la promotion et l'encouragement de la sensibilisation du public quant à la compréhension de l'importance de la conservation et de l'utilisation durable de la diversité biologique. Cet article concerne tous les jardins botaniques et, depuis que la Convention est entrée en vigueur en 1993, les jardins botaniques brésiliens ont fait des efforts considérables pour développer des projets éducatifs qui éveillent l'intérêt et la sensibilisation du publics quant à l'importance de la biodiversité et la gravité de son érosion au niveau mondial. Le Jardin botanique de Rio de Janeiro a développé un panel d'activités éducatives, dont le but est de stimuler les interactions entre le public et les ressources disponibles dans l'Arboretum. Son objectif est d'encourager l'intériorisation des principes et des concepts environnementaux, tout en mettant en avant l'importance de la végétation, de la conservation de la biodiversité, de la recherche scientifique et du développement durable.

RESUMEN

El artículo 13 de la Convención en Diversidad Biológica (CBD) se refiere a promover y motivar conciencia en el publico en la importancia de la sustentabilidad y uso de la diversidad biológica. Los jardines botánicos han guardado relación con la convención desde que entro en fuerza en 1993, los de Brasil han dedicado esfuerzos muy considerables en el desarrollo de proyectos educacionales que han despertado el interés y conocimiento con sus audiencias en temas de importancia como la seria perdida de la biodiversidad en el planeta. El jardín botánico de Rio de Janeiro ha generado actividades educacionales orientadas en estimular la dirección entre el público y los recursos disponibles en el Arboreto. La meta es alentar la interiorización del medioambiente y sus conceptos, enfatizando la vegetación, conservación de la biodiversidad, investigación científica y el desarrollo sustentable.

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Créer des écoles, récolter l'apprentissage
Crear escuelas, cosechando aprendizaje

Growing Schools
harvesting learning

Even traditionally conservative institutions like botanic gardens have the capacity to engage meaningfully with their host communities on issues of social and environmental importance, writes **David Jeffreys**, who reports on the emerging success of the Growing Schools Gardens scheme in England.

With the coolest Northern European summer for decades giving way to autumn and one of the warmest springs on record just a distant memory, the British love affair with gardens and gardening continues, serenely untroubled by the vagaries of the weather. The enduring popularity of prestige events like the annual Chelsea Flower Show and the hundreds of thousands of visitors who flock to botanic and show gardens around Britain seemingly attest to a robust and healthy national appreciation of the natural world.

Yet behind these benign assumptions lurk troubling questions about how genuinely this nation of nature lovers is responding to the key environmental challenges of our age, such as climate change and biodiversity loss.

By current UN estimates over half the global human population is now living in towns and cities, a trend driven in recent decades by massive population growth, increasing industrialisation and the headlong dash to urbanisation, especially in the developing world. It's a pattern long familiar in the UK of course, one of the most densely populated countries on earth, where the vast majority of the British population has been urbanised for well over a century. And herein lies a paradox: just as the scientific community is reaching near consensus about the dangers posed by global climate and biodiversity loss, humanity is busily turning its back on the natural world and heading into the cities.

What do these demographic and societal changes mean for nature reserves, botanic gardens, horticultural organisations and the like, operating as they do at the intersection of nature, science and society? Even more urgently, how do those who are charged with educating our largely urbanised children and young people instil in them a proper understanding of their place in the natural world?

Earlier this year, 29 pioneering English gardens, ranging from some of the most august names in English gardening to

The schools surrounding Cambridge University Botanic Garden have little or no outside green space. CUBG has set created a 20m x 40m site to inspire children and teachers about growing plants (Picture courtesy of Cambridge Botanic Garden)

Durham University Botanic Garden has created a Children's Garden on a limited budget using recycled materials (Picture courtesy of Durham University Botanic Garden)

inner-city newcomers, gathered in London to celebrate their membership of an elite group – as accredited Growing Schools Gardens (GSGs).

Launched under the Growing Schools initiative and jointly managed by Botanic Gardens Education Network (BGEN) and Farming and Countryside Education (FACE), the GSGs scheme is a network of gardens throughout England that:

1. Exemplify good practice, including risk management, in children's learning in the natural environment
2. Provide training for teachers and educators to develop outdoor classrooms for learning
3. Provide access to gardens that offer a range of plant displays and opportunities for learning outside the classroom

According to BGEN board member, Gail Bromley, from the Royal Botanic Gardens, Kew, "achieving accredited GSGs status shows that member gardens are benchmarking educational visit standards. They're delivering high quality teaching and learning experiences for children, while at the same time effectively managing risk."

A key philosophical strand in the Growing Schools approach is contained in the 2006 *Learning Outside the Classroom Manifesto*, that calls for every young person to "experience the world beyond the classroom as an essential part of learning and personal development, whatever their age, ability or circumstance". Growing Schools' particular focus is on:

- Food and farming, including the managed countryside
- Gardens, gardening and green spaces
- Wildlife and the natural environment

and within this framework the scheme aims to provide a practical approach to its core theme of care – for the individual, for others and for the environment.

Botanic gardens, with their historic tradition of public engagement, education and scientific enquiry have been among the first to seek GSGs accreditation. Cambridge University Botanic Garden is situated on a 40-acre site about a mile from the city centre and is surrounded by urban development, including several primary and secondary schools with little or no outside green space. Deciding that a Growing Schools' Garden would present ideal teaching opportunities, Cambridge created a 20m x 40m gated site with a covered teaching space and large vegetable growing areas connected by a path to the rest of the Botanic Garden.

Two themes dominated Cambridge's thinking. It was keen to provide a space for school groups to visit and get involved with practical horticulture, in particular to grow and care for vegetables, fruits, flowers and herbs. And it also wanted a demonstration garden to showcase ideas and techniques for visiting schools to reproduce elements of an accessible, wildlife and environment-friendly working plot in their own school grounds.

Kick-started by a local government grant and with early design inputs from local schools, a detailed plan was drawn up which took into account such factors as circulation and footfall within the garden. A large force of parents and botanic garden volunteers set to work and vegetable cultivation began in March 2007. Working with children in the garden environment was a challenge overcome by harnessing and effectively channelling their natural enthusiasm to be working outside!

Cambridge is installing raised beds to facilitate disabled access and engagement with the project, while a sensory area and the inclusion of art projects should enhance the site's amenity.

With its well-established reputation as a resource for local schools and its popularity with visiting families, Durham University Botanic Garden's decision in 2009 to create a specific Children's Garden was a natural development. Durham hosts around 85 school visits a year, mostly from primary schools investigating plant adaptations to their environment, and has noticed increasing interest in schools developing their own grounds. A key objective was to encourage interest in the provenance and cultivation of edible plants, especially vegetables, and provide opportunities for children to get actively involved. On a limited budget and using recycled material – a situation familiar to many schools – an interesting child-focused layout was created, with secret paths and hiding places. Adult access was restricted, for example, by constructing a low tunnel of canes over which sweet peas were grown, or by cutting a child-sized entrance out of plywood. Flowers, decorative end edible plants were cultivated in raised beds, as well as plants of particular ethnobotanical interest, like flax. When children visited the nearby oriental museum to see a mummy wrapped in linen they were able to make a link to the plant.

Durham's Head Gardener, Mike Hughes, is in no doubt about the garden's success. "Just having a garden area designated for children has helped us to focus and think more effectively about their needs and requirements. We've used the garden for a teachers' continual professional development (CPD) session and it has also been visited by teachers looking to develop their own school gardens."

Birmingham Botanical Gardens & Glasshouses are located on a 15-acre site at Edgbaston, just outside the city centre. A Growing Schools Garden, designed by award-winning TV gardener Chris Beardshaw, was installed in 2007 with central government backing and the support of Learning through Landscapes and FACE.

Critically, pupils from more than 30 schools were involved in its inception. The garden's purpose is to demonstrate how teaching and learning can take place outside the classroom, within school grounds and also beyond the school boundaries. An evolutionary section explores geological history and the evolution of plants and animals, and there are also aquatic, wildlife and storytelling areas. Onsite buildings showcase modern and traditional sustainable construction methods.

Already the Garden has been used for a range of CPD courses and, through its holiday workshops for children, is now an integral part of Birmingham's informal education programme.

These case studies illustrate the immense potential of botanic gardens and similar institutions to become agents of social engagement with their host communities – if they possess the necessary will and the vision. The GSGs framework enables gardens to identify and harness these innate capacities and share their good practice.

RÉSUMÉ

Une étude des Nations Unies indique que plus de la moitié de la population humaine vit en villes , unetendance des récentes décennies liée à un accroissement massif de la population, au développement de l'industrialisation et à la course à l'urbanisation, en particulier dans les pays développés. Au Royaume-Uni, qui est parmi les pays les plus peuplés au monde, la plus grande partie de la population britannique a été urbanisée depuis plus d'un siècle. Un changement démographique et sociétal aussi important pose d'immenses défis aux organisations comme les jardins botaniques et les réserves naturelles dont le champ d'action se situe à l'intersection entre la nature et la société. Il est probable que la question la plus cruciale, à laquelle doivent faire face ceux qui sont en charge de l'éducation des enfants et des jeunes largement urbanisés, est comment les amener à réfléchir sur leur place dans le monde naturel et également les aider à comprendre le rôle fondamental de la nature dans le développement de la société humaine, la culture et la recherche scientifique. David Jeffrey fait un compte-rendu du projet « Des jardins d'écoles qui poussent », 'un réseau de jardins anglais pionniers qui s'attaque de front à cette question.

RESUMEN

Actualmente estadísticas de las Naciones Unidas calculan que la mitad de la población mundial se encuentra en ciudades y poblaciones, la tendencia en recientes décadas es una explosión masiva en ellas, incrementando la industrialización y la precipitada urbanización, especialmente en los países desarrollados. El Reino Unido se encuentra entre los países mas altamente poblados del mundo, sus habitantes han sido urbanizados por más de un siglo. Estos cambios demográficos y sociales presentan un sinnúmero de retos a las organizaciones como lo son jardines botánicos y reservas naturales que están funcionando como intersección entre la naturaleza y la sociedad. Tal vez las interrogantes a las que se enfrenta la educación de nuestros altamente urbanizados niños y adultos jóvenes es como engendrar en ambos la concientización de el lugar que ocupan ellos en el mundo natural, también ayudarles a entender los papeles fundamentales de la naturaleza en el desarrollo humano de la sociedad, cultura y ciencia. David Jeffreys reporta en como la iniciativa aumentando los jardines escolares, red de jardines ingleses pioneros, puede tratar de resolver esta interrogante de frente.

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The Growing Schools Garden at Birmingham Botanical Gardens & Glasshouses is used for running Continuing Professional Development courses for teachers (Picture courtesy of Birmingham Botanical Gardens & Glasshouses)

Ouvrir une fenêtre sur la « cécité pour les plantes »
Apertura de la ventana de 'ceguera hacia las plantas'

Opening the window on 'plant-blindness'

Medicinal and spice plants are clear winners among visitors to the University of Vienna Botanic Garden, a survey has revealed, while ornamental plants and plants used in industry trail in behind. And age also makes a difference, with pupils generally less interested than adults in so-called 'useful' plants. **Michael Kiehn** and his colleagues describe how Vienna set about establishing how and with what plants they could encourage an interest in botany and overcome 'plant blindness'.

In a survey, spice plants and medicinal plants were consider the most interesting group of useful plants. Here we have Crocus sativus *which provides saffron, the world's most expensive spice (Picture courtesy of University of Vienna Botanical Gardem)*

Like many of the world's botanical gardens, the Botanical Garden of the University of Vienna (Hortus Botanicus Vindobonensis, HBV), Austria, was originally devoted to the cultivation of useful plants. It was founded in 1754, when the university separated botany from medicine to become a discipline in its own right. The new garden was created to serve as a natural display for medicinal and other useful plants necessary for the academic studies of future physicians and pharmacists. While the main focus of the garden soon changed and its collections were, from the early nineteenth century, focused mainly on plants used for systematic or morphological studies and for the education of future botanists, the HBV retained a species-rich collection of both useful and poisonous plants. Right up to the present day these plants continue to be used in the teaching of university courses in biology and pharmacy, but are also, like most areas of the HBV, on view to the circa 150,000 visitors annually coming to the garden (Kiehn, 2007).

Curing 'plant-blindness'

As well as the many visitors to HBV not on guided tours, more than 6,000 people every year are guided through the garden as part of the Green School Programme. This programme serves groups of all ages but many participants are school pupils between 6 and 18 years old; their visit to HBV is often their first conscious contact with botany and living plants. There does appear to be a common perception that plants are uninteresting or boring, and they are often overlooked in everyday life (Hershey, 2002). One aim of HBV's Green School Programme is to counteract this 'plant-blindness'.

The usefulness of plants seems to be an important criterion for people (especially children) when arranging plants in groups (Krüger & Burmester, 2005). Therefore focusing on useful plants is likely to be a good way to attract attention for plants in general. But how do you choose the best plants to engage the interest of the visitor? And what is the best way to build on the visitors' previous experience?

How much interest?

To answer these questions and to find out which species can be used as 'flagship-species' for capturing the visitors' attention, it is important to take into account which groups of plants the target audience is likely to be interested in. Whether or not someone has a prior interest is a factor often overlooked in learning curricula, but is a variable that has significant influence on our motivation to gather new knowledge (Hidi & Baird, 1986). For our purposes, it is also important to know whether interest in useful plants is evenly distributed within the target groups, whether interest in plants changes with age, and whether there are some areas of knowledge which are 'sexier' than others. These questions are very relevant to HBV's long tradition of teaching about useful plants, and initiated a series of studies which started in 2008 and are still ongoing, with the aim of developing an educational concept devoted to the useful plants group.

Finding the answers

To find answers to the above questions you need direct input from the targeted audience. Thus a special survey was designed, based on the ROSE-questionnaire used in an international study exploring the Relevance of Science Teaching (Schreiner & Sjoberg, 2004). For this project the conventionally accepted classification of useful plants into six groups was used: medicinal and poisonous plants, stimulant herbal drugs, edible plants, spice plants, technically used plants and ornamental plants.

The survey was in three parts:

- First, the participants had to answer 33 questions exploring their interests in the six different subgroups of useful plants.

Top: The useful plants group at the Botanical Garden around 1900
Above: The useful plants group at the Botanical Garden in 2011

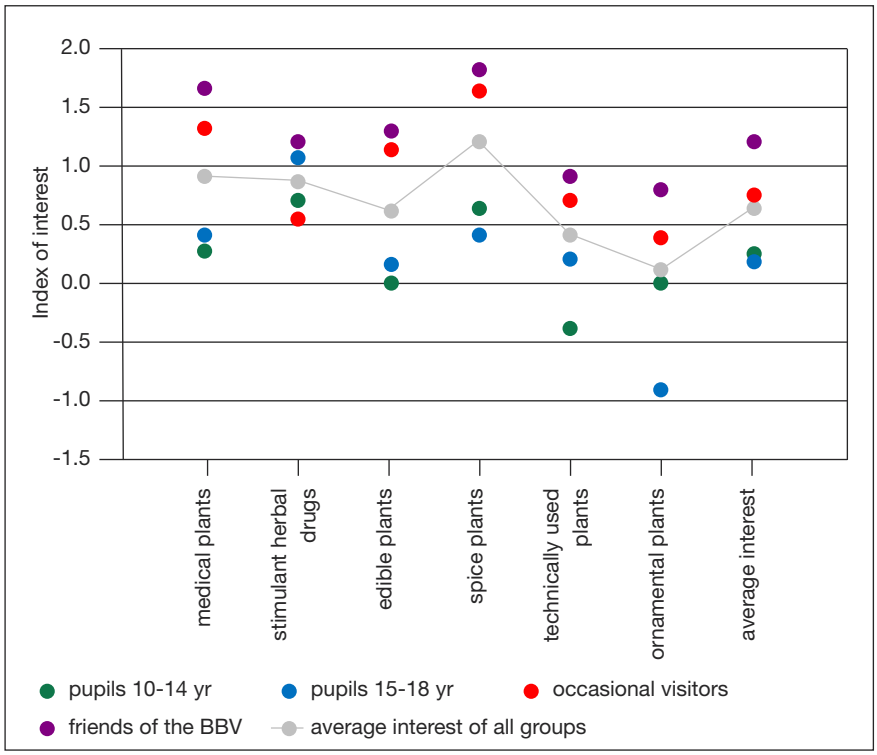

Figure 3 – Interest in different groups of useful plants shown for different groups of visitors (Courtesy of University of Vienna Botanical Gardem

- Secondly, they had to respond to 20 questions dealing with their existing knowledge, in order to estimate the level of information that should be offered to different groups of garden visitors.
- Thirdly, participants were asked whether they found an information panel already used in the HBV as appealing and/or which aspects could be amended.

The data from the survey were statistically analysed and an average value of interest was calculated for each of the four targeted visitor groups:
1) adult occasional visitors
2) visitors especially interested in plants picked from the 'friends association' of HBV
3) pupils from 10 to 14 years of age
4) pupils from 15 to 18 years of age.

Spices and medicines

As can be seen in Figure 3 the four subgroups clearly differ in their focal interests. Schoolchildren in general seem to be less interested than adults, except in stimulant herbal drugs! However, there is one general trend: spice plants and medicinal plants are the most interesting groups of useful plants. Ornamental plants and plants used for technical applications, on the other hand, do not appear to be very effective in raising interest in and enjoyment of plants.

There are not only differences between the groups of visitors when it comes to their interests, but also differences in respect to their existing knowledge (Fig. 4). The results seem to indicate (though it was not statistically proven) that for educational considerations, one should take into account that the same botanic content will differently influence the interest of the target group members, according to the already existing knowledge of each.

Practical consequences

Based on this survey, educational concepts to adapt the arrangement and presentation of useful plants in the beds of the Botanic Garden have been developed. Because of the diverse attendance at HBV, with its many different types of visitors, the garden is a perfect place to test a variety of teaching methods.

To appeal to occasional visitors of all ages the information panels will comprise both pictures and text, in equal measure. Furthermore, text and graphics should be mixed, so that short paragraphs of text alternate with corresponding pictures, since long texts were rated as rather boring and exhausting to read. In addition there is a strong demand for making the application of the useful plants clearer. This is addressed by placing, about every 10 meters, small panels with explanations for the abbreviations used on the plant name-tags to describe the applications of the useful plants in the beds (e.g. 'off.' for 'officinal plant').

Besides this first group of visitors there are many people who come to the garden purely to extend their – already good – botanical knowledge. These individuals would prefer to find even more information on the panels. To satisfy them additional media are needed, as putting more text on the information boards would counteract the interests of the first (large) target group. The solution here is to develop a booklet containing more detailed information on all of the useful plants in HBV. Such leaflets have already been produced for other topics in the garden (e.g., on wild bees, living fossils, or pollen).

While the concepts described up to now refer to adult visitors, there are also programmes designed to address different groups of young people. According to the results of the questionnaire there are two topics shown to be interesting to all age-groups: medicinal plants and spice plants. For both of these plant groups education units have been designed for different age classes, which include a guided tour by an expert, but also feature phases of investigative learning, where the pupils work on the subject on their own.

Conclusion

In conclusion, plants people know and perceive as interesting are likely to increase their attention to botanical information. The subject of useful plants contains many elements for increasing an understanding of botany in general. In order to optimize the target-oriented use of these plants for counteracting the problem of 'plant-blindness', this study is being continued in the context of a PhD thesis, intended to provide more details on the distribution of interests in useful plants among the garden's visitor base. It marks a new departure in scientific study at HBV.

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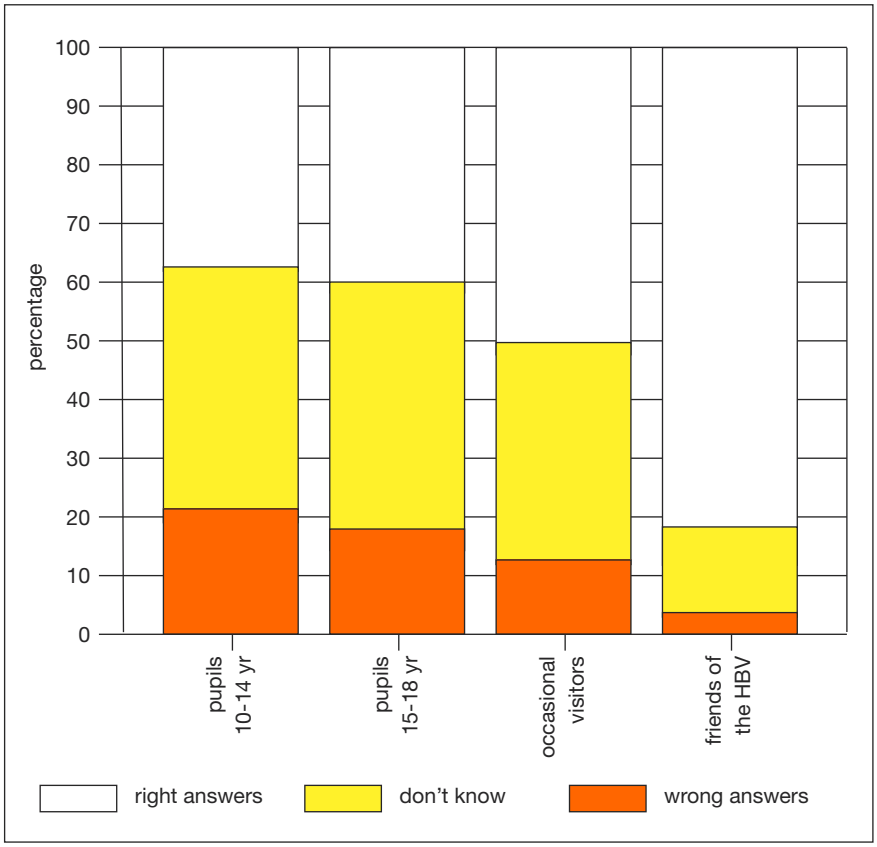

Figure 4 – Percentages of right and wrong answers to questions about useful plants; an indicator for knowledge in different groups of visitors (Courtesy of University of Vienna Botanical Gardem)

RÉSUMÉ

Dans la plupart des jardins botaniques, la culture et la présentation de plantes utiles est une longue tradition. Ce groupe de plantes est également connu pour être d'un grand intérêt pour les visiteurs des jardins. C'est pour cette raison qu'une étude a été menée au Jardin botanique de l'Université de Vienne pour définir comment les plantes utiles peuvent être employées pour susciter de l'intérêt pour la botanique, et comment cela peut être adapté à différents publics. Quatre groupes cibles ont été sélectionnés : les scolaires de deux groupes d'âges (10 à 14 ans et 15 à 18 ans), le grand public et les groupes spécialisés venant de l'Association des amis du Jardin botanique. Le bilan du questionnaire fait ressortir que les épices et les plantes médicinales sont les groupes de plantes utiles suscitant le plus d'intérêt de la part des visiteurs. Les plantes ornementales et les plantes utilisées pour l'industrie présentent un intérêt moindre pour les visiteurs. De plus, comparativement aux adultes, les scolaires expriment moins d'intérêt pour la plupart des plantes utiles à l'exception des plantes à drogues. Les données suggèrent que différentes approches sont nécessaires pour accroître la compréhension de la botanique et des plantes auprès de différents publics. Basé sur ces résultats, un panel de supports de communication a été développé pour correspondre aux différents groupes intégrant des panneaux d'interprétation, des livrets d'information, des programmes pédagogiques, qui seront testés pour leur efficacité à lutter contre la « cécité pour les plantes ».

RESUMEN

En la mayoría de los jardines se cultivan y muestran plantas útiles de larga tradición. Siendo estas también conocidas y de gran interés por los visitantes. Es por ello que por medio de una encuesta el Jardín Botánico de la Universidad de Viena está buscando como emplear las plantas útiles para crear un interés botánico, además, como se puede optimizar esto para diferentes tipos de audiencias. Se seleccionaron cuatro grupos: dos rangos de escolares (10-14 y 15-18 años), público en general y otro grupo de interés especial formado por la Asociación de Amigos del Jardín Botánico. Los resultados indicaron que las plantas usadas como especias y medicinales fueron las que más atrajeron el interés de estos visitantes. Asimismo, los escolares mostraron menos interés que los adultos en la mayoría de las plantas, a excepción, de aquellas que poseen drogas estimulantes. Los datos sugieren que se necesitan diferentes enfoques para aumentar el entendimiento botánico adecuado a cada tipo de audiencia. Con base a este estudio, un rango de medios de la comunicación están siendo implementados para cada uno de los diferentes grupos, incluyendo tableros de interpretación, cuadernos informativos, programas educacionales, los cuales también serán puestos a prueba de efectividad para vencer el fenómeno de 'ceguera hacia las plantas'.

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The art of exhibitions
a marriage of science and culture

In an exclusive interview for *Roots*, **Ken Arnold**, the Wellcome Collection's Head of Public Programmes in London, describes the imaginative journeys he and his team undertake as they create a world-class programme of exhibitions and lively public events exploring the links between medicine, life and art.

Introduction

The Wellcome Collection in London, is self-described as "a free visitor destination for the incurably curious". Through the permanent and temporary exhibitions and lively public events, the Wellcome Collection explores the connections between medicine, life and art. In this interview, Dr Ken Arnold, Head of Public Programmes talks to Dr Asimina Vergou of BGCI about the Collection's exhibitions which he describes as experimental, interdisciplinary, playful and even challenging to the public perception.

Asimina Vergou: The Wellcome Trust has been funded since the 1930s – when did you start developing the exhibitions and why?

Ken Arnold: We are 75 years old this year. Henry Wellcome, the founder died in 1936, leaving his fortune to fund the charity and also his enormous collection ¬– over a million objects. He gathered this collection as a sort of a window on the material and visual culture of health and medicine and well-being. So I suppose it has been more or less continuously on show ever since, but the idea of putting on a major display came about in the 1970s, when the Science Museum set up its Wellcome Collection (which it has on permanent loan) over two floors, still pretty much the same today. At the Trust we started doing small temporary exhibitions during the 1990s. The most recent Wellcome Collection version, based in Euston, London, was opened in June 2007. And it's an attempt to return to the origins of this extraordinary collection and the imagination that fired it and try to think about it in a contemporary context.

AV: So what do you think are the links between science and culture?

KA: Science and culture feel so intermingled that separating them out almost doesn't make sense, because they are, depending on what you think they are, big enough to contain each other. But in the conventional way science and culture are defined. I guess the links are to do with the excitement of thinking about things you already think about, but from a different perspective. It's exploring the space between them, the arguments or misunderstandings, that make exciting new things happen.

Quacks and Cures: An exciting late-night event of diagnoses and cures. Visitors had the opportunity to meet a quack doctor, handle live leeches or contribute to their own home remedies (Picture courtesy of Wellcome Library, London)

AV: Why do you think it's so important for the Wellcome Trust to communicate these links between science and society?

KA: That's at the heart of the Wellcome Collection. The fruits of science are inevitably going to be used or abused by everybody, so why not start that process earlier, create engagement and debate before. For example, there are huge protests about GM crops, or scandals about the use of human tissue. The idea that science is removed from society is one that fewer and fewer people believe in. Twenty years ago it was a struggle to make it clear that public engagement mattered, now the university world is recalibrating success, not by research excellence but what they contribute to other spheres.

AV: What makes the Wellcome Collection different from settings such as the Science Museum?

KA: I think we're more independent, experimental. Maybe a bit more playful. Also very interdisciplinary. The Science Museum has to be for everybody, whereas though we clearly have free entry for all, our audience is mainly adult and we try to be a cultural venue that happens to be about science, rather than a science venue that includes cultural ideas.

Also, one of the things that we are trying to do is use the exhibitions to think out loud, and not as a way of sharing research that has already been done. The idea is not to disseminate what is already known but trying to use exhibitions as a way of briefly bringing together ideas that are half known, so really using them as a form of inquiry.

AV: What would you say about the visitors you are targeting? For example, with the Dirt exhibition I noticed that the signs for the specimens are quite text heavy.

KA: We are a champion of expertise and not embarrassed about using sometimes difficult language. I don't think people expect to understand everything and if you work really hard to make sure that everyone can, you end up sharing very little. It may seem elitist, but our visitor statistics are no different from the national institutions that employ a lot of

Identity exhibition: Eight Rooms, Nine Lives, 26 November 2009 - 06 April 2010 (Picture courtesy of Wellcome Library, London)

people to target more diverse audiences. My sense is that if you put on an interesting, open minded exciting programme then people will be interested in it from different backgrounds and that's as effective a way of getting a broad audience as thinking long and hard what those audiences might anticipate and then preparing programmes based on what you think they might like. At the Wellcome Collection with three or four major topics a year and two live events every week, we get people of different interests. An exhibition on war and medicine attracted many older men with experience of war. We are about to do a Mexican exhibition about votive paintings that will be marketed to Hispanic communities in London.

AV: How do you choose the themes for your exhibitions?

KA: Some ideas come from me or my colleagues but lots are from outside academics, artists, scientists, or others who want to work with us – in a year we get maybe 200 ideas, of which perhaps 10 go forward to the board. We are very keen that each exhibition is different; at the moment we have the exhibition on dirt, then the Mexican miracle paintings, alongside another of amulets, then one on the brain, and one about ability. Everything is medically engaged, that's what we are about. But an exhibition on the stomach or genetics or a subject that few people are interested in, apart from scientists, isn't a good idea. It's better to have Dirt! That's a fantastic topic because it is in everybody's lives. We focus on big topics that reward a scientific interest, but are open to interpretations from philosophers, historians, artists, designers.

AV: Can you give an example of how you develop the exhibitions, what kind of framework do you use?

KA: There's no formula. But actually we do two types of exhibitions. We do exhibitions that have one-word titles like 'Dirt', 'Heart' and these are topics that everyone thinks they have some idea about and then the trick is to find what is the interesting material to show. This 'top-bottom' approach involves immersing oneself in the subject and getting lost, and then somehow finding something that feels like it is the key to reducing the wide topic. Then with that key in mind start finding the really interesting material. The other way we do it, a 'bottom-up approach', is start from the material that we want to show and then work out what's the meaning, what's the significance and interest in the material.

In the 'top-bottom approach' we carry out a huge amount of research, and there is often a breakthrough moment that becomes the key. For example, our Director wanted an exhibition on identity,

but for ages I couldn't work out how to do it. As a cultural institution everything is about identity! And the breakthrough came when I was thinking, 'don't let's do one big exhibition, let's do 8 or 9; each about one person (historical or contemporary) whose life, work or art, sheds light on this topic'. That was it. And the idea for Dirt came from an anthropologist, Mary Douglas, about dirt just being matter out of place, like weeds are just flowers out of place. So we used real places at interesting times – Delft, Holland in the 17th century, London in the 18th and 19th centuries, Glasgow in the 19th, then New York. Each has a different story about what 'dirt' means. That's the trick, to turn a confusing mass of material into a single strand.

AV: Could you also give a 'bottom-up' approach example?

KA: That sort of exhibition tends to be collection-based so it's finding something that looks exciting, like a skeleton. We worked with the Museum of London who has 14,000 skeletons. A whole graveyard was uncovered and we thought, 'Great! Put the skeletons on display.' We don't know who they are but the archaeologists can tell that they had this disease or lived this sort of life, and what sort of people they might have been, so the science re-animates.

AV: It seems very interdisciplinary work. How do you engage all these different scientists?

KA: We are lucky at Wellcome Trust, our colleagues know lots of social scientists, historians, philosophers and of course 'hard core' scientists – and we give them money to do research so they like us! We were able to find 10 experts within a couple of hours, but you need people excited by their subject, who can share it with others and this is a rare gift. And it's important they don't think it's their exhibition. That means being very clear about their role and managing expectations. We have our struggles – a chief curator said the other day, 'Ken, can we make sure that we never, ever, ever collaborate with anyone again?' He wasn't serious but sometimes you do think, 'oh God, never again!' But we don't know enough ourselves so you bring people together to do things, just as exhibitions bring objects together.

AV: I guess it's difficult to go back to the scientists and ask if the exhibition had outcomes for them.

KA: I do hope the people involved in our projects feel it shifted them slightly. Maybe the scientists meet people who are interested in their subject in a different way, helping them think about where their next research could go, or getting more involved in public engagement.

AV: As an organization providing funding it's easier for you to find people willing to share their knowledge. Do you have any suggestions for botanic gardens on how to engage their scientists in communicating their work to the public?

KA: Well, in science now, the idea that you engage the public accidentally at the end of a project is much less common. Organizations like ours say 'here is money for research but you have to do something that engages the public'. So there is good motivation there. But perhaps find ways of making it enjoyable? Of course scientists love their science, but you need to be realistic about how much time it takes. Choose individuals carefully – first, because they have interesting ideas, second, because they're willing. There's nothing worse than working with people who really don't want to be there. And to be honest, the other thing is brand value. In the botanic garden world there is no one who won't have a good impression of the organization, its great work, as is true of the Wellcome Trust. You have to trade off that a bit, about what they, as scientists, can get back from the process. Training, an opportunity to practice things they are doing, or just being given the name of somebody they might be interested to talking to – you can give them a little boost, a fun experience and some contacts that they wouldn't have had or ideas of what else they might like to do.

AV: Could you suggest any plant-focused exhibitions in botanic gardens?

KA: Focusing on some odd range of very specific plants might be an interesting approach to an exhibition. A botanic garden could probably want to focus on 10 or 12 extraordinary plants – like the pomegranate which may be the original Adam's apple and is now thought to be miraculous for health, and essential food plants like cassava and rice. From a curatorial point of view, an issue is that exhibitions are usually indoors, and this subject is all about the outdoors. So, how can an exhibition bring the outside inside and how do you find a way for the exhibition to go outside of its own space. And also an exhibition can be on for three or four months; one of the obvious things about plants is that they are alive and they change; so how could you avoid freezing time in an exhibition and make growth a part of its subject? For the hour that people spend in the exhibition it's very difficult to get them to see a great deal of change because not a huge amount of growth happens in an hour. So just thinking about the change over those four months and how that relates to the change in plants etc., that might be interesting.

AV: Dr Ken Arnold, thank you very much for talking to me and sharing your expertise and experience about developing exhibitions on science and culture.

Tour of the Medicine Now Gallery, Wellcome Collection (Picture courtesy of Wellcome Library, London)

For more information about the Wellcome Collection visit: www.wellcomecollection.org/ Wellcome Trust also funds public engagement projects that build excitement and interest around science and society. For more information visit: www.wellcome.ac.uk/Funding/Public-engagement/index.htm

RÉSUMÉ

Le musée Wellcome Collection de Londres, se décrit comme étant « une destination gratuite pour les visiteurs incurablement curieux ». Au travers d'expositions permanentes et temporaires, et d'évènements publics animés, le Wellcome Collection explore les connections qui existent entre la médecine, la vie et l'art. Dans cet entretien, le Dr Ken Arnold, chef des programmes publics, explique la démarche effectuée par son équipe pour créer les expositions du musée Collection, qu'il décrit comme expérimentales, interdisciplinaires, espiègles, voire ambitieuses vis-à-vis de la perception du public. Il existe deux façons de s'engager sur la voie de la conception d'expositions. Vous pouvez commencer par un vaste thème, vous immerger dans le sujet, vous y perdre puis, d'une manière ou d'une autre, trouver quelque chose qui ressemble à la clé pour réduire le sujet, et avec cette clé en tête vous trouverez la matière réellement intéressante. Ou alors, vous commencez par la matière et, suite à des discussions avec des experts, vous avez la compréhension du thème et commencez à raconter les histoires qui à leur tour vous mènent à des idées plus grandes que celles simplement contenues dans l'objet spécifique.

Ken Arnold fournit des exemples concrets d'expositions fascinantes qui sont présentées au Wellcome Collection et indique comment motiver et rassembler des experts de différentes disciplines (sciences sociales et sciences naturelles). Cet entretien vise à apporter de l'inspiration et des idées aux jardins botaniques sur la façon de développer des expositions afin de mettre en lumière les liens entre science et culture, d'expliquer pourquoi cela peut être important pour leurs établissements, et de suggérer l'articulation entre l'exposition de spécimens liés aux plantes, en intérieur, et les collections de plantes vivantes en plein air.

Dirt exhibition, Wellcome Collection, 24th March - 31st August 2011 (Picture courtesy of Wellcome Library, London)

RESUMEN

La colección de la Institución Wellcome en Londres, se auto describe como "una visita libre destinada a la incurable curiosidad". A través de sus exposiciones temporales y permanentes, y eventos públicos se exploran las conexiones entre la medicina, la vida y el arte. En esta entrevista el Dr. Ken Arnold, Jefe de los Programas Públicos, explica los pasos que su equipo sigue para crear las exposiciones de la colección la cual describe como experimental, interdisciplinaria, traviesa [picara] e incluso un reto para la percepción pública. Para hacer una exposición hay dos caminos a seguir: uno, comenzando por un tema grande, sumergiese en el mismo, perderse en este, entonces de alguna manera encontrar algo clave que lo haga sentir reducido, y con este punto clave en mente encontrar el material realmente interesante. El otro camino es estar con el material, y a partir de conversaciones con expertos en este, se llega al fondo de éste y se comienza a hacer historias que generen ideas grandes y mas allá de solo el objeto en especifico.

Ken Arnold da ejemplos concretos de las exposiciones fascinantes detrás de las exposiciones de la colección Welcome y como ustedes podrán motivar y fusionar expertos en disciplinas muy diferentes (sociales o de ciencias naturales). Esta entrevista tiene como objetivo inspirar a los jardines botánicos en desarrollar exposiciones o escaparates que reúnan la ciencia y la cultura, para reflejar por qué puede ser importante para las instituciones el combinar las exposiciones interiores de los especímenes de plantas relacionadas con las cultivadas al aire libre.

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Resources

RESOURCES

Books

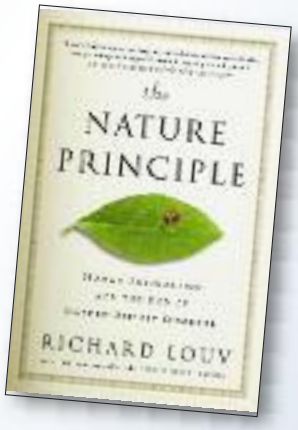
The Open Laboratory

The *Open Laboratory* is an annual anthology of the best science writing on the internet. Contributors to this anthology represent a range of professions, including artists, poets, students and professional science writers. These dedicated and skilled communicators present diverse and imaginative perspectives on science through a range of literary mediums and styles. Poetry, commentaries of current scientific affairs and historical narratives provide a sense of the diversity in scientific thought and a greater appreciation of science itself, in a way that is accessible, educational and enjoyable.

Jason G. Goldman and Bora Zivkovik (Eds.), 2011, Lulu Press Inc, Raleigh, North Carolina, US www.lulu.com
ISBN 13: 978-1-2571-1319-4

The Nature Principle

In *The Nature Principle*, Richard Louv sends a galvanizing message to adults of all ages to lay down their smart phones, PlayStations and iPads, and summon home nature. Louv presents personal narratives and current research to support his thesis that cultivating a relationship with nature benefits human well-being on individual and societal levels. This book is an inspiring, encouraging and practical guide for anyone wishing to bring nature back into their life, protect the diversity of life on our planet and create more sustainable



RESSOURCES

Livres

Le laboratoire ouvert

Le laboratoire ouvert est une anthologie annuelle des meilleures publications scientifiques sur Internet. Les contributeurs de cette anthologie représentent diverses professions, artistes, poètes, étudiants et auteurs scientifiques professionnels compris. Ces écrivains dévoués et talentueux présentent des points de vue variés et pleins d'imagination, et utilisent toute une gamme de moyens de communications et de styles. Poèmes, commentaires sur des sujets d'actualité scientifique et récits historiques donnent une image de la diversité de la pensée scientifique et une meilleure appréciation de la science elle-même, d'une manière accessible, éducative et plaisante.

Jason G. Goldman and Bora Zivkovik (Eds.), 2011, Lulu Press Inc, Raleigh, North Carolina, US www.lulu.com
ISBN 13: 978-1-2571-1319-4

Le principe nature

Dans *Le principe nature*, Richard Louv envoie un message aux adultes de tous âges pour les pousser à poser leurs smartphones, playstations et ipads et d'appeler la nature à venir dans la maison. Louv présente des récits personnels et des résultats d'études actuelles pour soutenir sa thèse : cultiver une relation avec la nature favorise le bien-être des humains au niveau individuel et sociétal. Ce livre est un guide pratique, inspirant et stimulant, pour quiconque souhaite ramener la nature dans sa vie, protéger la diversité de la vie sur notre planète et créer des communautés plus soutenables.

RECURSOS

Libros

El Laboratorio Abierto

El Laboratorio Abierto es una antología anual de la mejor ciencia escrita en Internet. Los colaboradores de esta antología abarcan una amplia gama de profesiones, incluyendo artistas, poetas, estudiantes y escritores de ciencia profesionales. Estos expertos y dedicados presentan a los lectores perspectivas de la ciencia diversas e imaginativas a través de una amplia gama de medios y estilos literarios. Poemas, comentarios sobre temas científicos de actualidad y relatos históricos proporcionan un sentido de la diversidad del pensamiento científico y una mayor apreciación de la ciencia misma, todo ello en formas accesibles, educativas y divertidas.

Jason G. Goldman and Bora Zivkovik (Eds.), 2011, Lulu Press Inc, Raleigh, North Carolina, US.
ISBN 13: 978-1-2571-1319-4
www.lulu.com

El Principio Natural

En El Principio Natural, Richard Louv envía un mensaje a los adultos de todas las edades para olvidar por un tiempo los Play Station, los teléfonos inteligentes y los iPads, y en su lugar convocar la naturaleza a la casa. Louv presenta historias personales e investigaciones actuales para apoyar su tesis de que cultivar una relación cercana con la naturaleza impacta positivamente a los niveles individual y social del bienestar humano. Este libro es una guía práctica inspiradora y alentadora para cualquier persona que desee devolver la naturaleza a sus vidas, proteger la diversidad de la vida en nuestro planeta y crear comunidades más sostenibles. Louv presenta pruebas convincentes de que,

communities. Louv presents persuasive arguments that by healing our schism with nature, humans will lead healthier, happier, more productive lives and contribute to a brighter future for our world.

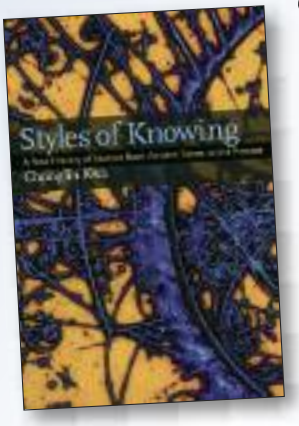
Richard Louv, 2011, Algonquin Books, Chapel Hill, North Carolina, US
www.workman.com
ISBN 10: 1-5651-2581-9
ISBN 13: 978-1-5651-2581-0

Science in Public: Communication, Culture and Credibility

Jane Gregory and Steve Miller present a thorough and accessible analysis of scientific literacy in *Science in Public: Communication, Culture and Credibility*. They effectively present the case for promoting an improved understanding of science, scientific thought and scientific processes, survey the history of science communication and suggest a new framework for the future of its success. Gregory and Miller also discuss how to interpret scientific communication from various types of institutions that may have varying motivations as well as the role of the media in science communication.

Jane Gregory and Steven Miller, 1998, Basic Books, Cambridge, MA, US
www.perseusbooksgroup.com
ISBN 10: 0-7382-0357-2
ISBN 13: 978-0-7382-0357-7

Styles of Knowing: A New History of Science from Ancient Times to the Present



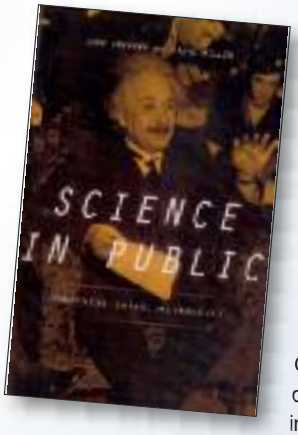
Chunglin Kwa's Styles of Knowing: A New History of Science from Ancient Times to the Present, is a thorough and accessible account of the historical development of six different styles of scientific inquiry. Each of the six styles, deductive, experimental, evolutionary, hypothetical-analogical, statistical and taxonomic, are examined in a cultural-historical context. Kwa discusses how each style developed, what influences they have

Louv prouve de façon convaincante que, en réduisant notre schisme avec la nature, les humains mèneront des vies plus saines, plus heureuses et plus productives, et contribuerons à un avenir meilleur pour notre terre.

Richard Louv, 2011, Algonquin Books, Chapel Hill, North Carolina, US
www.workman.com
ISBN 10: 1-5651-2581-9
ISBN 13: 978-1-5651-2581-0

La science en public: communication, culture et crédibilité

Jane Gregory et Steve Miller présentent une analyse complète et accessible de la culture scientifique dans *La science en public: communication, culture et crédibilité*. Ils présentent des arguments en faveur d'une meilleure compréhension de la science, de la pensée scientifique et des processus scientifiques, étudient l'histoire de la communication scientifique et proposent un nouveau cadre pour un avenir plein de succès. Gregory et Miller abordent également la question de comment interpréter les communications scientifiques venant de différentes sortes d'institutions qui peuvent avoir des motivations diverses et le rôle de la communication scientifique des médias.



Jane Gregory and Steven Miller, 1998, Basic Books, Cambridge, MA, US
www.perseusbooksgroup.com
ISBN 10: 0-7382-0357-2
ISBN 13: 978-0-7382-0357-7

Méthodes de connaissances : une nouvelle Histoire de la science, d'autrefois à aujourd'hui

Méthodes de connaissances : une nouvelle Histoire de la science, d'autrefois à aujourd'hui de Chunglin Kwa est un compte-rendu complet et accessible du développement historique de six méthodes différentes d'enquête scientifique. Chacune des six méthodes (déductive, expérimentale, évolutionniste, hypothético-analogique, statistique et taxonomique) est examinée dans un contexte culturel et historique. Kwa

una vez que sea superada la separación de la naturaleza, los seres humanos llevaremos una vida más productiva, más saludable y más feliz, que nos permita contribuir a un mejor futuro para nuestro mundo.

Richard Louv, 2011, Algonquin Books, Chapel Hill, North Carolina, US
ISBN 10:1-5651-2581-9
ISBN 13: 978-1-5651-2581-0
www.workman.com

La Ciencia en el Público: Comunicación, Cultura y Credibilidad

Jane Gregory y Steve Miller presentan un análisis completo y accesible de la cultura científica en *La Ciencia en el Público: Comunicación, Cultura y Credibilidad*. Los autores presentan este caso de manera eficiente para promover una mejor comprensión de la ciencia y del pensamiento científico y sus procesos; exploran la historia de la comunicación científica y sugieren un nuevo marco para su éxito en el futuro. Gregory y Miller también discuten de qué manera interpretar las comunicaciones científicas provenientes de instituciones diversas con una variedad de motivaciones, así como el papel de la comunicación de la ciencia en los medios.

Jane Gregory and Steven Miller, 1998, Basic Books, Cambridge, MA, US
ISBN 10: 0-7382-0357-2
ISBN 13: 978-0-7382-0357-7
www.perseusbooksgroup.com

Los Estilos del Saber: una Nueva Historia de la Ciencia desde la Antigüedad hasta el Presente

Estilos del Saber: una nueva historia de la ciencia desde la antigüedad hasta el presente, de Chunglin Kwa es un conteo completo y accesible de la evolución histórica de seis estilos diferentes en investigación científica. Cada uno de los seis estilos (deductivo, experimental, evolutivo, hipotético-analógico, estadístico y taxonómico), es examinado en un contexto histórico-cultural. Kwa analiza la manera en que se desarrolló

had on each other and how each has evolved over time. Kwa also recounts the unique canons which each style used to gauge good science. This book is an excellent reference for historians, scientists, students and laypersons alike, for understanding the foundations of scientific reasoning processes.

Chunglin Kwa, 2011, University of Pittsburgh Press, Pittsburgh, Pennsylvania, US
www.upress.pitt.edu
ISBN 10: 0-8229-6151-2
ISBN 13: 978-0-8229-6151-2

Journey of the Universe

This documentary film project, stand – alone or companion book and 20-part educational series draws on established scientific discoveries and cultural history to tell the grand narrative of the universe. It discusses the origins of the universe, life on earth, our present planetary dilemmas and the impact of the human species concisely and comprehensively, in prose that is both beautiful and accessible. Journey of the Universe raises awareness of big picture topics of cosmological history, species extinction and climate change without being bogged down with scientific details or an ideological agenda for what we should do. Instead, we are provoked into thought, promoting a deep awareness of the place and role of the human species in the universe. This epic narrative is remarkable in both its informative scope and power to inspire.

Brian T. Swimme and Mary E. Tucker, 2011, Yale University Press, New Haven, Connecticut, United States,
www.journeyoftheuniverse.org
www.yale.edu/yup/
ISBN 10: 0-3001-7190-0
ISBN 13: 978-0-3001-7190-7

Weblinks/Websites

COPUS: Coalition on the Public Understanding of Science

http://www.copusproject.org

COPUS is a grassroots organization that works to build connections between scientific institutions and the public in support of a better public understanding of science and its value to society. Their website offers listings and links to organizations and individuals,

examine comment chaque méthode est apparue, quelle influence elles ont l'une sur l'autre et comment elles ont évolué avec le temps. Kwa rappelle également les critères utilisés par chaque méthode pour dire ce qu'était une donnée scientifique sérieuse. Ce livre est une référence excellente pour tous, historiens, scientifiques, étudiants et non-initiés, pour comprendre les bases du raisonnement scientifique.

Chunglin Kwa, 2011, University of Pittsburgh Press, Pittsburgh, Pennsylvania, US
www.upress.pitt.edu
ISBN 10: 0-8229-6151-2
ISBN 13: 978-0-8229-6151-2

Le voyage de l'univers

Ce projet de documentaire scientifique, livre et série éducative en 20 épisodes s'inspire des grandes découvertes scientifiques reconnues et de l'histoire culturelle pour raconter la grande histoire de l'univers. Il traite des origines de l'univers, de la vie sur terre, des problèmes globaux actuels et de l'impact de l'espèce humaine, d'une manière concise et exhaustive, dans un texte à la fois beau et accessible. *Le voyage de l'univers* apporte une vue d'ensemble sur l'histoire de l'univers, l'extinction des espèces et le changement climatique, sans être entravé par des détails scientifiques ou un parti-pris idéologique sur ce que nous devons faire. Au lieu de quoi, nous sommes amenés à la réflexion, qui encourage une profonde prise de conscience de la place et du rôle de l'espèce humaine dans l'univers. Ce récit épique est remarquable par sa portée informative et son pouvoir d'inspiration.

Brian T. Swimme and Mary E. Tucker, 2011, Yale University Press, New Haven, Connecticut, United States,
www.journeyoftheuniverse.org
www.yale.edu/yup/
ISBN 10: 0-3001-7190-0
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Sites Internet

Coalition pour une connaissance de la science pour tous

http://www.copusproject.org

COPUS est une association de base qui s'attèle à établir des liens entre les institutions scientifiques et le public pour

cada estilo, sus mutuas influencias y cómo cada uno ha evolucionado con el tiempo. Kwa también da cuenta de los cánones particulares utilizados por cada estilo a manera de inidcadores de lo que es la buena ciencia. Este libro es una excelente referencia para comprender los fundamentos de los procesos del razonamiento científico, útil para historiadores, gente de ciencia, estudiantes y laicos por igual.

Chunglin Kwa, 2011, University of Pittsburgh Press, Pittsburgh, Pennsylvania, US
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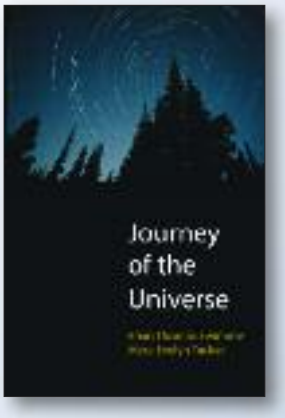
El Viaje del Universo

Este proyecto fílmico documental (solo o junto con un libro y una serie educativa de 20 partes) se basa en la historia de la cultura y los descubrimientos científicos bien establecidos para presentar el gran relato del universo. Se analizan los orígenes del universo, la vida en la tierra, nuestros actuales dilemas planetarios y el impacto de la especie humana de forma concisa y completa, escrito en una prosa bella y a la vez accesible. *El Viaje del Universo* fomenta el interés sobre los grandes temas de la historia cosmológica, la extinción de especies y el cambio climático sin empantanarse con detalles científicos o bajo la luz de una determinada agenda ideológica. En cambio, provoca el pensamiento, promoviendo una más profunda conciencia sobre el lugar y papel de la especie humana en el universo. Este relato épico es notable, tanto en su alcance informativo como en su poder inspirador.



Brian T. Swimme and Mary E. Tucker, 2011, Yale University Press, New Haven, Connecticut, United States,www.journeyoftheuniverse.org
www.yale.edu/yup/
ISBN 10: 0-3001-7190-0

programmes, blogs, narratives and scientific and educational resources. This network of organisations and individuals is passionately led by scientists and educators from universities, museums, and governmental and non-governmental organisations whose goal is to celebrate and promote science and community.

Extinction Countdown
http://www.scientificamerican.com/blog/extinction-countdown/

Extinction Countdown, a Scientific American Blog, features news and research regarding endangered species from all over the world. Several times a week, Jon Platt, a journalist who focuses on environmental issues, presents information on a species that is in danger of extinction, why it is in danger and what is being done to prevent its extinction. This website contains a wealth of scientific, cultural and legislative information regarding specific species of plants and animals, both common and little known.

Urban Science Adventures! Exploring & Discovering Nature in Urban Areas
http://urban-science.blogspot.com

Urban Science Adventures is one of the blogs of Danielle N. Lee, biologist and outreach scientist extraordinaire. Danielle enthusiastically writes about different ways in which to discover and appreciate nature in urban environments. She specializes in evolutionary biology and engaging diverse audiences. This blog carries with it a myriad of awards for its ability to inform and engage.

promouvoir une meilleure connaissance de la science et de sa valeur pour la société. Leur site Internet propose des listes et des liens vers des organisations et personnes, projets, blogs, récits et ressources scientifiques et éducatives. Ce réseau d'organisations et de personnes est animé par des scientifiques et éducateurs passionnés venant d'universités, musées, organisations gouvernementales et non-gouvernementales, dont l'objectif est de célébrer et d'encourager la science et le collectif.

Compte à rebours des extinctions
http://www.scientificamerican.com/blog/extinction-countdown/

Le Compte à rebours des extinctions, un blog du Scientific American, présente des nouvelles et des études concernant les espèces menacées du monde entier. Plusieurs fois par semaine, Jon Platt, un journaliste spécialisé en questions environnementales, présente des informations sur une espèce en voie d'extinction, pourquoi elle est en danger et ce qui est fait pour empêcher son extinction. Ce site contient une mine d'informations scientifiques, culturelles et juridiques concernant des espèces végétales et animales, certaines communes et d'autres peu connues.

Aventures en sciences urbaines! Explorer et découvrir la nature dans les zones urbaines
http://urban-science.blogspot.com

Aventures en sciences urbaines est l'un des blogs de Danielle N. Lee, une biologiste et scientifique extraordinaire qui a une vocation sociale. Danielle écrit de manière enthousiaste sur les différentes façons de découvrir et d'apprécier la nature dans les environnements urbains. Elle se spécialise en biologie de l'évolution

Sitios Web

COPUS: Coalición para la Comprensión Pública de la Ciencia
http://www.copusproject.org

COPUS es una organización de base que trabaja para crear conexiones entre las instituciones científicas y el público en apoyo de un mejor entendimiento de la ciencia y su valor para la sociedad. Su sitio web ofrece una lista y enlaces a organizaciones y particulares, programas, blogs, relatos y recursos científicos y educativos. Esta red de organizaciones e individuos es apasionadamente dirigida por científicos y educadores provenientes de universidades, museos y organizaciones gubernamentales y no gubernamentales, cuya meta es celebrar y promover la ciencia y la comunidad.

Extinción Cuenta regresiva
http://www.scientificamerican.com/blog/extinction-countdown/

Extinción Cuenta regresiva, un blog de Scientific American, que presenta noticias e investigaciones sobre las especies en peligro de extinción de todo el mundo. Varias veces a la semana, John Platt, un periodista que se centra en temas ambientales, ofrece información sobre una especie en peligro de extinción, por qué lo está y qué se está haciendo para evitar su extinción. Este sitio web contiene una gran cantidad de información científica, cultural y legislativa respecto a ciertas especies de plantas y animales, incluyendo tanto a especies muy comunes, como a otras poco conocidas.

¡Aventuras de la Ciencia Urbana! Explorando y descubriendo la naturaleza en las zonas urbanas
http://urban-science.blogspot.com

Bad Science

http://www.guardian.co.uk/science/series/badscience
http://www.badscience.net

Ben Goldacre is the author of a series of books, a blog and a column in the Guardian, all aptly entitled Bad Science. Goldacre, a medical doctor and academic, believes that the misinterpretation of data by the media and general public has become a public health issue. Goldacre explains failures of understanding, downright frauds and bad science in general with the hopes of improving the public understanding of scientific issues and science itself. This is a thought provoking resource on the power of science and the responsibility of those whose role entails communicating scientific knowledge to the public in a comprehensive way.

Ben Goldacre, 2011, Emblem Editions, Toronto, Canada, www.mcclelland.com/emblem/index.html
ISBN 10: 0-7710-3579-9
ISBN 13: 978-0771035791

Journal of Science Communication (JCOM)

http://jcom.sissa.it/archive/

This open-access, on-line journal focuses on communication between scientific institutions and the public and communication within the scientific community. JCOM aims to provide academics and practitioners with theoretical guidelines for communicating science to the public. The free circulation of information through this academic

et s'adresse à divers publics. Ce blog a remporté quantité de récompenses pour sa capacité à informer et à motiver.

Mauvaise science

http://www.guardian.co.uk/science/series/badscience
http://www.badscience.net

Ben Goldacre est l'auteur d'une série de livres, d'un blog et d'une rubrique dans le journal The Guardian, tous nommés avec justesse Bad Science. Goldacre, docteur en médecine et universitaire, pense que la mauvaise interprétation de données par les médias et le grand public est devenue une question de santé publique. Goldacre explique les erreurs de compréhension, les escroqueries pures et simples, et la mauvaise science en général, dans l'espoir de promouvoir, parmi le grand public, une meilleure connaissance des sujets scientifiques et de la science elle-même. C'est un outil qui donne à réfléchir sur le pouvoir de la science et la responsabilité de ceux dont le rôle implique de transmettre, d'une manière compréhensible, des connaissances scientifiques au public.

Ben Goldacre, 2011, Emblem Editions, Toronto, Canada, www.mcclelland.com/emblem/index.html
ISBN 10: 0-7710-3579-9
ISBN 13: 978-0771035791

Journal de communication scientifique (JCOM)

http://jcom.sissa.it/archive/

Ce journal en ligne, d'accès libre est centré sur la communication entre les institutions scientifiques et le grand public, et ainsi que la communication entre les scientifiques. JCOM vise à fournir aux universitaires et aux praticiens

Aventuras de la Ciencia Urbana es uno de los blogs de Danielle N. Lee, bióloga y extraordinaria divulgadora científica. Con gran entusiasmo Danielle escribe sobre las diferentes maneras de descubrir y apreciar la naturaleza en entornos urbanos. Ella es especialista en biología evolutiva y logra atraer a públicos diversos. Este blog ha obtenido una gran cantidad de premios por su capacidad para atraer e informar.

La Mala Ciencia

http://www.guardian.co.uk/science/series/badscience
http://www.badscience.net

Ben Goldacre es el autor de una serie de libros, un blog y una columna en el periódico The Guardian, todos ellos bajo el acertado título de La Mala Ciencia. Goldacre, médico y académico, cree que la mala interpretación de los datos que hacen los medios de comunicación y el público en general, se ha convertido en un problema de salud pública. Goldacre explica los fracasos en la comprensión, los fraudes y la mala ciencia en general, con la esperanza de mejorar la comprensión pública de los temas científicos y de la ciencia misma. Se trata de un recurso para provocar la reflexión sobre el poder de la ciencia y la responsabilidad de aquellos implicados en la comunicación del conocimiento científico al público de manera entendible.

Revista de Ciencias de la Comunicación (JCOM)

http://jcom.sissa.it/archive/

Esta revista de libre acceso en línea se centra en la comunicación entre las instituciones científicas y el público y en la comunicación al interior de la comunidad científica. JCOM tiene como objetivo proporcionar a los académicos y profesionales los lineamientos teóricos para comunicar adecuadamente la ciencia al público en general. La libre circulación de información a través de esta revista académica refleja su pasión y dedicación para desarrollar un diálogo sobre las existentes necesidades de comunicación entre la ciencia y los ciudadanos, así como los problemas que pueden surgir cuando una variedad de modelos teóricos y de medios de comunicación son utilizados para divulgar temas científicos.

journal reflects its passion and dedication to develop a dialogue on the needs of communication between science and citizens, and the problems that may arise when theoretical models and a variety of media are used to popularize science.

Using a Blog to Engage the Public in Plant Science
http://growingcuriosity.wordpress.com/dissertation

This recent dissertation is available on the blog, Growing Curiosity: Interesting Things from the World of Science and Technology of dissertation author, Hugh Mackinnon. Mackinnon collaborated with the Royal Botanic Gardens, Edinburgh and the Edinburgh International Science Festival to study the public's understanding of plant science. His blog was originally part of the study itself but has since transitioned into a personal blog covering topics in science and technology. Mackinnon's research for this dissertation evaluated the use of various types of social media in engaging the public in plant science, discusses the importance of public engagement in science and democracy in scientific communication and outlines how to use a blog to engage the public.

des directives théoriques pour communiquer sur la science auprès du grand public. La libre circulation de l'information dans ce journal universitaire montre cette passion et cet attachement à développer un dialogue entre science et citoyens, et les problèmes qui surgissent quand des modèles théoriques et une diversité de médias sont utilisés pour vulgariser la science.

tiliser un blog pour intéresser le public aux sciences du vegetal
http://growingcuriosity.wordpress.com/dissertation

Ce mémoire récent est disponible sur le blog La curiosité qui pousse : choses intéressantes du monde des sciences et technologies, de l'auteur de la dissertation, Hugh Mackinnon. Mackinnon a collaboré avec le Jardin botanique royal d'Edimbourg, Edimbourg et le Festival international de science d'Edimbourg pour étudier les connaissances du public en sciences du végétal. Son blog était à l'origine une partie de l'étude elle-même, mais a évolué pour devenir un blog personnel traitant de sujets en sciences et technologie. Les recherches de Mackinnon pour ce mémoire évaluent l'utilisation de différents médias sociaux pour développer un intérêt du public pour les sciences du végétal, discutent de l'importance d'un intérêt du public pour la science et de la démocratie dans la communication scientifique, et montrent comment utiliser un blog pour attirer le grand public.

El uso de un blog para atraer al público a las ciencias de las plantas
http://growingcuriosity.wordpress.com/dissertation

Esta reciente disertación doctoral está disponible en el blog Curiosidad Creciente: Curiosidades del mundo de la Ciencia y la Tecnología, de Hugh Mackinnon, autor de la mencionada disertación. Mackinnon colaboró con el Real Jardín Botánico de Edimburgo y el Festival Internacional de las Ciencias de Edimburgo para estudiar el entendimiento del público sobre las ciencias de las plantas. Este blog fue originalmente parte del estudio en sí mismo, pero actualmente es más bien un blog personal dedicado a temas de ciencia y tecnología. En su investigación, Mackinnon evaluó el uso de varios tipos de medios sociales de comunicación para atraer al público a las ciencias de las plantas. También analiza la importancia de la participación pública en la ciencia y la democracia en la comunicación científica y describe cómo usar un blog para involucrar al público.

Championing Plants at the Olympics

Join us for this year's Fairchild Challenge/BGCI Global Competition - Plant Champions

This fantastic international competition is linking plants to the London 2012 Olympic and Paralympic Games.

Children are asked to create garlands/wreaths using their national flora, prepare a list of plants and take an image of their wreath. Gardens will submit images of their top entries to BGCI by Monday 23rd April 2012 and the winners of the Global Competition will be announced on BGCI's website and The Fairchild Challenge Global web page in May 2012.

Plans are underway to host an exhibition of the images next year during London 2012.

To find out how you can join in visit

www.bgci.org/education/fair2

BGCI
Plants for the Planet

Botanic Gardens Conservation International

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ISSN 0965-2574

Announcing BGCI's 8th International Congress on Education in Botanic Gardens
Education and the Global Strategy for Plant Conservation

Anunciando el 8º Congreso Internacional de Educación en Jardines Botánicos
Educacion y la Estrategia Global de Conservación Vegetal




Jardín Botánico del Instituto de Biología de la Universidad Nacional Autónoma de México, Ciudad de México, Mexico

IMPORTANT ACCOUNCEMENT – THE DATES OF THE CONGRESS HAVE CHANGED!
12-15 November 2012

This congress is for everyone involved in delivering communication, education and public awareness programmes in botanic gardens. During the congress we will focus on how gardens can address all targets of the GSPC through education. We will also agree on a common set of messages for plant conservation.

Convocamos a todas las personas que desarrollan programas de comunicación, educación y concienciación en jardines botánicos. El congreso se enfocará al análisis de como los jardines botánicos pueden abordar todas las metas de la Estrategia Global de Conservación Vegetal (GSPC) a traves de la educación. Acordarermos también un conjunto común de mensajes para la conservacón vegetal.




Para obtener información acerca de los temas del Congreso y cómo presentar un resumen:
For information about themes and how to submit an abstract visit:

www.bgci.org/education/mexicoform