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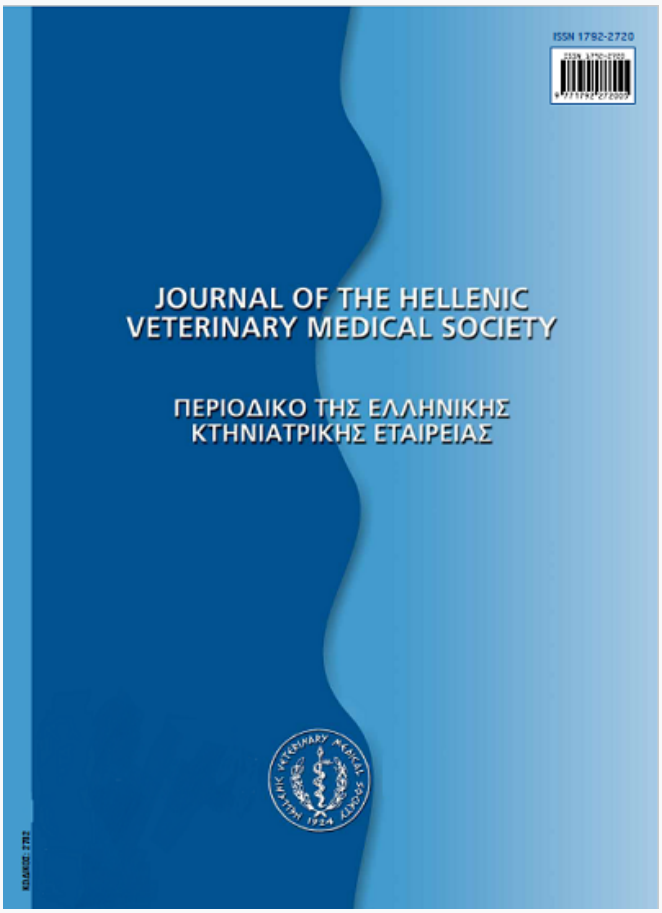

Open Access: When knowledge unifies nations...

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ΠΕΡΙΟΔΙΚΟ ΤΗΣ ΕΛΛΗΝΙΚΗΣ ΚΤΗΝΙΑΤΡΙΚΗΣ ΕΤΑΙΡΕΙΑΣ 2010, 61(3): 226-235

Special article
Ειδικό άρθρο

Open Access: When knowledge unifies nations...

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Ανοιχτή Πρόσβαση: Όταν η γνώση ενώνει τα έθνη...

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ABSTRACT. The World Wide Web disseminates scientific knowledge. The possibility of searching and retrieving simultaneously scientific publications tends to promote research and ensures originality. The traditional publishing model restricted research to published subscription-based journals, thus providing scientific information only to financially sound communities. In response to this, the Open Access movement was created, which is an economical way of diffusion and management of scientific information. As a result, scientific information is now available to all for free spreading research activity worldwide, while encouraging communication and interoperability in areas of diverse research interests. This article discusses the phenomenon of open access. Also, open access journals and repositories are referred as well as modern ways of disseminating research to the public.

Keywords: open access, open access journals, repositories, veterinary sciences

ΠΕΡΙΛΗΨΗ. Ο Παγκόσμιος Ιστός συμβάλλει στη διάδοση της επιστημονικής γνώσης. Η δυνατότητα ταχύτατης αναζήτησης και ανάκτησης επιστημονικών δημοσιεύσεων συντείνει στην προαγωγή της έρευνας και διασφαλίζει τη δυνατότητα πρωτοτυπίας. Το παραδοσιακό μοντέλο δημοσίευσης περιόριζε την έρευνα στις δημοσιεύσεις συνδρομητικών περιοδικών, με αποτέλεσμα η επιστημονική πληροφορία να καταλήγει μόνο στους οικονομικά εύρωστους. Ως αντίδραση στα παραπάνω, δημιουργήθηκε το κίνημα της Ανοιχτής Πρόσβασης, το οποίο αποτελεί έναν οικονομικό τρόπο διάχυσης και διαχείρισης της επιστημονικής πληροφορίας, που διατίθενται πλέον ελεύθερα, με αποτέλεσμα η ερευνητική δραστηριότητα να διαδίδεται παγκοσμίως και παράλληλα να ενθαρρύνεται η επικοινωνία και η διαλειτουργικότητα σε τομείς ποικίλου ερευνητικού ενδιαφέροντος. Στο παρόν άρθρο αναλύεται το φαινόμενο της Ανοιχτής Πρόσβασης. Παράλληλα αναφέρονται περιοδικά και αποθετήρια ανοιχτής πρόσβασης που αφορούν στις κτηνιατρικές επιστήμες, καθώς και οι σύγχρονοι τρόποι διάδοσης της επιστημονικής πληροφορίας στο ευρύ κοινό.

Λέξεις ευρετηρίασης: ανοιχτή πρόσβαση, ανοιχτής πρόσβασης περιοδικά, αποθετήρια, κτηνιατρικές επιστήμες

According to Thomas Huxley,

"The great tragedy of science is the slaying of a beautiful hypothesis by an ugly fact".

Before the advent of the Internet, research was limited to experiments and observations published mostly in books or journals. Announcements were usually limited to laboratory level and their results came out as a publication which, due to the long time between submission and final acceptance, proved to be time-consuming and obsolete by new data.

The Internet brought revolution to electronic publishing, as it contributed to the rapid dissemination of research, but it, also, created new problems. Again,

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the editors imposed technological and legal barriers wanting to protect their rights towards digital technology that allows the distribution of copies at almost no cost. The technological obstacles include software that prevents or eliminates access to unauthorized users, often supported by hardware. As a result, libraries have limited access to journals for which they have already paid a huge amount of money.

Furthermore, the gap between the Information Rich and the Information Poor has increasingly created social inequalities (Doctor 1994).

In developing countries, access to scientific information is vital when dealing with problems, such as hunger, diseases and inadequate water. Implementing science and technology plays a key role in resolving them.

According to Global Forum for Health Research (2009), only 10% of global medical research goes to developing countries. The institutes and researchers have limited or no access to previous scientific results of advanced countries, mainly because they cannot afford the high cost of printed journals, and the delivery mechanisms are poor and of non-advanced quality, thus preventing access to electronic records (Arunachalam 2003).

In attempting to resolve the problems mentioned above, the model of open access was created. Its main characteristics are two: the material is free to all and the authors retain the right to disseminate their work if they do not aim at commercial exploitation.

What is Open Access and what it includes

The Budapest Open Access Initiative defines Open Access as the "free availability of material on the public internet, permitting any users to read, download, copy, distribute, print, search or link to the full texts of these articles, crawl them for indexing, pass them as data to software or use them for any other lawful purpose, without financial, legal or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution and the only role for copyright in this domain should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited".

Open Access includes research from peer-reviewed articles, conference proceedings, technical reports, theses and reports. The data are used freely, mainly for research and teaching.

Usually there are no licensing restrictions to the readers. Authors retain copyright of their work and give it freely to the scientific community provided that their names are attributed every time the user refers to their work.

Implementing Open Access

Open Access is implemented in two ways: either by open access journals or by open access repositories, where the authors reserve the right to freely upload their published articles in Institutional Repositories or in Open Archives (Frangou 2006).

Cost of Open Access

Although Open Access provides users with free supply of material, the publishing costs shoulder the publishers. Of course, the production cost is much lower for electronic material than that of printed material, as reproduction and distribution costs remain at the circulation of the first copy. However, new factors have appeared, such as staff salaries, software and preservation of digital information.

Financial criteria depend on the dissemination of the material, that is whether it is deposited in open access journals or open access archives. In Open Access Journals, cost consists of software, hardware, peer-review and final preparation of the submitted article. Peer-review cost, although important, is often eliminated, as reviewers work on a voluntary basis. In Open Access Archives, where the author retains the responsibility for the quality and the deposit of his work, the cost is limited only to hardware, since the software is an open source and free.

The volatile nature of Open Access allows any kind of material to be added. In Open Access Journals, there are cases where the text is freely available and adds-on (usually charts or pictures), if considered commercially exploitable, are charged to users.

The awareness of the information cost favours cooperation between open access supporters and publishers, in order to create a new model of electronic publishing.

Nowadays, more and more publishers allow authors to maintain the right to self-archive their publications to repositories, regardless of whether they, also, appear at a commercial journal or not.

Quality and Peer-review

Opponents of open access argue that publishing in Open Access Journals and Repositories lacks in credibility. They believe that, since any paper is available on the web, there is no quality control of the publication. However, the term "Open" does not refer to the lack of evaluation, but simply to the free availability of research.

Traditional subscribed-based journals publish works that have been previously peered by well-known -to the research community- reviewers. Thereby, along with scientific knowledge, the author's validity is ensured even more, as reviewers reject articles that contain inaccuracies and erroneous results. Traditional peer review serves two purposes: it gives feedback to the authors, helping them to improve their manuscript, and it controls the quality of published articles.

Reviewers in Open Access Journals mainly work on a voluntary basis and, in most cases, their review is signed. For instance, the open access journal "The Electronic Transactions on Artificial Intelligence (ETAI)" introduces a new system of peer review, which is even stricter on the authors. In that journal, as long as one's article is submitted for consideration by the journal, it is automatically available on the Internet. Then, for a trial period of three months, the author is subjected to any kind of open comments derived by the scientific community. He is obliged to answer, fortifying his research, and, after the discussion period, he has the chance to revise the article. The final pass-fail decision is made by two other reviewers and, finally, it is decided whether the article will be published or not.

Impact factor

Impact factor is a widely known term for the scientific community. It is introduced by Thomson Scientific and its indices change annually. The impact factor, often abbreviated IF, is a measure reflecting the average number of citations to articles published in science and social science journals. It is frequently used as a proxy for the relative importance of a journal within its field, with journals with higher impact factors deeming to be more important than those with lower ones (Wikipedia 2010).

Researchers tend to submit their articles in journals with greater IF, since they help them to be promoted to a higher scientific level (Panayiotopoulou 2006).

Since 2004, a variety of Open Access Journals have been added to the ISI Citation Database. Many times, they compete the relevant subscribed ones with regard to IF. For instance, the "Journal of Reproductions and Development" by the Japanese Society of Animal Reproduction has an IF 1.609, while Elsevier's "The veterinary journal" has 1.802.

However, the impact of a researcher's work cannot be measured only by citations produced by a profit organization which mentions only certain journals and excludes sources, such as conferences, book chapters and multimedia. According to studies, users tend to cite more frequently open access journals because of their free access and quicker publication time.

Open Access in Repositories

Repositories are online loci for collecting, preserving and disseminating - in digital form- the intellectual output of research fields or institutes (Wikipedia 2010). Information can be immediateley identified through search engines (Google Scholar, Scirus) and harvesting mechanisms (OAIster).

Repositories function supplementary to publishing houses. Combined with open access journals, they provide an objective peer review method broader than that of the Science Citation Index or IF, imposed by commercial publishers. Therefore, access can no longer be prevented.

At the same time, they encourage the creation of various forms of expression regardless of digital format, language or scientific field, thus spreading information internationally and evolving cooperation and exchange of knowledge.

Open Access in Veterinary Science

Veterinary repositories

The first Open Access Repository was created in 1991 by the Los Alamos Laboratory National Security Center in the USA and included papers which referred to computers and mathematics. The initiative was embraced by the scientific community and soon physics, biology and statistics were added.

A similar approach, specifically referring to Veterinary Science, is the Ivy Academic Search

Table 1. Repositories on Agriculture and Veterinary Science

Name	Country	Institute	Content	Language
AgEcon Search	USA	Waite Library, Dept. of Applied Economics, University of Minnesota	Articles, conferences, unpublished, special	English
AHKRC Digital Library	Pakistan	Institute of Rural Management	Articles, unpublished, learning objects, multimedia, special	English
Animal Physiology and Livestock Systems Archive	France	INRA	Articles	English, French
National Chaiyi University Institutional Repository	Taiwan	National Chaiyi University	Unpublished	Chinese, English
Bioversity International Publications	Italy	Biodiversity International	References, conferences, unpublished, books, special	English
Centro Virtual de Informacion CVI IICA oficina en Colombia	Colombia	Instituto Interamericano de Cooperacion para la Agricultura IICA oficina en Colombia	Unpublished	Spanish
Digital Treasures Repository: Central/Western Massachusetts Resource Sharing Project (C/WMARS)	U.S.A.	Central/ Western Massachusetts Automated Resource Sharing	Multimedia	English
DSpace at Madan Puraskar Pustakalaya	Nepal	Madan Puraskar Pustakalaya	Special	Nepali, English
DSpace at The University of Washington	U.S.A.	University of Washington Libraries	Articles, theses, unpublished, multimedia, special	English
Dspace Avignon at INRA Avignon	France	INRA Centre de Recherche PACA	Conferences, theses, unpublished, learning Objects, multimedia	French
Ecological Restoration Institute - Northern Arizona University	U.S.A.	Northern Arizona University	Articles, conferences, theses, unpublished, books, multimedia	English
Electronic Environmental Resources Library (eERL)	U.S.A.	Advanced Technology Environmental Education Center	References, conferences, unpublished, learning objects	English
Eprints@IARI	India	Indian Agricultural Research Institute	Articles, conferences, theses, unpublished	English
Epsilon Dissertations and Graduate Theses Archive	Sweden	Sveriges Lantbruksuniversitet	Theses	English, Swedish
Epsilon Open Archive	Sweden	Sveriges Lantbruksuniversitet (SLU)	Theses, unpublished	English, Swedish
Epsilon Undergraduate Theses Archive (Epsilon)	Sweden	SLU Libraries (Swedish University of Agricultural Sciences Libraries), Sveriges Lantbruksuniversitet (SLU)	Theses	English, Swedish
FAOBIB	Italy	UN.FAO	Articles, conferences, unpublished, books, multimedia	English, Arabic, French, Spanish
Foodbase	U.K.	Food Standards Agency	Unpublished	English
IFPRI Publications	U.S.A.	International Food Policy Research Institute	References, unpublished, books, datasets, learning objects, special	English

Table 1. Repositories on Agriculture and Veterinary Science

Name	Country	Institute	Content	Language
KARI e-repository	Kenya	Kenya Agricultural Research Institute	References, conferences	English, French
Mahider	Kenya	International Livestock Research Institute	Articles, theses, unpublished, books, learning objects, multimedia, special	
Nano Archive	U.K.	ICPC-Nanonet, Institute of Nanotechnology	Articles	English
National Agricultural Library Digital Repository	U.S.A.	United Sates Department of Agriculture, National Agricultural Library	Articles, books	English
Open Access Agricultural Research Repository (OpenAgri)	India	Indian Institute of Technology Kanpur	Articles, conferences, books	English
Open Marine Archive	Belgium	Vlaams Instituut voor de Zee	Articles, conferences, unpublished	English, German
OpenFields	U.K.	National Rural Knowledge Exchange	Articles, unpublished, learning objects	English
Organic Eprints	Denmark	Forskningscenter for Økologisk Jordbrug	Articles, references, conferences, unpublished, books	English, German
ProdINRA	France	INRA	Articles, references, conferences, theses, unpublished, books	English, French
Queensland DPI&F eResearch Archive (eRA)	Australia	Department of Primary Industries and Fisheries	Articles, references	English
Queensland University of Technology ePrints Archive	Australia	Queensland University of Technology	Articles, conferences, theses, unpublished	English
Repositório do Instituto Politécnico de Castelo Branco	Portugal	Instituto Politécnico de Castelo Branco	Articles, conferences, theses, unpublished, books, special	Portuguese
Repositório Eletrônico - Departamento de Ciências Agrárias	Portugal	Departamento de Ciências Agrárias, UNITAU (Universidade de Taubaté)	Articles	Portuguese
Search4Dev	Netherlands	Library of the University of Amsterdam, Royal Tropical Institute	Articles, unpublished, books, special	English, Dutch
Tierärztliche Hochschule Hannover	Germany	Hochschulebibliothek, Stiftung Tierärztliche Hochschule Hannover	Theses	German
United Nations Digital Library Islamabad	U.S.A.	United Nations	Unpublished	English
UPSpace at the University of Pretoria	South Africa	University of Pretoria - Department of Library Services, University of Pretoria	Articles, conferences, theses, datasets, multimedia	English
Wageningen Yield	Netherlands	Wageningen UR Library, Wageningen University and Research Centre	Articles, references, theses, patents	English

Veterinary and Medicine by the Utrecht University[1]. It consists of 10 Repositories including PubMed, the University of Zurich and others.

According to the OpenDOAR[2] catalogue, there are 37 officially registered repositories in Agriculture, Food and Veterinary Science (Table 1).

The University of Wisconsin has created remarkable digital collections. For instance, the collection "Veterinary anatomical illustrations" contains illustrations of the integumentary and musculoskeletal systems of the horse, cow, dog, lion, goat and deer, taken from the classic works of the German veterinary anatomists, Wilhelm Ellenberger and Hermann Baum, and the medical illustrator, Hermann Dittrich (Figure 1). These were published between 1898 and 1925. Apart from their cultural value, they are still considered to be highly useful to scientists dealing with modern comparative veterinary anatomy, since some specific anatomical structures across these species are very similar to the contemporary ones.

In order to be included in DOAJ, a journal must meet certain conditions: it must, of course, be available electronically, have scientific content, ISSN, peer reviewed articles and provide a list of the basic metadata (such as article title, author). There is no restriction on language (Figure 2).

Veterinary Science is part of the broader category "Agriculture and Food Science". Currently only 16 out of the 75 included journals have impact factor[4] (Table 2).

Analyzing DOAJ statistics worldwide, it seems that new journals are added annually, thus revealing how important the release of scientific results has proven to be to the wider community.

Of the 107 countries of the catalogue, the U.S.A. come first, as it is expected. In 2002, there were 20 open access journals, while, by the time of writing, they have reached 1.073. Greece stands at the 33rd place having 25 open access journals covering areas such as medicine, tourism, technology and statistics.

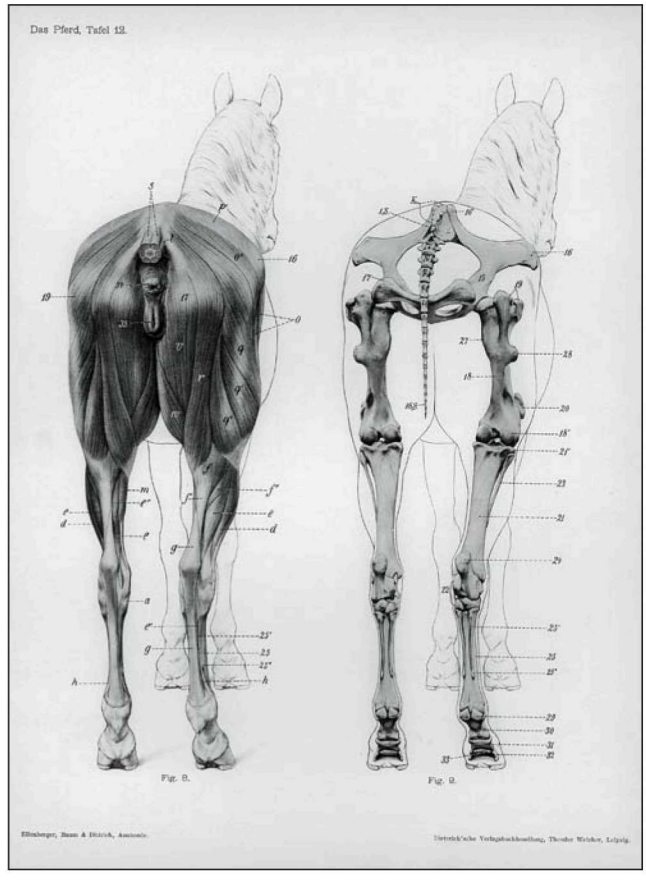

Figure 1. Illustration taken from the collection "Veterinary anatomical illustrations"[3].

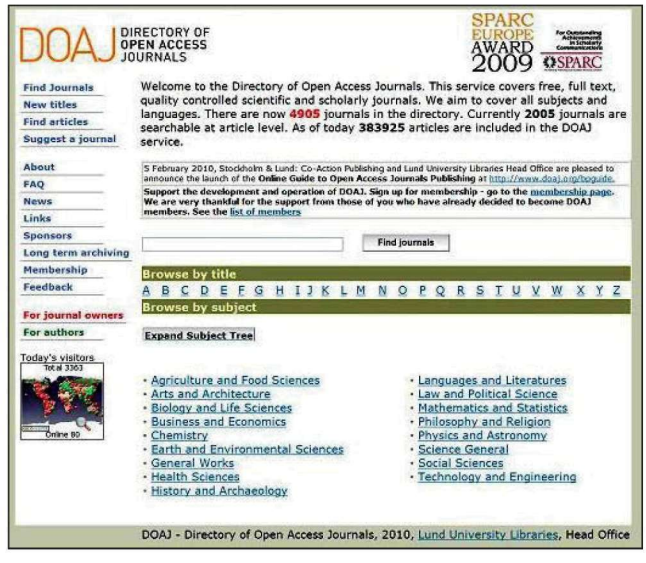

Figure 2. DOAJ homepage.

[1] http://www.ivyacademicsearch.org/
[2] http://www.opendoar.org/index.html
[3] http://digicoll.library.wisc.edu/WebZ/FETCH?sessionid=01-45994-677346017&recno=3&resultset=2&format=F&next=html/nffull.html&bad=error/badfetch.html&&entitytoprecno=3&entitycurrecno=3&entityreturnTo=brief

[4] IF journal rates have been calculated according to 2008, since the relevant for 2009 will be published within 2010.

Table 2. Journals referring to Veterinary Science and included in DOAJ catalogue

JOURNAL	PUBLISHER	COUNTRY	IF Add what year the IF corresponds to	BEGINNING DATE
Acta Agriculturae Slovenica	University of Ljubljana	Slovenia	----	2004
Acta Scientiae Veterinariae	Universidade Federal do Rio Grande do Sul	Brazil	----	2001
Acta Scientiarum: Animal Sciences	Eduem - Editora da Universidade Estadual de Maringá	Brazil	----	1998
Acta Veterinaria Brno	University of Veterinary and Pharmaceutical Sciences, Brno	Czech Republic	----	1999
Acta Veterinaria Scandinavica	BioMed Central	U.K.	----	2001
Agraarteadus	Estonian Academic Agricultural Society	Esthonia	----	2001
Agroalimentaria (Caracas)	Universidad de Los Andes	Venezuela	----	1995
Agrociencia	Colegio de Postgraduados	Mexico	0,232	2000
American Journal of Animal and Veterinary Sciences	Science publications	U.S.A.	----	2006
Analecta Veterinaria	Universidad Nacional de La Plata	Argentina	----	1998
Animal Biology & Animal Husbandry	Bioflux Society	Romania	----	2009
Animal Reproduction	Brazilian College of Animal Reproduction	Brazil	----	2004
Animal Science Papers and Reports	Polish Academy of Sciences	Poland	0,214	2003
Annual Review of Biomedical Sciences	São Paulo State University	Brazil	----	1999
Archives of Veterinary Science	Universidade Federal do Paraná	Brazil	----	1998
Archivos de Medicina Veterinaria	Universidad Austral de Chile	Chile	0,329	1997
Archivos de Zootecnia: Revista Trimestral	Universidad de Córdoba, Córdoba	Spain	----	1975
Archivos Latinoamericanos de Producción Animal	Asociación Latinoamericana de Producción Animal	Venezuela	----	2005
Arquivo Brasileiro de Medicina Veterinária e Zootecnia	Universidade Federal de Minas Gerais	Brazil	0,499	1999
Bangladesh Journal of Veterinary Medicine	Bangladesh Society for Veterinary Medicine	Bangladesh	----	2003
Basic and Applied Myology	Unipress Padova	Italy	----	1997
Biotechnology in Animal Husbandry	Institute for Animal Husbandry	Serbia	----	2004
BMC Veterinary Research	BioMed Central	U.K.	----	2005
Bulgarian Journal of Veterinary Medicine	Trakia University	Bulgaria	----	2005
Ciência Animal Brasileira	Universidade Federal de Goiás	Brazil	----	2000
Ciência Rural	Universidade Federal de Santa Maria	Brazil	----	1995
Experimental Animals	Japanese Association for Laboratory Animal Science	Japan	0,711	1995
Extreme Life, Biospeology & Astrobiology	Bioflux Society	Romania	----	2009
Human & Veterinary Medicine	Bioflux Society	Romania	----	2009
International Journal of Animal and Veterinary Advances	Maxwell Science Publication	U.K.	----	2009
International Journal of Poultry Science	Asian Network for Scientific Information	Pakistan	----	2002
The Internet Journal of Veterinary Medicine	Internet Scientific Publications, LLC	U.K.	----	2002
InVet	Universidad de Buenos Aires	Argentina	----	2005
Iraqi Journal of Veterinary Sciences	University of Mosul, College of Veterinary Medicine	Iraq	----	2008
Israel Journal of Veterinary Medicine	Israel Veterinary Medical Association	Israel	0,256	1998
Italian Journal of Animal Science	PAGEPress Publications	Italy	0,132	2002
Journal of Animal and Veterinary Advances	Medwell Online	Pakistan	----	2005
The Journal of Applied Research in Veterinary Medicine	Veterinary Solutions	U.S.A.	----	2003
Journal of Equine Science	Japanese Society of Equine Science	Japan	----	1995

Table 2. Journals referring to Veterinary Science and included in DOAJ catalogue

JOURNAL	PUBLISHER	COUNTRY	IF Add what year the IF corresponds to	BEGINNING DATE
Journal of Marine Animals and Their Ecology	Oceanographic Environmental Research Society	Canada	----	2008
The Journal of Poultry Science	Japan Poultry Science Association	Japan	----	2002
Journal of Reproduction and Development	Japanese Society of Animal Reproduction	Japan	1,609	1995
Journal of Veterinary Medical Science	Japanese Society of Veterinary Science	Japan	0,725	1997
Journal of Veterinary Science	Korean Society of Veterinary Science	Korea	0,937	2000
Livestock Research for Rural Development	Centro para la Investigación en Sistemas Sostenibles de Producción Agropecuaria	Colombia	----	1989
Lucrari Stiintifice: Zootehnie si Biotehnologii	Facultatea de Zootehnie si Biotehnologii, Timisoara	Romania	----	2007
Mljekarstvo	Croatian Dairy Union	Croatia	----	2001
Nucleus Animalium	Fundação Educacional de Ituverava	Brazil	----	2009
Open Veterinary Science Journal	Bentham open	U.S.A.	----	2007
Pakistan Veterinary Journal	University of Agriculture, Faisalabad	Pakistan	----	2005
Pesquisa Veterinária Brasileira	Colégio Brasileiro de Patologia Animal - CBPA	Brazil	0,425	1997
Rangifer	Nordic Council for Reindeer Husbandry Research (NOR)	Norway	-----	2008
REDVET	Veterinaria Organización	Spain	-----	2003
Research Journal of Animal and Veterinary Sciences	INSInet Publications	Pakistan	-----	2006
Revista Brasileira de Saúde e Produção Animal	Universidade Federal da Bahia	Brazil	-----	2001
Revista Brasileira de Zootecnia	Sociedade Brasileira de Zootecnia	Brazil	0,463	2000
Revista Científica	Universidad del Zulia	Venezuela	0,090	2002
Revista Científica UDO Agrícola	Universidad de Oriente Press	Venezuela	----	2001
Revista Colombiana de Ciencias Pecuarias	Universidad de Antioquia	Colombia	----	2006
Revista Corpoica: Cienca y Tecnología Agropecuaria	Corpoica - Corporación Colombiana de Investigación Agropecuaria	Colombia	----	1996
Revista de Investigaciones Veterinarias del Perú	Universidad Nacional Mayor de San Marcos, Facultad de Medicina Veterinaria	Peru	----	2001
Revista de la Facultad de Ciencias Veterinarias de la Universidad Central de Venezuela	Universidad Central de Venezuela	Venezuela	----	2005
Revista Mvz Cordoba	Universidad de Cordoba	Colombia	----	2000
Revista Veterinaria	Universidad Nacional del Nordeste	Argentina	----	1999
Slovenian Veterinary Research	University of Ljubljana	Slovenia	----	2001
South African Journal of Animal Science	South African Society for Animal Science	S. Africa	0,365	2000
Técnica Pecuaria en México	Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias	Mexico	----	2000
Tropicultura	Agri-Overseas	Belgium	----	2002
Turkish Journal of Veterinary and Animal Sciences	Scientific and Technical Research Council of Turkey	Turkey	0,280	1998
Vet Scan	Kashvet Society, Kashmir	India	----	2005
Veterinaria Italiana	Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise G. Caporale	Italy	----	2004
Veterinaria Mexico	Universidad Nacional Autónoma de México	Mexico	----	2005
Veterinární Medicína	Czech Academy of Agricultural Sciences	Czech Republic	0,659	1999
Veterinary Medicine International	SAGE-Hindawi Access to Research	U.S.A.	----	2010
Zootecnia Tropical	Instituto Nacional de Investigaciones Agrícolas Venezuela	Venezuela	----	1983

Innovative Actions and Open Access: Public participation in research

The technological advancement and the Internet have created new means of communication between readership and scholars.

Open source software is gradually created and disposed to the wider public for free.

Mashups, i.e. Web pages or applications that use and combine data from two or more sources, enable users to identify the reliability of information and create new services.

Wikis offer the opportunity to add, remove or edit content quickly and easily, while retaining all previous versions of the specific issue. This application favours collective works.

Science blogs map the latest developments in science by making research results free and subject to debate.

Finally, collaborative research networks have begun to seek ordinary citizens' help to carry out experiments based on data collection, observation and mapping. Therefore, sampling extends the research team, making scientific results even broader, beyond the confinements of any country or region. At the same time, they spread general awareness over common global problems, such as climate change, and they serve educational purposes as well. A typical example is the programme "Community Collaborative Rain, Hail & Snow Network" by the University of Colorado, that, by integrating civilians' measurements and observations, it monitors and forecasts weather conditions.

In January 2010, the network "Science for citizens" was created (Figure 3), where anyone, regardless of educational level, can participate in research programmes.

Figure 3. Science for citizens homepage.

Conclusion

Research, by any means, contributes to the improvement of human life. By recoding (not clear what the author means by "recoding") scientific results, development and innovation are promoted leading to social empowerment and equality of all nations.

But is there actually democracy and fairness in information retrieval? And to what extent may countries with less economic power have access to information that could prove beneficial for their viability?

Open Access is one of the most revolutionary steps in the digital era and the majority of the scientific community tends to gradually adopt it.

Open Access Journals have started to compete the relevant commercial ones and are included in databases, such as the Web of Science. Worldwide, repositories are created and authors are no longer unwilling to deposit their papers there.

Overcoming geographic, linguistic, social, financial and legal obstacles, the empowerment of people comes only through knowledge. As Thomas Edison said, "*The greatest problem of civilization is to teach man to think*." Ideally, to participate actively as well...

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