

Submission of views in preparation for the Expert Meeting on the need for and modalities of a global multilateral benefit-sharing mechanism and the first meeting of the Compliance Committee of the Nagoya Protocol

Joseph Henry Vogel  
Manuel Ruiz Muller  
Klaus Angerer

26 June 2015

(i) Situations which may support the need for a global multilateral benefit-sharing mechanism that are not covered under the bilateral approach;

Situations which support a global multilateral benefit-sharing mechanism (GMBSM) depend on the definition of genetic resource for the purpose of access. If defined as the vehicle of natural information, viz., “genetic material”, the number of situations is few (e.g., an ex situ microorganism whose provenance is unknown). If defined as the natural information itself, the number is so large that one can assume that such situations constitute the default position (Oldham et al, 2013, 6). Nevertheless, the issue is empirical and reduces to two questions: (1) At what taxon does one find the natural information to be utilized? (2) What is the geographic range of individuals belonging to those taxa? At the extremes, some natural information is found in all life forms, while others, ephemeral to a few individuals at a moment in time, e.g., ATP synthase (Doering et al, 1995) and epibatidine of *Epipedobates anthonyi*, respectively (Angerer, 2011).

Although one does not know a priori the diffusion of useful natural information, iconic examples suggest that geographic ranges will overlap multiple jurisdictions. For example, the compound paclitaxel of the block-buster chemotherapeutic TAXOL is found in both new-world *Taxus brevifolia* (Wani et al, 1971) and old-world *Taxus baccata* (Malik et al, 2011). Because the object of interest for Research and Development (R&D) is the natural information and not the vehicle, textbook economics implies that competition among suppliers will reduce the price of the genetic material to the cost of access (Samuelson and Nordhaus, 2005). Had the Convention on Biological Diversity (CBD) been international law at the time *Taxus* was under study, benefit sharing (the price) could have been reduced through competition among Providers (the suppliers) to the cost of collecting and submitting the leaves and bark of the species of *Taxus* into the R&D pipeline. Thinking abstractly, the bilateral approach restores the “common heritage of mankind” by eliminating the “rents” associated with information goods protected by intellectual property rights (Vogel, 2007).

The need for a GMBSM arises from the need for rents to offset the high opportunity costs of habitat conservation, analogous to the high costs of R&D. The economic rationale also achieves quid pro quo: just as monopoly intellectual property rights enable rents for owners of artificial information, a GMBSM would enable rents for Providers of natural information (Vogel, 1991, 7.).

(ii) Possible modalities for a global multilateral benefit-sharing mechanism as well as information regarding the implications of different scenarios on these modalities; and

The modality should be one that facilitates access while being fair and equitable. Application of “bounded openness” (May 2010, 142) to ABS meets the dual criteria. The modality can be reduced to ten essential steps which have appeared in the academic literature, under various expressions by different authors, since 1992:

1. A negotiation of royalty rates between User and Provider countries based on a matrix of relevant characteristics of utilization;
2. Establishment of a Global Fund to hold royalties in escrow;
3. Disclosure of utilization in the transmittal of applications for intellectual property;
4. Recognition of redundancy of natural information at different taxa as an empirical question;
5. Recognition of the determination of the diffusion of natural information across taxa as a transaction cost subject to change, decaying with technological advances;
6. Recognition of the determination of the geographic distribution of the information dispersed across taxa as a transaction cost subject to change, also decaying with technological advances;
7. Monitoring and tracking of patents which have disclosed natural information and their commercialization;
8. Collection of revenues by the Global Fund;
9. Dispersal of royalties to the countries of origin, proportional to the relative holdings of the natural information, when the costs of determinations (5) and (6) are inferior to the sum held in escrow for the natural information utilized;
10. Dispersal of the sum collected in the Global Fund to the infrastructure required to make the determinations whenever the costs of the determinations are superior to the sum collected at the moment the intellectual property right expires on the utilization (Vogel, 2015).

Scenario A: Cadastral systems vary from country to country (Andreasson 2006) as do the attributes of the land which can be owned or alienated. The following step emerges regarding the distribution of royalty revenue to align incentives among providers (landowners) within Providers (Parties):

11. Determination of the geographic diffusion of the natural information among landowners in a country of origin with dispersal whenever the sum is superior to the cost of the determination of geographic share (Vogel 1994, 2015).

Scenario B: When value has been added to natural information and the associated intellectual property right has expired, any future value added to the same natural information should not fall under an ABS obligation. An example is acetylsalicylic acid, the principal agent of Aspirin, isolated from the genus *Salix*. The US patent held by Friedrich Bayer & Co expired in 1917 (History.com 2105). Under the proposed modality, any future medical indications on acetylsalicylic acid would not carry an ABS obligation even though R&D on other information obtained from *Salix* would carry the obligation. The implication is strong and goes beyond the chemical isolates of any species now in the public domain. Natural information as the object of access means that all specimens held *ex situ* are subject to ABS obligations to the countries of origin (N.B. the use of the plural “countries”).

Scenario C: A rigorous literature exists that the CBD and the NP are ignored by those who access genetic resources and/or add value through Research and Development (Oldham, 2005; Hammond, 2014; Davis et al., 2015; Watanabe 2015, Vogel et al, 2011, 2013). One suspects that the GMBSM will meet a similar fate if compliance is not addressed forcefully from the outset. Economic abstraction is again powerful. The modality must design an expected cost for non-

disclosure of the use of natural information (the mathematical product of the probability of detection for non-compliance multiplied by the penalty), which is greater than the benefit of non-compliance, viz., the evasion of the royalty payment. The proposed GMBSM accommodates such a design. The transaction costs of compliance are zero for public science and almost zero for the commercial User from the first instance of R&D to the filing of a patent application---just ticking off one of two boxes on a patent application, which queries whether or not natural information was used in R&D, i.e., YES or NO. Inasmuch as most patents do not result in commercial products, follow-up by the GMBSM will not ensue; the vaunted confidentiality of research streams is maintained. In cases where the patent is commercially successful, the GMBSM will query the User regarding the species and location of collection, proceeding through steps (4) to (10).

Scenario D: Significant genetic resources have already been collected under Material Transfer Agreements for the purposes of bioprospecting before the ratification of the CBD (Reid et al, 1993). Under the suggested modality of “bounded openness”, said contracts would be binding only for the natural information that is endemic to the contracting Party. For that which is diffused across taxa and jurisdictions, the User would have to remit royalties to the Global Fund according to the suggested modality of the GMBSM.

Scenario E: The Puerto Rico Science, Technology & Research Trust of the The US Commonwealth of Puerto Rico are committing financial resources to establish the requisite infrastructure for commercial bioprospecting (2015). The archipelago lies in the neotropics and most of its genetic resources, when understood as natural information, are transboundary. The Steering Committee has been repeatedly exposed to the legal argument that researchers in a US jurisdiction, albeit non-Party to the CBD, would be “well advised” (Bagley and Rai, 2013) to abide by the Nagoya Protocol. Nevertheless, the Chair insists that the technical issues of bioprospecting can be separated from the legal issues and the latter contemplated at a later unspecified date (see Vogel, personal communications of 28 February 2015 and 11 March 2015, Appendices I and II). Disconcertingly, at least one member appears to have engaged in systematic collection of genetic resources in CBD countries without PIC (Engerman, 2006). The Puerto Rican Science, Technology and Research Trust is impervious to the suggestion not to invoke retroactivity when collecting transboundary genetic resources in Puerto Rico and even impervious to correct mis-attribution of the title of doctorate to the paid consultant. Should the Trust ever achieve its ambitious goals of large-scale bioprospecting, the proposed modality of the GMBSM would “encourage non-Parties to adhere to this Protocol” (Article 24 of the NP) by levying a royalty on biotechnology imports to Parties which derive from transboundary resources in a non-Party .

(iii) The areas requiring further consideration, as identified in paragraph 23 of the report of the Expert Meeting on Article 10 of the Nagoya Protocol.

The areas for further examination as identified in paragraph 23 of the report of the Expert Meeting on Article 10 of the Nagoya Protocol (document TJNEP/CBD/ICNP/3/5) are as follows:

(a) Whether or not there is a need for a GMBSM;

The GMBSM is its own Article of the Nagoya Protocol, viz. 10, which is evidence prima facie of a strongly perceived need by some Parties, notwithstanding capacious language only to

“consider the need for and modalities of a global multilateral benefit-sharing mechanism.” It is thus tempting to dispatch the issue of “whether or not there is [such] a need.” Indeed, why even consider a GMBSM if the logic and evidence in its favor can never persuade? Nevertheless the question of “need” is welcome for a GMBM under “bounded openness”; it reminds us that the CBD and the Protocol are framework conventions. Through a Decision of the COP, the meaning of “genetic resources” in Article 2 of the CBD can be defined as “natural information” or the object of access in Article 15 of the CBD can be specified as “natural information”. The correction of the category mistake is the linchpin to “fair and equitable” benefit-sharing.

(b) Whether there is sufficient experience with implementation of the Protocol to determine whether such a need exists;

Twenty-five years---one human generation---of “Paying Peanuts for Biodiversity” (Drahos 2014, 138-153) for access to genetic resources constitute sufficient experience to determine the need for a GMBSM. However, the question suggests that the COP will pursue futile attempts of the bilateral approach rather than recognize failure---the financial rescue of INBio being the most dramatic (Hammond, 2015). Economics is powerful in its abstraction. “When it comes to economics---and other subjects”, according to Nobel Memorial Economist Paul Krugman, “we live in an age of derp...”, defined as “saying the same thing no matter how much evidence accumulates that it’s completely wrong,” which results in “never-changing policy prescription” (2015, A21)

The need for a GMBSM was published by various economists and legal scholars during and shortly after the drafting of the CBD, a human generation ago (Vogel 1992, Swanson 1992, Stone 1995, Kagedan, 1996) Why the studied ignorance? For ABS, the failure of the Parties to entertain the economics of information (Oduardo-Sierra, et al, 2012) has been explained as “the tragedy of unpersuasive power” (Vogel 2013), which complements “the tragedy of the commons” (Hardin 1968). The tragedy suggests a strategy to grapple with the aforementioned “derp[itude]”: heightened awareness that the legacies of institutional and political leaders are in the balance and that “delegated delegation” (Ehrlich and Ehrlich, 2004, 313) will generate rich rewards through the implementation of known technical solutions.

(c) Whether the utilization of genetic resources without PIC would entail benefit-sharing obligations that could be met through a GMBSM;

Under the proposed modality of “bounded openness,” no PIC is necessary, thus greatly reducing the transaction costs of “fair and equitable benefit sharing”. The royalties are standardized across Parties according to a negotiated matrix of utilizations (for further elaboration, see Ruiz, 2015).

(d) Whether a Party’s decision not to require PIC (e.g. under Art. 6(1)) or to waive PIC (e.g. under Art. 8) can constitute situations for which it is not possible to grant or obtain PIC in the context of Article 10;

Under the proposed modality of “bounded openness,” no PIC is necessary, thus greatly reducing the transaction costs of “fair and equitable benefit sharing”. The royalties are standardized across Parties according to a negotiated matrix of utilizations (for further elaboration, see Ruiz 2015).

(e) Whether benefit-sharing requirements are waived when a Party has decided not to require PIC or has waived PIC;

Under the proposed modality of “bounded openness,” no PIC is necessary, thus greatly reducing the transaction costs of “fair and equitable benefit sharing”. The royalties are standardized across Parties according to a negotiated matrix of utilizations (for further elaboration, see Ruiz 2015).

(f) Whether there is no requirement for benefit-sharing when mutually agreed terms are not required or have not been established;

Under the existing CBD definition of genetic resources as material, the removal of any requirement for benefit sharing “when mutually agreed terms are not required or have not been established” almost guarantees that “mutually agreed terms” will never be achieved. The User would have a strong incentive never to agree.

(g) Whether the absence of ABS legislation or regulatory requirements in a Party due to lack of capacity or lack of governance means that PIC for access to genetic resources is not required and there is no obligation to share benefits. In the context of Article 10, whether such instances would constitute situations for which it is not possible to grant or obtain PIC;

Under the existing CBD definition of genetic resources as material, the removal of any requirement for benefit sharing “due to lack of capacity or lack of governance”, almost guarantees that Users will access in countries where there is “lack of capacity or lack of governance”. The User would have a strong incentive never to access transboundary resources in Provider countries where there is governance.

(h) Whether the absence of measures in a Party to implement Article 7 means that PIC for access to traditional knowledge associated with genetic resources is not required and there is no obligation to share benefits. In the context of Article 10, whether such instances would constitute situations for which it is not possible to grant or obtain PIC;

Under the proposed modality where genetic resources are defined as “natural information”, the benefit-sharing requirements are standardized across Parties. Under the existing definition where genetic resources are material, the removal of any requirement for benefit sharing due to “the absence of measures in a Party to implement Article 7”, will strongly favor access in countries where there is an “absence of measures”.

(i) Whether a genetic resource that is found in more than one Party constitutes a transboundary situation in the language of Article 10 (even if it is possible to identify the source of the genetic resource) or whether the bilateral approach should be applied if a genetic resource is found in more than one Party and it is possible to identify the source of the genetic resource. In the latter case, whether the bilateral approach or a GMBSM could be fair and equitable;

The key phrase in Article 10 of the NP is “genetic resources that occur in transboundary situations”. Quantum theory notwithstanding, everyday objects cannot be in two places at the same time (Connor, 2010) . Even migratory species are only in one jurisdiction at a given moment; physical samples taken will usually not overlap national boundaries. “Transboundary situations” only makes sense if genetic resources are understood as natural information, conveyed through independent vehicles. In other words, Article 10 implicitly accepts genetic resources as information, thereby contradicting Article 2 of the CBD which defines them as

“material.” Because genetic resources are information, the bilateral approach can never be fair or equitable, as competition among Providers will deny any benefit to all range Parties but one and that Party will be “pa[id] peanuts”, using the colloquial phrase of the award-winning jurist Peter Drahos (Grawemeyer 2004). Only a GMBM that can charge and distribute rents, will ever achieve fairness and equity.

(j) Whether traditional knowledge associated with a genetic resource that is found in more than one Party constitutes a transboundary situation in the language of Article 10 (even if it is possible to identify the source of the genetic resource) or whether the bilateral approach should be applied if traditional knowledge associated with a genetic resource is found in more than one Party and it is possible to identify the source of the genetic resource. In the latter case, whether the bilateral approach or a GMBSM could be fair and equitable;

Traditional knowledge is artificial information and a conundrum emerges. Should the knowledge be published and no patent application filed, then the ideas expressed have fallen into the public domain even though the expression is protected by copyright. Should the knowledge not be published, the ideas may enjoy protection as trade secrets (Gollin, 1993). However, many traditional communities co-evolved with the same genetic resources and converged on the same knowledge. A fair and equitable sharing of benefits would require an infrastructure to collect the knowledge and filter the databases against what has already fallen in the public domain and against databases from other communities in the same habitat. That which has not yet been published, could be the object of access and negotiated in a multilateral system. The benefits would have to be shared with other communities who are also part of the network of privately held databases (Vogel ed, 2000).

(l) Whether Article 11 is sufficient to respond to transboundary situations;

Extensive infrastructure of databases and capacity-building at the community level is a prerequisite for a fair and equitable distribution of benefits of traditional knowledge (Vogel, 2000), thereby making Article 11 grossly insufficient.

(i) Whether a GMBSM should address the sharing of benefits arising from the utilization of: Genetic resources in ex situ collections in relation to transboundary situations or for which it is not possible to grant or obtain PIC;

“Bounded openness” eliminates the question and simplifies the issues. Natural information as the object of access means that all specimens held ex situ are subject to ABS obligations to the countries of origin (N.B. the use of the plural). See Scenario A of the response to (ii) to NP-1/10 above.

(ii) Genetic resources in ex situ collections used for purposes for which PIC was not granted and for which it is not possible to grant or obtain PIC;

“Bounded openness” eliminates the question and simplifies the issues. Natural information as the object of access means that all specimens held ex situ are subject to ABS obligations to the countries of origin (N.B. the use of the plural). See Scenario A of the response to (ii) to NP-1/10 above.

(iii) Genetic resources in areas beyond national jurisdiction or whether this issue falls within the competence of the United Nations General Assembly; “Bounded openness” would apply globally and be within the scope of the NP. See the response to (i) and (ii) to NP-1/10 above.

(iv) Genetic resources in the Antarctic Treaty area; “Bounded openness” would apply globally and be within the scope of the NP. See the response to (i) and (ii) to NP-1/10 above.

(v) Traditional knowledge associated with genetic resources that is publicly available and where the holders of such traditional knowledge cannot be identified or for which it is not possible to grant or obtain PIC.

Publicly available traditional knowledge connotes public-domain status. A claim to public-domain traditional knowledge may provoke a call for renewal of expired intellectual property as *quid pro quo*. It is a thorny empirical question whether the value of public-domain traditional knowledge is greater than, equal to, or less than that of expired intellectual property. Even if the value were greater than the aggregated value of expired intellectual property, payment of rents for public-domain traditional knowledge would not reward preservation of unpublished knowledge now at risk of extirpation. The legal notion of a statute of limitations for long past injustices over property seems wise (Hardin, 1974). Resources should be channelled to enable benefit sharing over the utilization of commonly held unpublished knowledge through the appropriate infrastructure and capacity building.

## REFERENCES

- Andreasson, Kristin. “Legal Coordinated Cadastres – Theoretical Concepts and the Case of Singapore”, TS 69 – Land Administration Concepts, Legal Coordinated Cadastres, Theoretical Concepts and the Case of Singapore, Shaping the Change XXIII FIG Congress Munich, Germany, October 8-13, 2006. <http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=1024806&fileOId=1027725>
- Angerer, Klaus. “Frog tales – on poison dart frogs, epibatidine, and the sharing of biodiversity.” *Innovation: The European Journal of Social Science Research*. 24, no. 3 (2011): 353–369. doi: 10.1080/13511610.2011.592061.
- Bagley, Margo A. and Arti K. Rai. “The Nagoya ProTocol and Synthetic Biology Research: A Look at the Potential Impacts” *Synthetic Biology Project/Synbio* 6 (2013): 22 [http://www.wilsoncenter.org/sites/default/files/nagoya\\_final.pdf](http://www.wilsoncenter.org/sites/default/files/nagoya_final.pdf)
- Kate Davis, Kate and Martin F. Smit, Martin Kidd, Suzanne Sharrock, Pamela Allenstein. “An access and benefit-sharing awareness survey for botanic gardens: Are they prepared for the Nagoya Protocol?” *South African Journal of Botany* 98 (2015) 148–156 <http://dx.doi.org/10.1016/j.sajb.2015.01.015>
- Connor, Steve. . “Einstein was right, you can be in two places at once”, *The Independent*, December 17 (2010) <http://www.independent.co.uk/news/science/einstein-was-right-you-can-be-in-two-places-at-once-2162648.html>
- Doering C, B. Ermentrout, G. Oster. “Rotary DNA motors”. *Biophys. J.* 69 (6) December (1995): 2256–67 doi: [doi:10.1016/S0006-3495\(95\)80096-2](https://doi.org/10.1016/S0006-3495(95)80096-2)

- Drahos, Peter. *Intellectual Property, Indigenous People and their Knowledge*. Cambridge University Press, 2014.
- Ehrlich, P. R. and A.H. Ehrlich. *One with Nineveh*. Washington, D.C.: Island Press, 2004.
- Engerman, Suzanna, “Gifts from the Sea: Marine bioprospecting is the wave of future medicine”. *INVENTIO* vol. 3 (2005)  
[http://graduados.uprrp.edu/inventio/vol3/gift\\_sea1.htm](http://graduados.uprrp.edu/inventio/vol3/gift_sea1.htm)
- Gollin, Michael. "The Convention on Biological Diversity and Intellectual Property Rights." In *Biodiversity Prospecting: Using Genetic Resources for Sustainable Development*, edited by Walter Reid, 289-302. Washington, D.C.: World Resources Institute, 1993.
- Grawemeyer Award. 2004. <http://grawemeyer.org/worldorder/previous-winners/2004-john-brathwaite-and-Peter-Drahos.html>
- Hammond, Edward. “Patent Claims on Genetic Resources of Secret Origin” TWN Third World Network, 2014. [http://www.twn.my/title2/biotk/misc/budapest\\_final\\_21%20Feb2014.pdf](http://www.twn.my/title2/biotk/misc/budapest_final_21%20Feb2014.pdf), at 1
- Hammond, Edward. “Amid Controversy and Irony, Costa Rica’s INBio surrenders biodiversity collections and lands to the state.” TWN Third World Network, April 2 (2015). <http://www.twn.my/title2/biotk/2015/btk150401.htm>
- Hardin, G. “The tragedy of the commons. *Science*.” 162 (1968): 1243-1248.
- “Lifeboat Ethics: the Case Against Helping the Poor.” *Psychology Today*, September 1974. [http://www.garretthardinsociety.org/articles/art\\_lifeboat\\_ethics\\_case\\_against\\_helping\\_po\\_or.html](http://www.garretthardinsociety.org/articles/art_lifeboat_ethics_case_against_helping_po_or.html)
- History.com. “March 6 1899: This Day in History” <http://www.history.com/this-day-in-history/bayer-patents-aspirin>). Accessed June 13, 2015.
- Kagedan, Barbara Laine. “The Biodiversity Convention, Intellectual property Rights, and the Ownership of Genetic Resources: International Developments prepared for the Intellectual Property Policy Directorate Industry Canada, 1996” [http://iatp.org/files/Biodiversity\\_Convention\\_Intellectual\\_Property.pdf](http://iatp.org/files/Biodiversity_Convention_Intellectual_Property.pdf).
- Krugman, Paul. “Fighting the Derp”, *The New York Times*. June 8 (2015): A21.
- Malik, Sonia, Rosa M. Cusidó, Mohammad Hossein Mirjalili, Elisabeth Moyano, Javier Palazón and Mercedes Bonfill. “Production of the anticancer drug taxol in *Taxus baccata* suspension cultures: A review.” *Process Biochemistry* 46(1) (2011):23-34. DOI: 10.1016/j.procbio.2010.09.004
- May, Christopher. *The Global Political Economy of Intellectual Property Rights*, 2nd edn. London: Routledge, 2010.
- Oduardo-Sierra O., Joseph H. Vogel and Barbara A. Hocking. “Monitoring and tracking the economics of information in the Convention on Biological Diversity: studied ignorance (2002-2011).” *Journal of Politics and Law* 5, no. 2 (2012): 29-39. doi: [10.5539/jpl.v5n2p29](https://doi.org/10.5539/jpl.v5n2p29)
- Oldham, Paul. “Global Status and Trends in Intellectual Property Claims: Genomics, Proteomics and Biotechnology”, ESRC Centre for Economic and Social Aspects of Genomics (Cesagen). UNEP/CBD/WG-ABS/3/INF/4, January 22 (2009).
- Oldham P, Hall S, Forero O, Biological Diversity in the Patent System. *PLoS ONE*, 8(11) (2013): e78737. doi:10.1371/journal.pone.0078737
- Puerto Rico Science Technology and Research Trust. “News: Fideicomiso avanza la agenda científica del País al formalizar su programa de Bioprospección”, March 17 (2015).

- <http://prsciencetrust.org/fideicomiso-avanza-la-agenda-cientifica-del-pais-al-formalizar-su-programa-de-bioprospeccion/>
- Reid, Walter V. Sarah A. Laird, Carrie A. Meyer, Rodrigo Gámez, Ana Sittenfeld, Daniel H. Janzen, Michael A. Gollin and Calestous Juma. *Biodiversity Prospecting: Using Genetic Resources for Sustainable Development*. Washington, D.C.: World Resources Institute, 1993
- Ruiz Muller, Manuel. *Genetic Resources as Natural Information: Implications for the Convention on Biological Diversity and Nagoya Protocol*. New York: Routledge, 2015.
- Samuelson, Paul and William Nordhaus. *ECONOMICS*, 18th ed. New York: McGraw-Hill, 2005.
- Stone, Christopher D. “What to Do about Biodiversity, Property Rights, Public Goods and the Earth’s biological Riches.” *Southern California Law Review*, no. 68 (1995): 577-605.
- Swanson, Timothy M. “The Economics of the Biodiversity Convention.” Norwich: CSERGE, School of Environmental Sciences, University of East Anglia, 1992.
- Vogel, Joseph Henry. “The Intellectual Property of Natural and Artificial Information.” *CIRCIIT Newsletter*, June (1991): 7.
- . *Privatisation as a Conservation Policy*. Melbourne, Australia: Centre for International Research on Communication and Information Technologies, 1992.
- *Genes for Sale*. New York: Oxford University Press, 1994.
- . 2“Reflecting Financial and Other Incentives of the TMOIFGR: the Biodiversity Cartel”. In M. Ruiz and I. Lapeña eds, *A Moving Target: Genetic Resources and Options for Tracking and Monitoring their International Flows*. Gland, Switzerland: IUCN, (2007) 47-74. <http://data.iucn.org/dbtw-wpd/edocs/EPLP-067-3.pdf>.
- . “The Tragedy of Unpersuasive Power: The Convention on Biological Diversity as Exemplary.” *International Journal of Biology* 5, no. 4 (2013): 44-54. <http://www.ccsenet.org/journal/index.php/ijb/article/view/30097/18019>.
- Vogel, Joseph Henry. “On the Silver Jubilee of ‘Intellectual Property and Information Markets: Preliminaries to a New Conservation Policy’” Foreword in Manuel Ruiz Muller, *Genetic Resources as Natural Information Implications for the Convention on Biological Diversity and Nagoya Protocol*. New York: Routledge, forthcoming 2015.
- Vogel, Joseph Henry, ed. *The Biodiversity Cartel: Transforming Traditional Knowledge into Trade Secrets*. The InterAmerican Development Bank/Consejo Nacional de Desarrollo, CARE, USAID, SANREM, and EcoCiencia. Quito, Ecuador, 2000.
- Vogel, Joseph Henry, Nora Álvarez-Berríos, Norberto Quiñones-Vilche, Jeiger L. Medina-Muñiz, Dionisio Pérez-Montes, Arelis I. Arocho-Montes, Nicole Vale-Merniz, Ricardo Fuentes-Ramirez, Gabriel Marrero-Girona, Emmanuel Valcárcel Mercado, Julio Santiago-Rios. “The Economics of Information, Studiously Ignored in the Nagoya Protocol on Access and Benefit Sharing” *7/1 Law Environment and Development (LEAD) Journal*, (2011): 51-65 <http://www.lead-journal.org/content/11052.pdf>
- Vogel, Joseph Henry, Claribel Fuentes-Rivera, Barbara A. Hocking, Omar Oduardo-Sierra, and Ana Zubiaurre. “Human Pathogens as Capstone Application of the Economics of Information to Convention on Biological Diversity.” *International Journal of Biology*, Vol 5, No. 2 (2013): 121-134. <http://www.ccsenet.org/journal/index.php/ijb/article/view/22760>
- Wani, Manuskhlal C. Harold Lawrence Taylor, Monroe E. Wall, Philip Coggon, Andrew T. McPhail. “Plant antitumor agents. VI. Isolation and structure of taxol, a novel

antileukemic and antitumor agent from *Taxus brevifolia*” *J. Am. Chem. Soc.*, 93 (9) (1971):2325–2327. DOI: 10.1021/ja00738a045

Watanabe, Myrna E. “The Nagoya Protocol on Access and Benefit Sharing International treaty poses challenges for biological collections” *Bioscience*, vol. 65, (6) (2015): 543-550. doi: 10.1093/biosci/biv056