Turning Visitors into Users: Challenge for Virtual Exhibition on Genetics - 'Reading the book of life'

Jordi Domènech Casal

Òliba Research Group (Universitat Oberta de Catalunya)
Universitat Oberta de Catalunya, Avda. Tibidabo, 39-43, 08035 Barcelona, Spain
E-mail: jdomenechca@uoc.edu

ABSTRACT

In this paper, the construction and main goals of a virtual exhibition on genetics has been described. A first attempt based in html and flash formats is described followed by a first evaluation by the users. The current developed version is based on the Joomla 1.5. The content management system (CMS) includes eight virtual exhibition halls,and interactive resources like news and multimedia. The navigation is improved by the use of metatags and other automated tools of Joomla1.5. Web 2.0 tools are used to increase participation by the users, as well as Wikipedia and Facebook resources, are being set. The virtual exhibition has received 101,977 visitors from several countries in one year. The paradigm for virtual exhibitions has been discussed and the real exhibition can be seen at http://oliba.uoc.edu/adn.

Keywords: Virtual exhibitions, Joomla 1.5, content management system

1. INTRODUCTION

The fast scientific advances have made evident to wide a gap in the current concept of culture: while disciplines such as art, philosophy, and history are considered fundamental parts of the culture, scientific disciplines remain as technical skills instead of cultural elements. This definition of culture collide with reality: the boundary between science and society is very close, and science has important effects in other cultural demonstrations, to such an extent that some of these demonstrations can only be understood through the eyes of science. The discovery of America or Heliocentrism, the discovery of antibiotics and vaccines, the arrival of the man on to moon, the atomic bomb, etc. are technological and scientific milestones that have changed our world and have become cultural archetypes.

This is exceptionally clear in the case of genetics. This branch of knowledge has experienced a development so fast that has put the society in front of ethical questions to which was not still prepared, like transgenics, cloning, or gene therapy. For the public, the sheep 'Dolly' and the structure of the DNA have become cultural archetypes before scientific concepts. The creation of effective strategies of science dissemination and communication of the current research in genetics has become indispensable. The use of virtual exhibitions is a tool that has demonstrated its potential in culture popularisation. In the Òliba Research Group, from 2003 awards onwards, have developed several tools for facilitating the creation of virtual exhibitions through the use of content management systems (CMS), which facilitate the updating and interactiveness of websites[1, 2].

The virtual exhibition about genetics 'Reading the book of life' was initiated as an exploration of the possibilities of virtual exhibitions to present science as cultural element. The initial aim was to generate interest about genetics among the public, to make it more proactive for posterior contacts with news related to genetics published in conventional scientific media. Therefore, the main goal was not to obtain public, but to generate it for other science communication efforts. The project has experienced several technical modifications as new goals were proposed (and viceversa), and the result has been a particular vision of interactive virtual exhibition connected with the present.

2. PORTAL STRUCTURE

The project to create the exhibition started in 2007. The exhibition did not have any associated physical exhibition, and had the goal to generate a draft model to test three main working pathways:

(i) Attractive approach to genetics, using sensationalist headlines to pick up the attention of visitors;

(ii) Division of the subject in several and independent, but interrelated, virtual 'Exhibition Halls';

(iii) Effort to make evident the relationship between genetics and science history and other cultural demonstrations (art, history, cinema, literature, etc.).

This draft model was carried out exclusively in Catalan language and is still available at http://oliba. uoc.edu/adn_old/principal.html. The draft model of the exhibition was constructed using two different web publishing languages, Html and flash, each of them bringing different advantages to the portal. The contents of the portal were constituted by several flash animations, which appeared inside the Html frames, and gave dynamism and interactiveness to the exhibition. Flash animations are downloaded in .swf format, which allows the partial download of the file, while playing (streaming). The html frames facilitated the search engines (Google, Altavista, etc.) to select the portal, due to the insertion of metatags (keywords).

Based on the contents, they were divided into 8 'virtual exhibition halls', each of them dealing with one of the main topics of genetics like (evolution, genetic engineering, cloning, etc.). Each virtual exhibition hall was constituted by a flash file, which showed sequentially several virtual exhibition panels. Each panel dealt with one or more conceptual aspects of the topic, and, in addition, some of them where dedicated to the researchers (science history) or to the relationship between the science and society. In the flash files of each exhibition hall, we inserted several points where the visitor could jump into another exhibition hall, making transversal pathways of visit through the panels of the different exhibition halls dealing with researchers or science and society.

At the entrance to the virtual exhibition the different halls were represented through an image, a title, and a brief sensationalist introductory text, trying to attract the attention of the visitor.

Figure 1 shows the main menu (on the top) allowed to select resources, while at the bottom, the flash file allowed to move forward and backward inside this hall by using cursor buttons pointer 1 of fig.1, or jump from a hall to another in selected points of the visit. Contents were divided in two spaces: at the left, the Hall's introductory text. pointer 2 in fig. 1, At the right, the contents, animations and images appeared sequentially. An internal menu pointer 4 in fig.1,allowed moving directly to a chosen panel of the Hall.

2.1 Model Analysis

In January 2008, the exhibition was available, even though only three out of the eight exhibition halls had been developed which were:

- "Will I develop scales on my skin if I eat transgenic tomatoes?" (about genetic engineering);

- 'The Spell of Tsars' (about genetic heredity); and

- 'The Mysterious elf of Leewenhoek' (about DNA structure)

A very simple diffusion was made by e-mailing some educational centres and students of the Universitat Oberta de Catalunya. Moreover, the diffusion was carried out for a very brief period
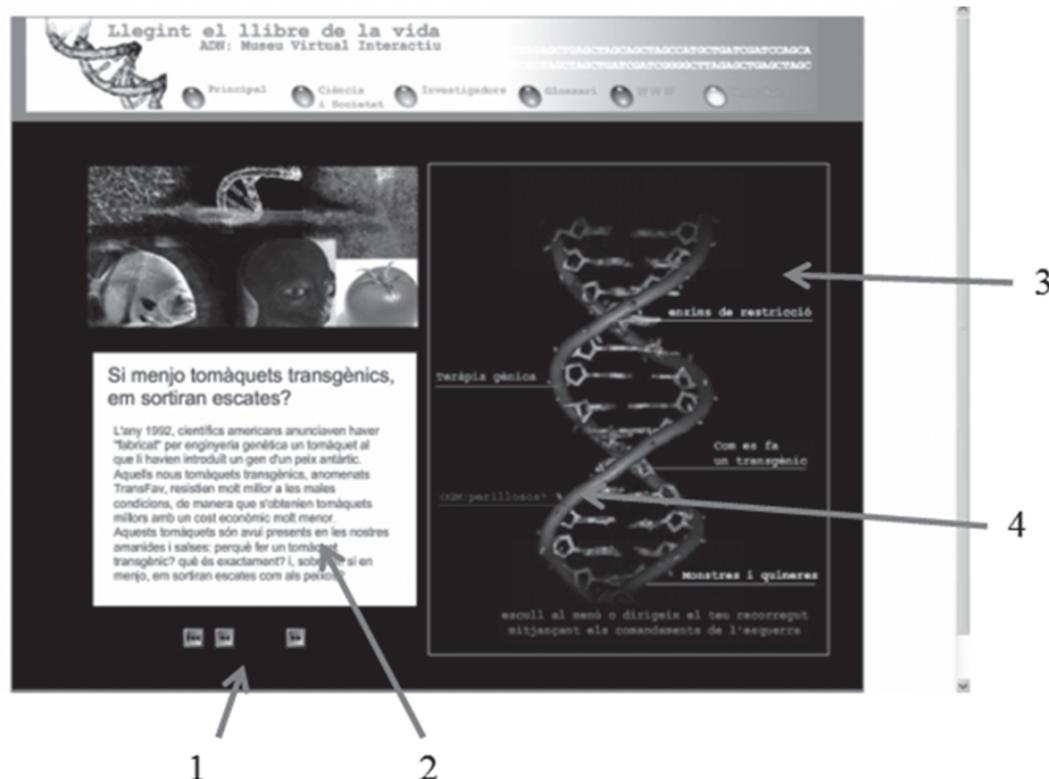

Figure 1. Image of an exhibition hall from the first version of the virtual exhibition.

of 15 days, during the Christmas holidays, which hampers the visits, since in all virtual projects it was detected that the number of virtual visitors decreases during the holidays[3]. However, the portal registered more than 400 visitors during the 15 days of the study. A study of the accesses was made and 60 visitors filled in a poll about the virtual exhibition. Regarding the accesses, the independent html frames for each exhibition hall allowed detecting visits for every hall navigated. Besides the three disposable exhibition halls, many visitors tried to access to the exhibition halls which were non available by that time, especially those pertaining to evolution and mutation. Visitors made more transversal pathways selecting panels belonging to different exhibition halls than itineraries following the sequence inside the exhibition halls, which indicates that proposing transversal pathways is a successful strategy.

The results of the poll showed that 98 % of the visitors felt that the portal was interesting, even though only 75 % approved the interactiveness and its value as a source of information. More than 95 % agreed the contents were of high quality, and considered them as good educational resources, and useful for improving the understanding of the concepts of genetics.

The level of interest and knowledge about the genetics was worked out before and after visiting the website. Both parameters improved qualitatively, since the percentage of individuals who had high interest for genetics became almost double after having visited the portal and the same happened with the level of knowledge of genetics. This is important, since the virtual exhibition pursued, mainly, to increase the interest of the public in the field of genetics. The visitors proposed to add an internal search engine, translate the portal into other languages, and somehow link the contents to the current research in the field. Regarding technical aspects, the visitors suggested that it is necessary to improve the colours and the resolution of the text, and the operation of some buttons.

2.2 Current CMS Exhibition: Interactiveness

With the experience and evaluation obtained in the previous phase, and thanks to the funding obtained from the FECYT (Fundación Española Para la Ciencia y la Tecnología), the virtual exhibition has been improved and consolidated.

The former version had demonstrated that the three working lines of 'Reading the book of life' were a good strategy for science divulgation, but it was necessary to improve its interactiveness. This led us to tackle changes in the aims and in the technical aspects of the virtual exhibition. The new version of the virtual exhibition has been available since January 2009 till date at http://oliba.uoc.edu/adn.

As a platform for this new version of the virtual exhibition, the platform decided to use the CMS is Joomla1.5!. The CMS is platform for website publication which allows working independently with the contents and their presentation, thanks to a database. This facilitates the same contents to be presented in several ways, even depending on the user, and interrelate themselves much more easily. Moreover, the application has elements allowing the generation of contents by the users. Therefore, CMS is often being used as a platform for virtual exhibitions[4].

2.3 Current CMS Exhibition: Interrelation and Plasticity of Contents

Regarding the contents structure, it has been decided to keep the structure in 8 exhibition halls. The content of the three exhibition halls performed in the previous version has been introduced in the Joomla1.5! platform, and the remaining five exhibition halls have been displayed:

The current virtual exhibition hence has the following eight exhibition halls:

(a) "Will I develop scales on my skin if I eat transgenic tomatoes? " (Genetic engineering),

(b) 'The Spell of Tsars' (Genetic heredity),

(c) 'The Mysterious elf of Leewenhoek' (DNA structure),

(d) The mark of Hiroshima horror (for mutation),

(e) Lucy's long journey (Phylogeny and forensic genetics),

(f) The attack of the clones (Cloning and stem cells),

(g) "If I study a lot, will I have cleverer children? "(Evolution), and

(h) What does ATGGTATTCCACTATGGTC mean?" (Genome project and genetic code)

Moreover, the two selections of transversal contents of researchers and science and society are still offered. The navigation in the virtual exhibition is facilitated by a horizontal main menu, with three main sections:

• Home (information about the virtual exhibition);

• Resources (offering several multimedia elements that, not being a part of the virtual exhibition, serve as support to the contents);

• Exhibition halls (access to the eight exhibition halls and the two additional transversal selections).

Moreover, at the portal entrance, the Main hall show (Fig. 2) an animated panel wtih the title of each exhibition hall, together with a related image and a brief text describing its content. This animated panel aims to generate interest and allows the visitor to select directly the exhibition hall of his interest.

Figure 2. Screenshot of the main hall.

As the former version, each exhibition hall has several panels, which present sequentially explanations, images and animations that develop the topic. Some of the panels of each exhibition halls make reference to the researchers, and some to the relationships between science and society, always related to the topic of this exhibition hall.

Each panel finishes with a suggesting phrase or a question inviting the visitor to follow to the next panel to keep the interest of the visitors. At the bottom of each panel, arrow buttons allow to go forward and backward through the hall along its panels.

At the top, the Main Menu allows selecting a topic. At the body, an animated content-manager shows texts and images presenting the content of each exhibition hall.

In some panels, fash animations are offered. These animations can be initiated, paused, and reloaded by the visitor. At the left of each panel, a Guide-Menu of the exhibition hall allows the user to select directly the panel of his interest, instead of following the panels in a sequence.

Joomla1.5 allows each panel to be identified at the data base as an independent article. It allows each panel being available as a part of an ordered sequence of panels (as is presented in each exhibition hall), but also grouped by other criteria.

One of these criteria is the addition of 'metatags', or keywords, which are not visible by the user. These 'metatags' are used to describe to the Joomla1.5 programme the content of each panel. With the module 'Related articles', when we visualise a panel, Joomla1.5 search automatically other panels sharing with the visualised panel one or more metatags. The resulting panels are listed as a Menu as 'Related Articles' at the right of the visualised panel, so the user have also the choice to make his own personalised transversal pathway through the virtual exhibition by following these related articles selection.

At the middle, the panel with text, images and animations. At the left, two menus: the top is the menu of the exhibition hall (where a list of the panels of this hall is shown), tand the bottom is the ADNews menu (showing the last news on the current

research on the topic described in this exhibition hall). At the right the menu 'Related Articles' allows the user to configure its own pathway through the exhibition, presenting the panels related to the current by metatags.

The contents of the 8 exhibition halls were initially available only in Spanish. Thanks to a funding from the AGAUR (Agència de Gestió d'Ajuts Universitaris i de Recerca-Generalitat de Catalunya), and with effect from December of 2009, the translation in Catalan has been offered.

The Joomla1.5 allows us the effective management of the translations from the different elements of the contents through the module Joomfish. At the right of the horizontal Main Menu, icons allowing change from spanish to catalan at any moment are shown. Given that the linguistic politics on the subject of education in Catalonia favours the use of Catalan at school, which will show an increase in the use of the virtual exhibition as an educational resource.

2.4. Current CMS Exhibition: Multimedia Resources

The digital support of the virtual exhibition 'Reading the book of the life' allows us to incorporate several resources in the form of videos, PDF documents, educational materials, interviews, and animations. These contents have been incorporated, and are available at the Main Menu as resources. These contents are also related with the rest of contents through metatags, so that when the user visualises a determinate Panel, the resources related with the visualised Panel appear in the menu at the right of the panel, together with the related panels. This allows to access of the contents (panels, videos, animations, interviews) in a transversal way, independent of the type of contents. The tool Wikiboot, in Joomla1.5! allows to make automated searches in Wikipedia in a simple way, and that some terms come off automatically linked to the definitions of Wikipedia. These terms appear in red in the virtual exhibition, and the definition can be obtained by clicking on them. Even though initially the virtual exhibition had a Glossary, Wikiboot favours the topicality and connectivity of the contents.

2.5 Current CMS Exhibition : Generating Public, Communicators, Towards Web 2.0

One of the most important challenges of the scientific divulgation in the present is to serve as a tool for the communication of current scientific research. It is of no use to popularise the concept of the gene if it does not communicate the last advances in genetics. Scientific dissemination should direct the public towards the communication of the scientific present.

This, together with the technical possibilities of the Joomla1.5! has allowed us to consider a

new goal: Constituting the virtual exhibition as a meeting place for researchers, public, students, teachers and the science communicators, so that the contents of the virtual exhibition would not be static, but only the axes for helping the visitors to construct the virtual exhibition.

This implies a change of role for the visitor, who would transform from visitor to user, while the virtual exhibition would become simply a pole attracting these users, and giving them an adequate environment.

The public accesses by the exhibition halls, from where additional contents of different sections are proposed; ADNews (current research on genetics), Resources (interviews, videos, animation, etc.) and Virtual Laboratories (Pedagogic resources). The virtual exhibition intends eventually, these additional contents to be generated and to be updated by different types of users. This outline works in parallel and independently for each of the eight exhibition halls (Fig. 3).
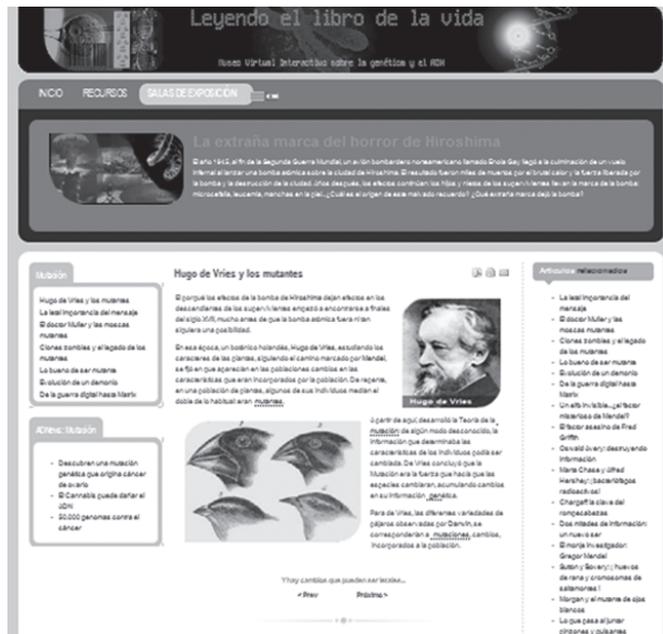

Figure 3. Screenshot of a panel of an exhibition.

How to achieve this aim? Joomla1.5! allows the creation of user accounts, so that the users can improve and add contents.

To workout these possibilities, areas of participation for the users are being develop. These areas are accessible at the horizontal main develops menu, under the name of Resources.

2.5.1. ADNews

In this section brief news of current research on genetics is presented. Even though these news are already published in other portals, in 'Reading the book of the - these news are catalogued according to different categories that correspond with the topics of the eight exhibition halls. Through the automated menus of the Joomla1.5! the users of

the exhibition halls can see in a lateral menu at the left of the visualised panel a list of the latest news on genetics research in the topics related to the exhibition hall they are visiting (Fig. 4). These news can also be visited directly from the ADNews section, and, when a news is visualised, the virtual exhibition propose to the user to visit the exhibition hall related to this news.
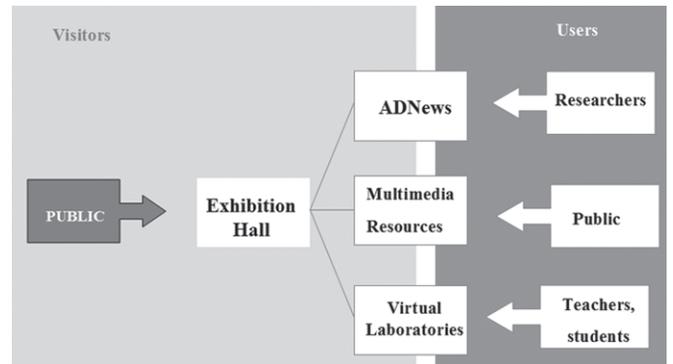

Figure 4. Outline of proposed user's participation in the virtual exhibition.

Therefore, synergic dynamics among the different content has been generated at present, the news of the ADNews section are being introduced to make the researchers and research in ADNews

Researchers might publish directly their news, without being concerned about explaining the basic concepts, which would be automatically offered by the virtual exhibition together with the news.

To achieve this, the work is in progress so that the virtual exhibition allows the creation of contents by the users and allows them to catalogue the contents in one of the eight topics corresponding to the eight exhibition halls. The first contact with Spanish Research Centres (Department of Genetics of the Universitat de Barcelona, Parc de Recerca Biomèdica de Barcelona, etc.) showed interest in these centres in an option of scientific communication of this type, even though they do not seem disposed to make a great effort in this sense.

2.5.2 Virtual Laboratories

Virtual environments can be a powerful strategy to improve teaching processes[5]. An important part of the visitors in the virtual exhibition are students and their teachers. As in the 'Physical Exhibitions', one of the roles of the virtual exhibition is to be a pedagogic resource. To facilitate the use of the virtual exhibition in this sense, a new section has been established, named Virtual Laboratories, where the teachers will be able to find activities for learning and evaluation for the visits of their students to the virtual exhibition and allso enable them to create contents.

'Associations of Teachers and Pedagogues' have been contacted to propose them to participate,

though with scarce response till now. May be because it is difficult to imagine the final result and the advantages of this initiative.

Both ADNews and Virtual Laboratories are at the present being constructed and maintained by the Oliba Research Group. When they'll be completely functional, a new diffusion campaign will be undertaken to get users who would, eventually, participate in the creation of contents.

2.6 Current CMS Exhibition: Diffusion of the Virtual Exhibition

Upto now, the virtual exhibition has been published in the website of Òliba and have sent press releases to some local media, and made an e-mailing campaign for the diffusion in distribution lists related to science divulgation. The press releases have appeared at the portal of the Universitat Oberta de Catalunya (http://www.uoc.edu) and at the local newspaper El Punt (http://www.elpunt.cat/).

Additionally, the press notes to local associations and institutions related to Scientific Divulgation, like the ACCC (Catalan Association of Scientific Communication, http://www.acccnet.net/) were sent. Moreover, the virtual exhibition was selected to be presented to a Congress on Scientific Divulgation 'Ciencia in Acción' celebrated in Granada in September 2009, where it was selected as a finalist. The jury and the assistants to the Congress (including participants of Spain, Portugal and South America) highlighted that the virtual exhibition is attractive and easily-used, besides its scientific rigor. The virtual exhibition has also been included in a collection of educational materials created by the organisers of the Congress.

Moreover, we have also undertaken action to promote the virtual exhibition through Wikipedia and Facebook. Wikipedia is a Virtual Encyclopaedia carried out by the users. Definition of each term usually includes a section to add external links inside encyclopaedia. To make diffusion of the virtual exhibition, during April 2009, in the definitions of several terms related to the virtual exhibition (like 'Cloning', 'Transgenic', 'Mutation' ...) we have added the related exhibition hall as an external link in the Spanish Wikipedia. Even though the moderators of Wikipedia vetoed these links at the beginning, for considering them spam, after some explanations and realising the quality of the contents they accepted to include these links, with the condition that each link should refer to the concrete part of the virtual exhibition that referred to the defined term, and that the link should be put in the last position in the external links list. At present, the links remain active in the corresponding articles of Wikipedia and many hits to the virtual exhibition came from these links. Moreover, through the study of the accesses to the portal, we have detected that the virtual exhibition

is added as a link in terms others than those we have worked with ('Biogenetics', 'Recombinant DNA Technology'...). This indicates that visitors of the virtual exhibition already act as users, by adding links to the virtual exhibition in Wikipedia. This suggests that the structure of participation that we propose for ADNews, Multimedia Resources and Virtual Laboratories sections might work perfectly once the elements for creation are completed with participation of users.

At present, the terms in Catalan are not introduced to the Catalan Wikipedia, but will be done soon. As Wikipedia has showed to be a good way to make diffusion of the virtual exhibition, with each new language of the portal we will also add the links to the definitions in the respective Wikipedia.

The virtual exhibition has also a blog in its Home menu where the news about the exhibition was publicised, but, as it is publicised inside the virtual exhibition, it is not useful to make diffusion of the exhibition. As a solution, we are constructing an account in Facebook. Facebook is a tool of social connection that allows us to keep updated the information about an individual or entity. Many entities and serious institutions have adopted Facebook as a measure to improve the contact with their customers. The virtual exhibition Facebook account will at the beginning show only images and links to the Virtual Exhibition links, and we are trying to connect it to the Facebook accounts of other Science Divulgation, Research and educative institutions.

The initiatives like Facebook and Wikipedia have the advantage of being sustained, and once set, its capacity of diffusion can surely increase with the time.

2.7 Current CMS Exhibition: Visitors to 'Reading the Book of Life'

The visits to the Virtual Exhibition have been monitored using two counters (Webaliser and AWStats) including information about the origin and duration of the visits, and about the search words and the links coming from external places. Data since January 2009 up to now has been analysed.

Regarding the number of visitors, during 2009 the vrtual exhibition has received a total of 101.977 visitors, corresponding to an average of 284 visitors per day. This average has experienced oscillations that have reached its maximum in October 2009, when it achieved 470 visits per day.

At all times, the number of visits has been nearly three times the number of visitors, which indicates that the visitors visit the page again several times. However, cybermetric data indicates that a very high percentage (about 70 % of the visitors) remain less than 2 minutes at the portal. This indicates that the main Hall page and the access

to the contents should be improved to keep the attention of the visitor. Even though an important increase was expected by the addition of links at Wikipedia (April 2009), no significant increase is produced until August. This increase is still more surprising when taking into account that during holidays a general decrease in the traffic is usually observed (Fig. 5).
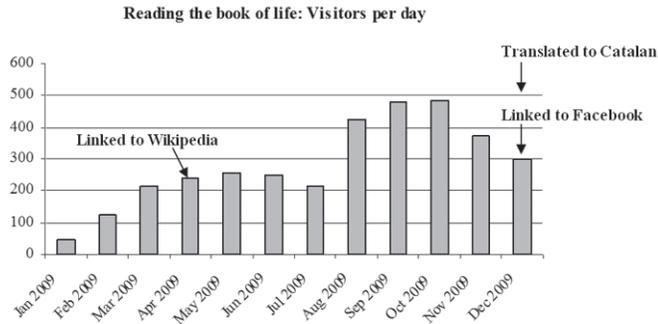
Figure 5. Visitors ranking for the virtual exhibition 'Reading the book of life'. During April and December 2009, contents were linked through Facebook and Wikipedia.

We estimate that after the diffusion of the Catalan version of the portal and the introduction of news started to work in the section ADNews, the visitors might stabilise at 500 visitors per day. Our project to translate the virtual exhibition to English should increase this rate substantially.

The search words used by the visitors to find the virtual exhibition make mostly reference to researchers, basic concepts of genetics, and multimedia resources. Other semantic fields or resources, like the relationship between science and society, and the interviews are not so much used as search words to arrive to the portal. Most of the searches contain terms or expressions that indicate profile of a student. This indicates that the creation of the virtual laboratories can increase and make the visits to the portal more fruitful.

Besides the pages of Wikipedia, the portal has been connected from several external web pages, like the pages of educational institutions of different regions of Spain (A Coruña, Barcelona, etc.) and Southern America. However, the number of links is relatively small, possibly because in these areas education vehicular language is Catalan, and not Spanish. Several pages related with science divulgation and scientific communication publish the link and even make a brief abstract about it (MedCiències, Icientificats, Scicom, School of Biologists of Catalonia, Global Talent, etc.).

The data present only slight variations between the different months of the year. Data showed correspond to September 2009.

Because of the Spanish language of the virtual exhibition, as expected, most of the visitors come from countries such as United States, Spain, and

Southern America. The rate of visits from United States is overestimated, since many users placed in other countries connect through servers placed in this country. In any case, the visits from Spain are still higher than those from Southern America, this suggesting that a compaign of diffusion directed to Southern America. In Southern America (data not shown) Mexico and Argentina make more visits to the virtual exhibition.

As a general appraisal, taking in account that the virtual exhibition does not have a corresponding physical museum, the rate of visits and interest of the users is high. As mentioned, the new challenges of the virtual exhibition are focused mainly in increasing the interactiveness and facilitate the participation of the users through the creation of users in the virtual exhibition. As soon as this new model for the virtual exhibition is applied, it will be necessary to make a new campaign of diffusion, possibly at the same time as the virtual exhibition is translated to English (Fig. 6).
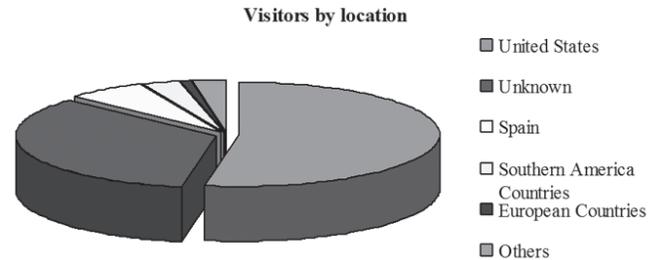
Figure 6. Geographical distribution of the visitors.

2.8 Reversing the Paradigm, Back from Virtual to Physic: A Physic Exhibition of Reading the Book of Life?

The goals of virtual exhibitions have experienced a very fast evolution. At first, static supports were constructed as a promotion of an exhibition placed in a museum (which in difference in the virtual ones, is named physical exhibitions). Later on, they started to offer additional contents that were difficult to offer in the physical exhibition[6]. At present, the goal of virtual exhibitions is both, to attract visitors to the physical exhibition and to complement its content. Therefore, the paradigm establishes that: the physical exhibition is set firstly, and the corresponding virtual exhibition (if this exists) is usually a derivative product from the physical exhibition, which complements it, often with materials that the physical exhibition cannot offer (music, videos, PDF documents, interactive maps, forums, etc.).

The idiosyncrasy of the virtual exhibition presented here (which does not have its corresponding physic exhibition) creates an interesting situation, since it opens a new way for the virtual exhibitions: would it be feasible to use the contents and the information of the users to generate a physical exhibition from

this virtual exhibition? Can we use the virtual exhibitions as a first approach to test possible physical exhibitions? This new perspective about the virtual exhibitions would allow to an exhibition to test the interest or opportunity of an exhibition before carrying it out, with the consequent saving. According to this system, when a virtual exhibition had success, a physical exhibition with materials and/or elements that the virtual exhibition could not offer might be generated a posteriori (touch, taste, space 3D, laboratory experiments in situ, etc.).

This would generate a new paradigm for the virtual exhibitions: the virtual exhibition is set firstly, and the corresponding physical exhibition (if it exists) is usually a derivative product from the virtual exhibition, which complements it, often with materials that the virtual exhibition cannot offer.

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