TRANSCRIPT

"New Approaches to Access and Benefit Sharing:

The Case for Bounded Openness and Natural Information"

SIDE EVENT

Conference of the Parties XIII to the UNITED NATIONS Convention on Biological Diversity, 9 December 2016. Cancún, Mexico.

http://www.iisd.ca/biodiv/cop13/enbots/9dec.html#event-4

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Transcript edited for clarity by individual speakers but not for substance. Participants questions and comments are verbatim; any inaudible segments are so indicated in brackets.

The opinions expressed are not necessarily those of the institution affiliated with the speaker. Transcription by Miguel A. Sánchez, supported by the Program to Incentivize Undergraduate Research, School of Social Sciences, University of Puerto Rico-Rio Piedras (Spring 2017).

Claudio Chiarrolla: Professor Joseph Henry Vogel and Manuel (Manolo) Ruiz Muller have analyzed and undertaken practical work in the area of genetic resource governance for the last two decades. Their work has focused, among other things, on assessing the regulation and use of genetic resources from an economic and legal point of view. They will start this conversation by providing us with the conceptual foundation to the notion of bounded openness and how that could help framing a meaningful discussion in terms of governance of genetic resources and ABS, included in the context of the CBD and its Nagoya Protocol. Manuel is going to start.

Manuel (Manolo) Ruiz Muller: First of all, thank you Claudio. Thanks to everyone for coming. What we would like to do with this panel is for each of us to have ten or fifteen minutes to take the floor and share ideas regarding the notion of genetic resources as natural information.

I will just start by giving an initial idea of framework for all of this. I think most of us in this room have been involved in ABS for long time. Yesterday evening I was having dinner with a few of our colleagues here on the panel when we realized that in 1999 we had had quite a lively discussion right here in Cancún at a workshop sponsored by the World Resources Institute, precisely on access and benefit sharing. A few of the people who are in attendance now were also there. What strikes me as interesting is that quite a few of the points that I am going to raise here in regards to the current situation in ABS were also actually raised in 1999 in regards to ABS.

Although there has been some progress in terms of policy, institutional frameworks, and initiatives in regards to ABS, the underlining and basic challenges and difficulties regarding ABS, are still in place. I have been to couple of side events here at this COP and I think this slide is more or less repeated from the other meetings I have been attending [Referring to a slide projected]. There is some common ground in terms of the idea about where we are at this moment.

First of all, in terms of benefit sharing there are a couple of concepts which are rarely discussed and are key for the third objective of the CDB. Usually when we do know about specific cases or cases studies regarding access to genetic

resources or bioprospecting, the terms of benefits are not defined and, more or less, only assumed to be equity and fair. There's not too much discussion regarding that. I think that this is a problem which you will see emerge from what we talk about in this panel.

The other situation are the terms and the known royalty rates regarding specific projects. These are, I would said, very low. They are more or less in a range of between 0.5- 3% in the best of cases, in a near trillion-dollar industry which annually generates huge benefits. Some of the more recent studies which follow the seminal work by Kerry ten Kate and Sarah Laird in 1999 with the commercial use of biodiversity, have, of course, improved the analysis. We do have a huge industry, which moves billions of dollars in different sectors using genetic resources.

Professor Peter Drahos from Australia has put it bluntly: Countries are receiving "peanuts for biodiversity", which has been used in this trillion-dollars industry. And so, I think we need to think about this and ask as to why this is so. We hope through some of the interventions today, we will have some answers from this panel.

Then we have the famous confidentiality clauses in many of the ABS contracts. And this, of course, generates a problem. We cannot really do a detailed analysis of these benefits, because they simply are not disclosed. We do have some anecdotal information and data of certain royalty rates which are negotiated but, in general terms the royalty rates are hardly ever disclosed. And that, I think, is a real problem for those of us who are trying to discover what and how equity and fairness concepts in the CDB actually materialize in these contracts.

Then, I think---and this is also part of the premises that some of us have been sort of studying for a few years now---that we find limited interest in the CDB and ABS process and community regarding what we consider a key flaw in the Convention of Biological Diversity. The flaw is the definition of genetic resources as material. Of course, we consider, as the title of my presentation suggests, that genetic resources are, in essence, absolutely natural information.

There is this trend to try to identify, and there has been, for the last couple of decades, quite of few exercises trying to find successful ABS contracts or bioprospecting projects. And these, whenever they are identified, they are deemed successful mainly because they were signed and executed. But I think there is a flaw to deem them equitable and fair in terms of the benefits that are distributed. So, this, I guess, is a very sort of synthetic analysis of our understanding of what the current situation of the ABS is. We make some basic, very basic assumptions. First of all, that genetic resources are natural information, for the purpose of securing intellectual property over the value added over that natural information.

One of our hypotheses is that fairness and equity are impossible to achieve--- there is no way we can achieve---- as long as genetic resources are negotiated as material. We will explain as to why this is so in a while. These are, as I said, just some of the basics assumptions on which we were working. Natural information is not only dispersed and widely disseminate among jurisdictions, different countries, but also across species, and that will bring us to another problem.

Again, there has been a tendency over the last 20 years to consider sovereignty as the faculty to sign bilateral contracts. If this is not included under the concept of sovereignty then supposedly we are not talking about sovereignty. We think sovereignty is basically the possibility and the options countries have to actually negotiate a multilateral regime. And the Nagoya Protocol has opened a small door or window of opportunity. And as we have said in our publications, the Global Multilateral Benefits-Sharing Mechanism is an expression of sovereignty, even though difficult to understand for Provider countries or countries of origin. It is a politically sensitive concept that needs to be addressed. We also think the definition of genetic resources as material needs to be reviewed and corrected. And that again is a complicated and difficult issue and process, which I want to present to you today and which have, in one way or another, been presented over the years. The issue is how the application of the economics of the information to genetic resources can naturally achieve in a very practical and quite straight-forward way. fair and equitable benefits sharing. So these are some of the assumptions we make.

The other point, and this to me is quite striking because the notion of genetic resources as natural information is anything, is the idea in the negotiation of the CBD that genetic resources should be defined as material. No? The idea is presented as a fact and so they are defined as material. But in the scientific world the notion that genetic resources are information has been long established. And it is again striking that the policy process did not take this into consideration when the CBD was negotiated. [Referring to a slide presentation of scientists since the 19th century who thought of genes as information]. Here you have just some of the examples well known representatives of the scientific world who in some form or another inferred that genetic resource were in fact information. It traces back as far as the nineteenth century. So now we use different variations of the concept as "digital genetic resource information ", which is a sort of oxymoron. We think we have started to look at genetic resources as natural information and started to understand the economics foundations of this idea, a global multilateral regime almost naturally and logically derive from this with precise and well tested economic rules.

So, just to finish off, the multiple issues, which are left unsolved by ABS at present can actually be addressed and solved through the notion of Bounded Openness, which is somewhat self-defining. Again I will not dwell on the concept but leave it to my colleague Joe. But there are a couple of sources, a couple of books, one of which has been translated here in Spanish [holding in hand the Spanish translation of *Genetic Resources as Natural Information* (Routledge, 2015)] which defines the conceptual framework of bounded openness and some of the practical ways in which a multilateral regime is both fair and equitable can be constructed. So I leave it at that. Joe will continue with some further ideas.

Thank you.

TIME: 00:14:25 – 00:28:45

Joseph Henry Vogel: Claudio has already introduced me, but for those of you who just entered, all that I will say is that I am a professor of economics in

the University of Puerto Rico where I have taught for the last 15 years and that I have taught economics for the last 30 years. I had hope to hear a gasp in the room that "no you don't look that old"..if not, that's fine... [looking to Tomme Young who feigns a gasp, Vogel smiles and continues]...I got a friend in the audience.

Over those 30 years I quite often used two books that are extremely well written and organized, which has freed up a lot of my time for research. One is *The Worldly Philosophers*, it has sold two million of copies and a beautiful Spanish translation. [Pointing to the image of the book cover on a slide] The central message of this book is the economics is a powerful tool of abstraction. I think that that powerful tool of abstraction, we can use for ABS. But there are many abstractions in economics. We economists, we number in the tens of thousands of PhD economists around the world. The literature is vast. An insight from Stephen Marglin, professor emeritus at Harvard is that "The enterprise of economics is better characterized by the content of elementary texts than by what goes on at the frontiers of economic theory". What is a very basic economics text is that of Paul Samuelson, first edition 1948 and now in its 19th edition, several millions copies sold in several languages. [Pointing to slide which divides the levels of learning in a pyramid: memorization, comprehension, application, synthesis and evaluation] Well, one would think that for ABS---and as a teacher--that we would have to climb Benjamin Bloom's famous pyramid of learning to the penultimate stage of synthesis, a synthesis with biology. And I hope to show, that really, that's not really the case. It is is simpler than that [laser pointing to the lower lever of Application in a slide of Benjamin's Bloom's pyramid]. I take an insight from E.O. Wilson's autobiography [*The Naturalist*] that "reductionism is the virtually unchallenged linchpin of the natural sciences". So this is a very reductionist approach that I have adopted. It begins with genetic resources.

What are genetic resources for the purpose of access? Ever since Francis Crick's publication of "The Central Dogma of Molecular Biology", actually in 1958 and re-published in *Nature* in 1970, the immaterial nature of genetic resources has been manifest in the literature. So Crick talks about translation, copying, genetic information. For the purpose of the ABS we economists can

do Crick one better. We can say that it is natural information. By saying natural information [pointing to a sequence] as we see in the slide to the far right, the naked mole, the genome has been fully and sequenced and blasted over the internet. You don't have to even touch the material to have access to do research. In fact, the cover of the design is the sequence that appeared in Nature. we have embedded in a keyboard in Spanish, "Apertura delimitada", Bounded Openness, which I will shortly describe. [Pointing to the image of of the book cover of the Spanish translation of *Genetic Resources as Genetic Information*]. To the left is the poison dart frog, its molecular structure was characterized in the 1980s. I believe, Klaus will clarify that later. [Pointing to the image of a frog]. Abbott Labs, never having touched the poison-dart frog, was able to adapt its molecular structure and come up with ABT-594. The book "Chimpanzee Cultures" [pointing to the image of chimpanzees on another book cover] documents what chimpanzee eat when they are sick, in other words, pharmacognosy. Interested researchers will not require access to the material, the genome of the chimp. [Pointing to a slide of burr and another of Velcro®]. Natural information would include biomimicry.

So we think of the case of Velcro. One could take a photo of the fastener in the burr. You could use that an input for research and development. From ECONOMICS by Samuelson and Nordhaus, the 10th chapter , specifically page 195, which is easily covered within the introductory course, we find an anomaly. The first nine chapters of the book celebrate how markets are good, how they work, how competition is desirable from both the consumer and the providers' viewpoint. Then in the 10th chapter, Samuelson tells us that the exception being information. So read through this very closely can show how we can apply this reasoning, simple reasoning, to natural information. [A slide of a passage is projected from Samuelson and Nordhaus]. So in the case of artificial information "It is expensive to produce but cheap to reproduce to the extent of the reward to an invention are inappropriable, one would be expect product research and development to the underfunded. Special laws, government patents and so on, copyright, trademarks, geographic indications, create intellectual property rights. The purpose is to give the owners special protection against the material being copied and used by other without compensation to the owner and the original creator. Why would governments

actually encourage monopolies? Monopolies imply deadweight loss to the society. By creating property rights, government encourage artist and inventors to invest time, effort and money in the creative process."

By the 15th edition of Samuelson and Nordhaus, the economics of information for which there have been many Nobel awards for pioneers in that area, had become so mainstream, such normal science, that it appears by page 195 in the introductory textbook. How do we apply this reasoning to genetic resources? With a simple substitution. Lawyers like to argue analogously. So here we have [the slide reproduces the above quote and then substitutes key words through a fade-out and fade-in function] "Genetic resources are expensive to conserve--the opportunity cost--but cheap to access. What is the cost of 5 kilo sof dry leaves? To the extent that the rewards to conservation are inappropiable, we would expect conservation efforts to be underfunded. An international regime or multilateral global mechanism governing ABS would create oligopoly rights. The purpose is to give the countries of origin---plural, not country of origin, but countries of origin, because the natural information of species are disperse across jurisdictions and even if the species is endemic to a country quite often the natural information can be found in more than one species of the same genus or family---In community special protection against the against the information being accessed can use by others without conservation to all the countries and communities which have conserved the respect habitat and knowledge. Why would government actually encourage oligopolies? By creating a cartel over genetic resources and associated traditional knowledge users countries encourage provider countries and community to invest time, effort and money in conserving habitats and knowledge." When I launched the *Biodiversity Cartel* in 2000, it took many people aback to hear the word "cartel". It puts you in a mental context of drugs and prostitution. But cartel is the common word for oligopoly. It is the same reasoning. It's not a radical economics. It is a very standard economics. And invoking John Maynard Keynes famous phrases: "Words ought to be a little bit wild", in order to provoke and grab one's attention.

[Pointing to the next slide] Here we have a riddle free access is not free. In Spanish the word free can be translated “libre” or “gratis”. Free of hassles is in the “libre” free flow sense. If you don’t have prior informed consent, natural information can flow freely. However, it is not free “gratis” as in free of cost. There would be a cost. We use “Bounded Openness,” as a handle. It not our term but one that was described very well, very thoroughly by Chris May in *The Global Political Economy of Intellectual Property Rights*, the second edition by Routledge [2010]. Surprisingly, in that book he does not define it succinctly. He did not want to put it in a straight jacket. Well, it is very hard for us to promote reductionism and not come up with a definition.

So, Manolo and I in the online discussion of synthetic biology, offered this definition for “Bounded Openness”: Legal enclosures which default to, yet depart from *re nullius* (property of no one) to the extent the departures enhance efficiency and equity, which must be balanced when in conflict”. In the case of ABS they are not in conflict, what is equitable is also efficient. What is the principle bound? The principle bound is money. Why is economics probably the most rigorous of the social sciences? Because we have a measuring rod. That measuring rod is money. Royalties would be the principal bound on the unencumbered flow of natural information. The percentage royalty would depend upon the combination of characteristics utilized. There are roughly ten types of intellectual property rights that could be asserted over the value added to natural information. In the work of Sarah Laird, there six economics sectors that are identified. There are also the substitutability with other inputs in value added, and the question whether there is directness or not in research streams. So we are looking at a combination that would be 10X6X2X2 or 240 combinations to be negotiated as flat royalty rates. As an economist, where do we begin? With the most lucrative which is the pharmaceutical.

[Pointing to a slide] Here we have.pharmaceutical sector. Many of you may have been traumatized by economics will remember that these curves are the graphs of coordinates of price and quantity. What we observe in reality is just one point, the point of sale, what was its price? What was its quantity? [pointing to the coordinates on the graph]. We economics professors have the

bad habit of then drawing the curve with a slope of negative one, 45 degree angle like this, and saying that there is an elastic region and inelastic region. Elasticity refers to the responsiveness of customers to buy when the price changes. In the elastic region, the price is high, if you raise the price, there will be a cutback in the quantity demanded [pointing to a movement along the curve]. We know that a monopolist in intellectual property is a time-limited monopoly and would price in the elastic region, never in the inelastic region. Because information is cheap to reproduce, there is a coincidence that the profit maximization point would pretty much occur where there is maximum revenue, that point is right here [pointing to the middle of the curve which maximizes the area of the resultant rectangle].

The reality: economics is also an empirical science and is very different. For the pharmaceutical industry, we have inelastic demand. This is proven very clearly by Valeant, once the darling of Wall Street before its share price collapsed in the stock market. In July 2015, for the drug Glumetza, Valeant raised the price from $572 to $3,432 and they still had lots of sales! They raised it again to five thousand something, which is a ten-fold increase. What is the implications of that fact for our scheme? Well, Glumetza derives from the French Lilac. So if there had been 15% royalty, then there would have been $85 per patient per year for ABS [at the original "low" price of $572] just on the sale of this one drug for the countries of origin. In the prologue to the book Manuel Ruiz has launched, I use an even more dramatic example: *Thermus aquaticus* and Polymerase Chain Reaction. Over its patent life, there has been $2 billion dollars in sales. Had there been a 15% royalty, then $300 million dollars for ABS.

I am very much an admirer of the Japanese just-in-time: On the 1st of December [2016] I received the press release from the Secretary [pointing to a facsimile of the message]. "More than 190 governments prepare to take tough decisions to stop biodiversity decline worldwide." Well, that's good news! To align incentive among users and provider is simple economics but I recognize that something is very tough. What is tough is the admission of the foundational error. The foundational error is the definition in Article 2 in both Convention of Biological Diversity and Nagoya Protocol, of genetic resources

as material. It has beleaguered the thirteen COPS. The bureaucracy is heavily invested in this mistake. I had an article that is open access, published by International Journal of Biology "The Tragedy of the Unpersuasive Power: The Convention of the Biological Diversity as Exemplary" [2013].

I have one conclusion and overarching recommendation: That leadership is required which perceives "bounded openness" as low-hanging fruit, which will help "stop biodiversity decline worldwide".

Thank you.

TIME: 0:29:38 - 0:49:29

Claudio: Thank you very much Professor Vogel. Now we will move to the second presentation, which is by Klaus Angerer, lecturer in the History of Medicine at the Justus Liebig University Giessen in Germany. He will delve into a concrete example and expand it through a thought experiment, which demonstrates the extent to which the ABS approach based on bilateral contracts is somehow flawed. He will explain how the concept of bounded openness could help solve some of the problems that have been described.

Klaus Angerer: Thank you Claudio. Thank all of you for being here. This is my first COP and I realize that some of us here have been been participating in COPs for 20 years. I will show you an historical case study that I hope contributes to understanding which problems exist under the current ABS approach. I hope to be able to show that under a system of bounded openness, that some of these same problems would not exist in the same manner.

The case I will show is about this tiny frog [slide projected on screen]. If you google the frog, you will find lots of references to case of the "poison-frog" or the "dart-poison-frog". In this case, the frogs were collected before the CBD was ratified. So, if we were to ask about compliance with the ABS framework, we would have to invoke the concept of "retrospectivity". But even if the frogs were accessed today and even if they were not brought to the US, the famous non-Party, a lot of problems would persist because, as I want to show, they are inherent to the current ABS regime. This thought experiment suggests

that many of those problems may be solved through a multilateral system based on bounded openness. So, I hope to show that the system my colleagues have suggested might actually work.

The case I want to talk about is about an alkaloid isolated from this frog [slide projected on screen]. It is called epibatidine and was isolated from skin secretions of the tiny poisonous frog *Epipedobates anthonyi*. It is the size of a thumb nail and endemic to southern-western on Ecuador and northern Peru, you can see it here [slide projected on screen]. Some 20 years after the original collection of the frogs, epibatidine turned out to be an important contribution to pharmaceutical research. It was hailed as "a possible first step toward producing a long sought drug: a powerful non-sedating, non-opioid, pain killer". The quote is from a publication in *Science* which appeared in 1993. The case was frequently cited in the favorable literature on bioprospecting in 1990s. For example, E.O. Wilson mentioned it as one of the good examples of the potential of bioprospecting in 1990s in his book *The Future of Life*. Of course, the NGO campaigns, as you all know, also condemned it as a case of flagrant bio-piracy and alleged an "invasion of the frog snatchers". Although they even used the image of the wrong frog [referring to a slide projected of *Epipedobates tricolor*] it was a very famous case for both supporters and detractors of bioprospecting.

The chronology of the case begins in 1974. The US National Institutes of Health sent a team lead by the chemist and pharmacologist John Daly on an exploratory field trip to Ecuador where they captured specimens of *Epipedobates anthonyi* and skinned several hundred frogs. They took them back to Daly's lab in the US where he injected extracts of the skins into mice. The effect of the injections was unexpected: the mice arched their tails over their backs. This effect is typical for opioids but was unseen in frog alkaloids. The question became: What compound in the extract was responsible for the reaction? The interest further increased when Daly et al ere able to show that the frog skin extract had powerful analgesic properties on mice, 200-fold more potent than that of morphine. Because they exhausted the supply of skins in experimentation, Daly returned to Ecuador to get more frogs skins. They finally gathered around 800 frogs, but were only able to isolated a very small

amount of alkaloids from the skins collected in 1976. After much research they still could not determine the molecular structure but ruled out an opioid substance. They perceived the potential that the compound could eliminate the risk of dependency, which characterizes morphine. However, with the existing technology and only small amounts of sample, they could not decipher the molecular structure. They needed more skins. In subsequent field trips to Ecuador, they only found specimens with insignificant amounts of alkaloids. Disappointingly, frogs raised in captivity were alkaloid-free. They had a problem. In 1987 the family of these frogs was also listed in CITES; access became even more difficult. Permits through CITES were possibly but significantly more trouble. So the determination of the molecular structure remained impossible with the available technology. Daly finally decided to---sorry----[pointing to a photo of slide] on this slide you see Daly skinning the frogs in the field when he was young and there are several papers highlighting his travels to the ends of Earth to satisfy curiosity, that was pretty interesting research. So, finally they cryopreserved the skins samples because they could not determine the molecular structure at that time.

In 1990s instrumentation improved, especially the sensitivity of Nuclear Magnetic Resonance spectrometers. So they could finally use the sample that they had cyropreserved to determine the molecular structure. In 1992 the decisive paper on epibatidine was published in *Science*. A little bit later they submitted a patent for the compound and in 1993, the paper I showed in an earlier slide was published and further raised interest in epibatidine. Pretty soon several papers on the ways to produce the compound by synthesis were also published. Epibatidine itself was never developed as a drug candidate because it has serious side effects near therapeutic dosage. So it cannot be used directly as a pharmaceutical drug candidate. What is interesting is that the contact between the academic research and pharmaceutical companies was rather informal. Quotes I found in a retrospective article by Daly's colleagues show this clearly. By the 1990s, Abbott laboratories had already done some research on compounds related to epibatidine, which bind to the same receptors. The area of research had not really progressed within the company. Real progress was only made once the Abbott scientists read about epibatidine. After reading the report in *Science*, one "immediately recognized

that similar compounds were being investigated" in his company. Then they proceeded and "immediately contacted Daly to see whether the mechanism of action was known. Daly indicated that a paper was in press and, after being asked whether it was nicotinic receptor, agreed". So you see, no transfer of material, no sharing of material, no contracts. The sharing of information did not involve any contract. Abbott finally used the knowledge about the compound as an inspiration for the design of a library of derived compounds.

Screening of this library led to the identification of ABT-594, a compound as potent as epibatidine but lacking the side effects. An article on the drug was published in *Science* in 1998. So you see, a 5 year dela and, in 1998, this is the article about the derivative [referring to slide]. Of course, all press publications made reference to the frogs even if there had been no research directly on the frog for several years. There was a major hype in media coverage and print, radio and television. TV stations were disappointed that they did not find any frogs at Abbott. The idea that a frog would yield a painkiller was even celebrated in song. Paul Simon wrote "Nothing but good news, there is a frog in South America whose venom is a cure", which turned out to have been too optimistic, as ABT-594 never became a cure for pain. Press coverage led to accusations of biopiracy. I won't go into the details, that raise the question whether access had been legitimately granted in the 1970s and whether traditional knowledge was used. The claim against Abbott, of course, failed. Although the Ecuadorian State had no real claim, the hype persisted.

We can draw several lessons from this case that I want to do with the remainder of my time. The first is that Daly and colleagues had gathered samples not only form Ecuador. Before they went to Ecuador they had been in Colombia and in Panama. Over the years, the frog alkaloid program would become global in reach. They collected frogs and extracted skins from Panama, Colombia, Ecuador, Peru, Venezuela, Brazil, Argentina, Madagascar, Australia and Thailand. They collected toxins from more than 60 species. Among the potentially interesting species, of course it is not surprising that they preferred those which were accessible. So when Daly laments the restrictions imposed on access to neotropical frogs from Central America and

South America, he suggested a pragmatic way of dealing with the obstacle: going somewhere else. This is what he said: “The research has been hindered by difficulties in obtaining permits, for this reason our research has shifted to bufonid frogs of Argentina and to mantellid frog of Madagascar”. It is not surprising nor it is *per se* something bad, but it is an expectable outcome. So the goal of minimizing the transaction costs, as Joe would say, involved collecting specimens and resulted in “forum shopping”, the term that legal scholars use, in “forum shopping” by the researchers. Since many species can be found in more than one country, “forum shopping” is presumably a common practice in the bilateral approach. It may lead to a “price war” between neighbor countries, driving the price down.

Another lesson is what I call the “unpredictable trajectory of information transmission”. In this case Abbott dismissed the claim of biopiracy, saying that they owed nothing to Ecuador “because it merely got its inspiration for this drug by reading a scientific paper about the frog chemical”. That is presumably true. It also suggests that under a bilateral approach to ABS, it is impossible to monitor what the Nagoya Protocol calls “the subsequent applications of genetic resources”, given the enormous variety of uses downstream, years after the original access. Usually, the relation between first access and commercial use, is anything but a straight line. There are many institutions involved. It takes a lot of time. In many cases, research fails but the bilateral approach places the responsibility for compliance downstream . The bilateral approach does not recognize how difficult or impossible these trajectories are to predict.

As a consequence of uncertainty, Provider countries can only require guarantees at the point of access in the very first moment. As we all know, the guarantees required at the point of access are very tough, leading to difficulties for researchers trying to access resources *in situ*. Even despite the fact that the nature and the amount of any benefit is unknowable at the outset. Frustration may lead to illicit access because of the difficulty to do it legally. Our suggestion is that a system of bounded openness would have permitted Daly’s research, since it couples an open access to genetic resources with the mandatory disclosure of having accessed natural information.

I have also come to the conclusion that the regulations of the current ABS regime would have impeded Daly's collection for a very different reason: scientists often employ a trial–and-error method in the field. In this case, the researchers decided which species to collect by touching the frogs and then tasting their their fingertips with their tongues. If it burned, it was an interesting frog species! It would have been hard to get a permit for such a method as one would not know before field experimentation which species to collect. I suspect in most cases, if you cannot state in the ABS forms the species which you intend to collect, you will not get the permit. So this is another real problem of the current system.

As previously alluded to, the frogs don't produce their poison in all circumstances. The poison depends on diet. So local, specific and ephemeral conditions became decisive. Only a few frog populations ever exhibited these toxins. So it was biodiversity below the species level, which could be preserved. Daly et al were not able to use the skin exracts at that time, but cryopreservation at -5°C, did allow them to maintain their irreplaceable sample for possible future use. Such a scenario is somewhat common in natural product chemistry. Epibatidine may be an extreme case but is hardly an exception. One does not know the biochemical content of genetic resources *a priori* but improved technologies for storage render the samples potentially useful for almost an infinite period.

The temporal dimension creates a dilemma for the bilateral approach. How to negotiate contractual conditions, based on values which cannot seriously be calculated in advance? Under a system of bounded openness, you do not require any *a priori* valuation of genetic resources. You only wait until there is some commercial success, before that you don't have to do anything. With significant success, royalties are shared among the countries which could have provided the resource. In this case, it would only have been Ecuador because no evidence exists that the alkaloid ever existed in other populations. Although the same species of frog can be found in Peru, too, it is unlikely that the same local conditions, which were decisive, would also be found there. Benefits of epibatidine have been quite indirect, so far.

Despite the media hype, no derivatives are on the market. Epibatidine itself is sold in bulk as a chemical compound for, in this case in Germany you can buy 5mg for 200 euros, so it is not really a huge benefit. What is the monetary value of frog alkaloids? Prior to epibatidine, there had been no expectations of an economic value at all. Afterwards, the expectations were inflated, much too high, and have never been fulfilled. As I said, no derivative is on the market. Several related compounds are being investigated. Of course, if they will be considered derivatives in the understanding of the Nagoya Protocol, is another question. For scientists a derivative normally is modified, but for the Nagoya Protocol, a derivative is not modified in its molecular structure. There are other related compounds being investigated currently but nothing on the market.

Epibatidine helped to open a new area of research into nicotinic analgesics, which had been unexplored. How do you measure the value of inspiration for research? How do you measure when there have been no monetary benefits so far? The indirect benefit is the contribution to pharmaceutical research. That [pointing to slide] is an overview about compounds which bind to the same class of receptors. All of those articles refer to epibatidine as the starting point for this line of research. There has also been much basic biological research into the chemical ecology of poison frogs. More than 800 poisonous alkaloids from amphibian sources are now identified. Some can be found in insects as well. Again, although they contributed a lot to research, monetary benefits have been absent so far. [Pause].

In the case of epibatidine, only in early stages were material samples required. Afterwards what was needed was only information on the mechanism of actions and the molecular structure. In this COP, there is much talk about synthetic biology. But I wanted to highlight that synthetic biology might be one step more but in no way is it a game changer. This case [referring to *Epipedobates anthonyi*] was like old-school medicinal chemistry. Still it was use of informational resources. So, it is far beyond and far earlier than synthetic biology.

My conclusions: Bounded openness could do justice to both Users and Providers. It would reverse the burden for the access. At the first point, it

would be much easier and in the highly unlikely, even in the case of promising compounds, highly unlikely case of commercial success, the mechanism for benefit sharing would kick in. So it would make life easier for most people.

Thank you very much.

TIME: 0:50:35 - 1:07:09

Sabrina Safrin: Thank you Claudio and thank you Manuel for bringing us all together. I love to write and think about technology but, unless I have my 14 year-old son with me, I don't like to use it. So I will not have a Power Point Presentation. I must say that of all the legal issues that I have dealt with in my life, and there have been many, "Access and Benefits Sharing" for genetic resources has been by far the most difficult. Much more difficult, for example, than the issues that we faced in the negotiation of the BioSafety Protocol. So, if nations individually and the community of nations as a whole, and we in interested civil society, continue to grapple with the issue and to experiment with how to achieve fair and equitable benefit sharing, we are to be forgiven because the issue is actually very very difficult. On one hand, it doesn't seems fair that corporations should be able to patent goods from natural resources without providing some measure of compensation to the holders of the raw genetic material. This is an equity point. Moreover, as those of us who are concerned with habitat destruction feel, and Professor Vogel has so persuasively argued in many of his writings, habitats are under stress from logging, mining and drilling. If we could make some money off raw genetic material, we could counterbalance or at least push back, on the economic incentives to plunder the environment, so this is our dream. On the other hand, how can we make money off raw genetic material?

The Convention on Biological Diversity grappled with this issue and concluded that genetic resources are really no different than other natural resources such as oil, gold and timber. Sovereigns could and should control access to genetic material much like they controlled access to these other

valuable resources. But are genes really like oil? While genes have a tangible component, a minuscule combination of chemicals, in many ways genes share more in common with an intangible good like information or perhaps air than they do with a typical tangible natural resource likes oil or gold. First, as information, the use of genetic material is non-rivalrous meaning in that the use by one person does not diminish its ability for the use of others. Second, one need not fell a forest to access its genetic material, a small quantity of genetic material suffices: a leaf, a twig, a spoonful of microbes, a fish. Third, the same genetic material will usually appear in the multiple countries and among multiple peoples. Fourth, what is been sought is really the information in the cell---nature's blueprint contained in that cell--- and, in fact, in millions of other cells. The challenge presented by the CDB is how to take an abundant non-rivalrous resource and make it scarce. This has led to burdensome access regimes where countries try to control the flow of genetic resource from their countries in the hope of capturing the economic value of the resource in the event that they might prove valuable. The extent of sovereign-based access regimes suffer from I have called hyperownership---too much ownership. But these regimes are not, as I said earlier, solidly grounded on the desire to make money from genetic material, but that would be wonderful. They also had been promulgated in reaction to hyperownership on the intellectual-property side, particularly the patent side.

For several decades the United States, in particular, allowed excessive ownership rights over genetic material. Thousands and thousands of patents were issued to unimproved isolated and purified genetic sequences. I have often been asked how does one patent a gene? Well the gene in my hair that makes my hair curly cannot be patented. However, what some scientists and corporations had said was that if the gene was isolated and purified, that isolated and purified gene does not exist in nature. It sits in a Petri dish and that isolated and purified gene could be patented. Finally, in June 2013 the United Supreme Court, in an unanimous decision, declared that isolated and purified genes and genetic sequences could not be patented because they were a naturally occurring substance or natural information. In a single day, the

United States Supreme Court struck down thousands of patents over isolated and purified genes as well as rendered obsolete thousands of pending patent applications. Moreover, a series of changes to US Patent Law that allows for post-grant procedures and the tightening of standards for obviousness or inventive steps has made it more difficult to obtain and maintain patents in the United States. While for many years the mantra in US Patent Law was "if you could name it, you could claim it", that is no longer the case. Thus we see some stepping back from hyperownership on the intellectual-property side. This may provide an opportunity to rethink some approaches on the ABS side as well.

Much credit goes to Manuel and Joe for their work on genetic resources as natural information, pressing us to think of an alternative model. It seems to me that there are three ways we could go from here. The first is to continue on our current path, which is that of a sovereign-based largely closed model. We assume that access to genetic resources should be controlled and closed, with open access being the exception such as open access for certain plant genetic resources for food and agriculture. And there are some positive signs that the current approach is working. I am heartened to hear, for example, that law firms in the United States are now saying that they need to advise clients on how to comply with access and benefit-sharing regimes. Amazing.

A second model would be to have a more open system. We would assume that unimproved genetic material, like most information, is generally open. A third approach would be something in between - an "open but" model. Manuel, Joe and Klaus have put forth an idea that access to genetic material should be open, accessible to all, but not free. Under this model researchers can access genetic material without going through a national PIC [prior informed consent] process. So, you wouldn't need a bioprospecting permit or the need to negotiate contracts up front. However, I note that this is not a license to trespass, even in the old open system. Researchers couldn't just sort of wander onto people's fields, take things off shelves or things like this. So what they are talking about is not a trespass model. It is that you don't go through a permitting contract negotiation up front, you still have to get the permission of the community or person from whom you are taking something from. So it is

not a license to trespass. Were products commercialized from what they call natural information, payment would be made into a fund.

Now I have five legal suggestions or thoughts for this intriguing approach. Normally lawyers offer three so two are extra, I also have one cautionary observation.]While the book calls for the application of this system to a broad range of IP rights, including copyright and trademark, it seems to me that this may go too far. Every time a poem or song is inspired by a tree or a trademark that has something that draws from natural resources, would it somehow be captured by this natural information model? It seems like the main point should really be on patents and also trade secrets. Second, I think we would need to have a clear definition and not an over-broad definition of what is meant by natural information, because a huge amount of information is natural information. Third, and here I would diverge from my respected colleague Joe, I think we will have to content ourselves with small payouts. It occurs to me that this should be done through a combination of two mechanisms. One, a small conservation fee levied at the time of patent application for pharmaceutical biotech and chemical compounds, which could be scaled so that companies pay a higher fee than say an individual. So a small sort of fee that goes to conservation. And second, a percentage of profits when something is in fact commercialized. Joe suggests that it could be something like 15%. I did not have the benefit of his slide when I was reading the book, but my reaction was exactly the opposite -that we would probably be looking, when we expand the universe of things covered, that we would be looking actually at a very small percentage. That way we do not get a lot of push back. Essentially, we are expanding the universe of what is covered but everybody is paying a smaller amount. So maybe something like a quarter percent or a half percent. Fourth, users need to feel good about this system. We need to be clear that this is to encourage habitat preservation. I was thinking about a person in Arizona, where I grew up, who derives a product from a lemon growing in his backyard. He or she would not feel that they owe something to an international system. The person would feel like: I planted the lemon tree, I took care of it, I discovered something for it, I paid exorbitant fees to obtain a patent and even more to defend a patent, as well as to commercialize a product. They are not going to feel that they owe something to an international

fund. But if we could cast it as part of being a good citizen of trying to put money back for the conversation of natural resources the world over, particularly in places that are facing habitat destruction, we may face less push back. Fifth, it would be wonderful to tie this idea to green certificates and other good corporate governance certificates, such that if corporations participate in this system, they would get a gold star so to speak.

Now my cautionary observation: In some ways this model calls for more propertization at the time when finally we are seen a step back from "propertization" in the intellectual property space. I for one argued against the patenting of isolated and purified genetic material, and now we are in a situation where, in fact, that is happened. You can no longer patent these things, they are un-owned. Propertization can often work in a kind of cascading fashion: the more we propertize things, the more things become property. Indeed, genetic resources had this propertization dynamic. There were so many intellectual property rights over genetic material, the response by developing countries in particular was that if this is all covered by intellectual property rights, we also want property rights. Now interestingly, we have a major biotech country, the United States, stepping back and saying: developing countries are right, there is too much property here and rolling it back. It is rolling it back, just at the time that this proposal by calling genetic resources natural information actually creates more property. That is from a legal perspective, not from economic perspective. Law is a lot about line drawing: when is something owned and when is something not own. The intellectual property regime left most information and most knowledge unowned. This is basically saying that all genetic resources are natural information, which it views as a new form of intellectual property, and if a person derives something from it even forty years later there should be some sort of fee. So that is a cautionary concern about what is a very creative proposal.

Another something in between, something between hyperownership and open to everything, might be some kind of tailored ownership system. Perhaps instead of trying to control everything, governments should try to think about what resources in their country are likely to prove valuable. So, Malaysia did

this with, I think, some trees or perhaps pursue something that is more of an ecotourism model, where a country tries to make themselves a go-to destination for bioprosepectig. Come do bioprospecting in our national parks, here we have done some initial assaying, we done some collecting, something that tries to add some level of value. That would be an alternative sort of intermediary model.

Finally, I am going to be hated for saying this, but those of us for which this is a dream, a dream of which I am one, may have to content ourselves with small amounts of money. The genes are not like oil or gold, they are too plentiful, they are owned by too many and it is too unlikely that any given gene will ever produce an economically valuable product. That doesn't mean that there isn't money there but it may not be in this, the kind of the dream, the dream, the dream range.

Thank you.

TIME: 1:08:23-1:25:50

Claudio: Thank you very much Sabrina. That was very insightful and I am sure that everyone is keeping questions for the many interesting points that you have just raised. Now I would like to invite Prof. Graham Dutfield, also to share his views on this particular topic. Prof. Graham Dutfield is Professor of International Governance at the University of Leeds. He has been writing and working and doing research for the past thirty years at least [laughter--twenty, twenty,---he's not that old--laughter].

Graham Dutfield: First I would like to thank Manolo for inviting me and also to IRDC for paying my airfare. I much appreciate it. Ok. What I am going to start off doing is to go straight to the language of the CBD on genetic resources and try to explain, rather than from a political perspective, but from an historical and scientific perspective, why that language is there. And then why it is so outdated now. And then I am going to talk a little bit about the whole information idea in relation to biology and environment and nature. And then finish with a few points about patents and ABS, etcetera. OK. Well,

if you go back long enough in time, you may well know about Gregor Mendel, how he discovered the laws of hereditary and for a long time before the age of molecular biology, genes - well he didn't call them genes, that was Johannsen in the early 20th century - genes were an abstraction. They had no chemical identity all. They were assumed to be there, somewhere in the nucleus, but what they were was a complete mystery.

And in a way we have sort of gone back to that.

So, molecular biology, in a sense, gave genes a chemical identity. What are genes made of? Right. In terms of sugars, phosphates, bases, etcetera, etcetera. That is a chemical question. But also they discovered that DNA is itself a kind of code, comprising bases, of four-letter bases. So, they were objects, waiting to be discovered, they were like beads on a string. You had a long string. You were looking for those beads.

Now if you go to the language of the CBD: "genetic resources", they use the term "material," clearly physical. But what I think is interesting is not just the word "material" but also the word "functional" and the word "units." "Functional units" that are "material." They are things. Each one codes for something. Right. Each is assigned a discrete function.

And so the Human Genome Project was launched, coincidentally, only a few years before the CBD. I think to understand why we have the language we have, we needs to understand what the Human Genome Project actually represented. What it sought to achieve. It sought to find what they thought were a 100,000 human genes, that amount was the rule of thumb. These were 100,000 beads on the massive string which is the human genome. And for years, newspapers were talking about genes for this, genes for that. Presumably, the stuff that wasn't genes was junk. It was information-free gobbledygook. It was worthless rubbish, nature being wasteful.

Well things have changed quite a lot since then. As I have said, in a way we are moving toward a sense of "we can't pin down exactly what a gene is". Sometimes it is not that difficult. Other times it is incredibly difficult.

Just to put my own cards on the table, I would say, yeah, they are information, they are chemicals, and they are hybrid objects. They are hybrid objects, which of course as we will see raises a lot of difficulties in terms of patent law. So, you have introns, the bits that don't code within and outside the gene. Are they *part of* the gene when they are *in* the gene? Or are they not part of the gene? There are genes that overlap. There are genes that are embedded in other genes. By alternative splicing a gene can code for more than one protein. We can actually argue they are separate genes, even though they "borrow" the same bases. Vast amounts of DNA are transcribed but not translated. The role of RNA: RNA, it has an editorial role, you might say, but they can perform enzymatic functions as well, which is becoming increasingly appreciated.

So, in an article that I read in Nature published about ten years ago: a fantastic article, which a lot of this comes from, basically. It says genes don't necessarily have a distinct boundary. RNA is transcribed from DNA bases, its "letters" (codons) can come from very distant parts on that "string", on that genome. How does that happen? Why? We don't yet know. But Nagoya still talks about the genetic and/or biochemical composition of genetic resources. Nagoya is sort of even worse than the CBD. I find it even more confusing. Is this progress?

Now all this kind of stuff I find academically fascinating. It has certainly provoked what you could say a healthy debate in a number of areas. But it hasn't changed policy at least in terms of the CBD and ABS.

So let me go through some questions in turn. What does it mean to talk about information in biology? What are the implications of information talk in biology? Do genes have a special place? Is it especially information in a way that other things at the molecular level are not?

Now there is a philosopher of biology called Paul Griffiths; according to his "parity thesis" you basically say that notwithstanding the A's, C's, G's and T's and their correspondence with amino acids, genes are no more "informational" than proteins, hormones, chemical *messengers* (that term "messenger" is chosen quite deliberately!). And beyond these, there is the environment: ecosystems. There is information in ecosystems, species, in landscapes.

That got me thinking about the idea of signposts. You could talk about signposts. As a scientist is looking in a way for signposts. Signposts are like genes and are physical but they are made of wood or metal but they also have text in them, pointing to certain things. Velcro is an example of the human expression of a kind of natural signpost, you might say, but it still took a person to make the connection, obviously. It is a matter also of human cognition as well.

It also got me to thinking that I should say something about indigenous peoples in this. Now, indigenous peoples who have lived in an area for a long long time, over many many generations, can read the landscape. Hugh Brody wrote a really nice book, where he explains that they can read the landscape like a book, like a text. So, for example, if you find some animal dung somewhere on the path, you how many hours ago the animal went past and maybe more information about the animal it came from. So, there is information in ecosystems as well.

So, in a way I am trying to pull away from privileging the gene as being all that special. It is. But even the gene, what affects gene expression is also environmental factors. Whether a crocodile's egg turns into a male or female crocodile depends on things like temperature. So, genes are information but they are very much incomplete. And they need to be combined with information on other levels. We are not quite sure if the whole genome itself provides all the information you actually need. For phenotype, probably not. I would say definitely not now that I think about it [laughter]. OK. Thanks. I will have a sip [drinking water, laughter].

Of course, all of this makes data even more important, not less important. Because, if you want to seek commercial possibilities you need to combine data at the genetic level with the omics disciplines, other areas of molecular biology. You need to have data, you may need to have environmental data: when do plants produce a certain useful compound? That might be information you can get from people. Well that is information for you to find out. All of this information can be uploaded on to a computer. And combining with other data gives you massive access that you cannot get from just one source. You can sequence all the genomes of all life of the world, but that is just data until you know how to interpret it. And that data is easier to interpret, to actually find useful, if it is combined with a full range of other types of information.

OK. Enough of information, let's move on to patents. When it comes again to genetics, as was talked about earlier by Sabrina, in a sense, the precedent of isolation and purification is actually quite wrong. Complementary DNA is not, well, pure. What is it a pure version of? If we are even not quite sure what a gene is, we don't know, it is not a pure version of anything. Yes, it has a utility. Isolating DNA does not enable you to do all the things you can do with cDNA. So it is different in terms of how it can be used, but in another way it isn't really different. Now, a difference I should mention also between the United States and Europe, now, is that Europe, because we rely on the doctrine of technicality, whatever that means, you can patent a copy of something that exists in nature, whereas in the United States you can't. So for example, something that is "natural" in one way or another. Isolated DNA is patentable in Europe even though the sequence is the same as what it is in nature.

Interestingly and similarly, the technique for making Dolly the sheep, right, the cloned sheep, is patentable in Europe and the United States. But you cannot patent the animal in the United States whereas you can in Europe. Why? Because each cloned animal is identical to the sheep or animal that donated its nuclear DNA. So it is not new. It fails the novelty test. Suffice it to say that Europe and the USA are both, I believe, totally confused and not

entirely coherent, but in different ways. I completely understand why that it is.

Finally, the last thing I want to talk about is: what does this imply for ABS? In what sense does industry actually utilize genetic resources, which is the third point I wanted to make. Well if you look at it, you really need to find this out. I have seen the recent work of Sarah Laird and Rachel Wynberg: when it comes to pharmaceuticals, Big Pharma is increasingly interested in microorganisms, often extraterritorial, outside anyone's territory, the sea, but are not that interested in plants. Plants are out of fashion but microorganisms are not. One of the reasons why is that quite a lot of plant metabolites, that are assumed to be manufactured by plants, well as with us, we are a macro-ecosystem ourselves, we are full of all sorts of life forms which we actually need to have so that we can digest food, etcetera, etcetera: well, some of these plant metabolites are actually made by microorganisms that are in symbiosis with plants. So, hence the interest in microbes.

Small firms, yeah, that is a bit different. Some do have an interest in direct access to natural products including plants. Of course, Big Pharma is the industry that is more effective than any other industry we have ever known - possibly - in accruing massive profit margins. They do make huge money to potentially be shared. But of course there is this whole issue about handing down obligations when they are not the ones doing the bioprospecting: often that's the small firms or the public sector. It becomes an interesting challenge that I do not know the answer to.

OK, so sovereign rights over genes is not a simple matter. I mean: Is it just the stuff? Or is it the information? How can you actually have some rights over information that you haven't yourself discovered? Basically, in a way it is a similar problem with chemicals: it is out there in that stock of biodiversity, but you don't know what's there. That's true whether it is information or physical stuff. Economically, there is a difference. But in terms of policy it is a common problem: ideally you have to know what's there before you can actually negotiate to make any money out of it, I would have thought.

So, yeah, time for a substantial re-think. [applause]

TIME: 1:25:51-2:10:34

Claudio: Thank you very much Graham. I think Manuel, maybe, will want to explain some of the dimensions of the proposal of bounded openness as how it can solve some of these problems and question marks that we have discovered through the various presentations. Please, the floor is yours.

Manuel: What I would suggest, Claudio, is that if we have a few questions, as I would imagine that there are a couple of questions, we can take them.

Claudio: Of course. I can see there are some burning questions.

Participant from Audience: Katharine Bernet from the ICC [International Chamber of Commerce] It was a fascinating discussion. I thank you for that. As you mention the IP system gives owners of IP a certain market power and because of that, there are cheques and balances, so that IP systems are circumscribed. You can't get, for instance, a patent of [inaudible].... There is a duration in time. Trademarks can only protect certain in certain instances.... So I don't know whether you have extended your analogy of genetic resources can take that into account? Or whether you follow through what checks and balances of your system that can protect the interests of users as well as providers?

The second question is concerning value. An intellectual asset in and of itself does not necessarily have value, physically. The value comes from what the end consumer, whether it is a business or an individual, is willing to pay for it. And between marketing, packaging, etcetera, and that point there is a lot of Research done, a lot of development, packaging, etcetera. The value comes from what the user is willing to, so I am just wondering how you factor that into account.

And the last question is: Are you thinking of your complementing the current bilateral approach or replacing it?

Joseph: I will take the last question first. There is a very simple answer: Replace [laughter]. The second, regarding market forces: in the slide, if you look at the demand side rather than the supply side: quite often we hear that, oh, the pharmaceutical industry spends a billion dollars in investment in Research and Development and well, all we can offer you is a 1% royalty because we've spent all the money.

Well, that can be identified in the history of economic thought, as the "Labor Theory of Value" of Karl Marx. I don't think that the pharmaceutical industry is advocating the "Labor Theory of Value", but that is what it is.

So, there are market forces. In that slide where we saw the demand function, the demand curve [pointing to the graph on the slide]. Below the curve, at the price level, is the consumer surplus. So that the 15%, in answer to Sabrina's comment, that, maybe, that is too much---it is actually very little. That was the point of Valeant. Valeant raised the price ten fold. So you can charge something much more than these peanuts that we have been receiving.

The last point, Users and Providers, checks and balances: economics is very abstract. We focus on patents and pharmaceuticals because that is where we perceive the highest profit margin. But there is is no reason why the same model would not apply to copyright. There is no reason that we should pooh-pooh it. Think of Avatar, that movie grossed a billion dollars and it is very obvious that there is a lot of biomimicry involved. So those are my short answers to the very good questions.

Claudio: I think Michael, followed by Pierre [signaling to them in the audience]

Participant from audience: Michael Halewood (?? please double-check the audio file to confirm or send it to me and I can recognize the voice if it is really inaudible, thanks!) [last name inaudible]. Thanks a lot for putting this together. I am sorry I am asking this question without having read the book. What I don't understand how this actually works. The quickest way to drill down my question is: What triggers the obligation to pay? One of your slides shows that there is no need for monitoring. I am not sure how that works. What is the trigger?

Joseph: We do have a slide! We didn't show it [laughter]. What triggers it? At the point of applying for the patent or whatever the intellectual property right, you disclose not what the species is, but just whether or not you use natural information. Most patents do not result in any commercial product. If that is the case, then there is no transaction costs whatsoever.

If there is a commercial product, then there is a negotiated royalty depending upon what is the combination. Remember there are different intellectual property rights, different economic sectors, was it direct or indirect? So one would apply that royalty rate. The monies would go into escrow. At the point where the sum makes it worthwhile to determine what are the countries of origin, then there would be disbursement.

The reasons for the disbursements is not so much to provide benefits for conservation. Quite often what we have to do is just align incentives. So that there are no incentives for degradation. If degradation pursues in a country of a transboundary resource, then their claim starts to shrink. So we are aligning incentives.

Frankly, as an economist, the best use of the funds is not conservation; maybe for clean water or vaccinations? We have to be very careful when you earmark money, funds, that is not fungible. Those funds would have gone to vaccinations anyway. We are trying to align incentives.This is from Manolo's book [pointing to projected slide] which gives the schema of what is triggered and this is in the case of a patent application. [pause]

Participant from audience: (Pierre du Pessis). In the negotiations to improve the working of the Multilateral System of the International Treaty, The African Group has been arguing that 0.3% of global seed sales would would bring in about in aggregate $50 million in a regular predictable income without anyone anyone really notice a price increase in their daily bowl of rice. There is a high level panel estimated that 0.2 % of global GDP, a fraction of 1/500th, would bring all the funds needed to save global biodiversity. So we have industry arguing that all this is absolutely too expensive to do. So, I am picking up on what Sabrina said about spreading the load and keeping it small on everyone. And the reason I raise the seeds sales. When we went to seed industry, they said: Why don't you just collect it on the food sales because we sell $5,000 worth of tomato seeds and the farmer grows 2 million dollars of tomatoes? It is really good question. I don't have an answer for it. Pennies on the pound for tomatoes, potatoes and all the other products of biodiversity, It is not hard to do an accounting on that. You wouldn't need to do an accounting on the genetics. Why don't we collect it on all the other products of biodiversity.

Natural information and the use of gene sequences and the royalties to pay. It is not hard to do in an accounting of it. So you wouldn't even need to do all these calculations. You wouldn't need to calculate the distribution of the genetics. You would calculate at the point where biodiversity makes someone a profit.

Is that a simpler model? [inaudible]Your model is simple. And I am very much a big supporter. Would it be simpler to [inaudible]. Wouldn't it be ultimately simpler to connect if we [inaudible] all profits on biodiversity.

Sabrina: I guess I will take a crack at that intriguing question. I guess they are saying that to put it at the time of the sale of the tomato, what they are suggesting is a sales tax or VAT, so that consumers would see it. I think we would be expanding the universe of pushback as we have a lot of foods are now taxed at the time of sale. Where as if we sort of move it. I actually love

the idea of 0.2% at the time of the seeds sale or something of this sort. I don't know whether it would be more doable and I don't know why there has been resistance to it as this is really a small amount. This is at the point of people who are most able to make profit off of genetic manipulation.

Joseph: If I could add, from an economic viewpoint, our model looks at where there is value added and rents, economic rents or profits. On tomatoes you are looking at much more competitive market. So what we feel, is that by having the royalty on intellectual property rights, especially where there is a very high profit margin, then what we will see is that the consumer will pay more but the consumer is benefiting, so he should pay the costs associated with the benefit.

Claudio: There is a question down there.

Participant from the audience: (Geoff Burton). Don't you think that the concept of bounded openness, a unitarily centralized system, has more applicability to the utilization of genetic resources beyond national jurisdictions rather than within jurisdiction? AB&J if you like. It seems to me that tying it to international jurisdiction that, as you propose, has a flaw that opposes the development of consensus. And that is this: When nature comes up with solutions to problems, it is sometimes unique, but very often it is quite common. So a gene that gives rise to Taxol is also found on a reef in the tropics. Not just on the Pacific yew tree. So if the benefit comes back to the countries of origin, you have instantly exhausted the economic value of that gene in other organisms in other places. So, if for example, it is comes from tropical species, and it is found in a different species but in another tropical country, that country may feel that it is going to lose out. You have created a hazard, if you like, with that system. I would think that there would be a number of countries which would be very reluctant to, if you like hand over the prospect of benefit from what whatever they had to somebody else because genes are not necessarily promiscuous but are often found in other places. Whereas in areas beyond national jurisdiction which is under negotiation right now, that particular problem does not happen.

Joseph: You have the more serious problem that one country will underprice the other. So in the case of paclitaxel, it was found in *Taxus bacatta,* I think and later in *Taxus brevifolia*. So, the countries of origin would expand. Each country would have a bit lower remuneration but they would expect reciprocity in other examples where the latter country was the source of the material from which the information was derived. I really think that it is a benefit that is recognized in the transboundary nature of genetic information, natural information. And that you are not going to foster this price war, whereby it behooves a company, whose fiduciary responsibility is to their shareholders, to source the natural information from the country that is most amenable to sell cheap.

Participant from the audience: [Name inaudible]. Thanks for organizing this really timely and interesting discussion. For the cartel solution, where there are shared or even unknown but potentially shared resources across boundaries or impossible to know who owns what? But if there is cartel formation, what is the value proposition to the User? Does it actually become a prescription service? Where the cartel says you, company, may take anything you want for a set percentage of anything you make, from anything you take? Now, there is still the traceability problem. But let's say, if the goal is let's reduce the transaction costs, and the potential cost of litigation to zero through a trust relationship. You can have anything you want but you pay a percentage of any thing you produce. Is that the end member of where this process could end?

Joseph: I would say basically yes. And that percentage will have to be negotiated depending on the combination of characteristics. What the Users get out of this? The elimination of transaction costs which are hampering the emergence of many technologies and also funneling them into the united States where the genetic resources remain *res nullius*. I believe that under a Trump government that they will remain a *res nullius* [laughter].

Participant from the audience: [Name inaudible]. Just as a follow-on. This solution creates an incentive for the companies to invest in the local technological development to reduce their costs of collecting, discovery, protection. That sets up a very beneficial incentive rather than the adversarial relationship of we are afraid you are going to steal something, so we are going to make it as hard as possible to find it. Now we are going to ask you to help you find it and benefit in the process.

Joseph: That is right. Exactly. And if it is so widely disbursed that it is not worthwhile to determine who are the countries of origin, it would go to the infrastructure. That if it is so widely disbursed, it would be self financing. Then the monies should go to offset the fixed costs of the biological inventories necessary to make the system work.

Participant from audience: (Geoff). Yeah, you refer to biological inventories. We are in a situation where a very significant number of species in the world have not yet been named, described, found and particularly in microorganisms, small organisms and, of course, there are symbionts and pathogens. It is one step or two steps beyond that. You are surely going to be disadvantaging countries which are knowing less about their biodiversity. So the poorer countries that are not putting money into discovery of biodiversity are going to have less money yet to carry on. Whereas the countries which have more money to discover their biodiversity are going to benefit more. So, aren't you developing a divisive system rather than a system that is going to benefit conservation...

Joseph: I think that you give them an incentive to see whether they do have that transboundary resource. There are all sorts of models that can be used to see whether a species is in a similar habitat. And if they do have it, then they have a claim. Rather than see it as divisive, it very much promotes cooperation. One of the early criticisms against INBIO in Costa Rica, was that the genetic resources of Costa Rica are largely found in Honduras, and in Nicaragua and Panama. Why should INBIo get all the benefits? So in this type of system, if there is not natural information endemic to Costa Rica, that base,

that rent, would be shared. INBio provided a lot of value added resources, value added to that natural information and for that they would be compensated. So, we are just looking at the base, the base resource being natural information.

Claudio: Gentlemen.

Participant from audience: Gunder [last name inaudible]. Very interesting. Just a few thoughts. First of all, I might have missed it. I didn't hear you talk about what for me is the most interesting thing about the Nagoya Protocol, which is traditional knowledge.. How would that work in this system? I may have missed it The second thing is that you try to solve one of the two major problems is the bilateral system. The other major problem for me is the linkage with the value creation. Where the actual value is created. That can be a very direct link. So, I think it might be interesting to step away from the concept of linking a certain genetic resource as information where the value is created and go toward more, let's say, a more, where-you-pay-for-accessing genetic information as such without linking it to the one you actually use. This could work not in place of the Nagoya Protocol, but in that that case, you would have the information part for the multilateral system and you could keep the bilateral system for traditional knowledge.

Joseph: With traditional knowledge, in the 2000 book, that was funded by InterAmerican Development Bank and USAID, the book was entitled *The Biodiversity Cartel.* And there are actually two cartels. One was with traditional knowledge is also transboundary. So why should the ethnic group of contact, receive the benefits? And because it is transboundary and information, you have the same phenomenon, there is a fiduciary response of the ethnobotanist is to source it at the cheapest source. In Ecuador there is the famous case of *Bansteriopsis caapi*, ayahuasca, where supposedly the shaman received two packages of Marlboro cigarettes for his traditional knowledge. But perhaps it was only worth two packs of Marlboro cigarettes because that knowledge had fallen in the public domain for centuries. With traditional knowledge, one has the real problem of ascertaining what is already in the

public domain? Well if it is not in the public domain, well then, and is diffused among communities, the solution within the Intellectual Property Regime is to try to maintain it confidential and trade it as a trade secret. But to do that requires a lot of infrastructure for which there seems to be no willingness to fund. It is much more expensive proposition, probably a biodiversity cartel over ancestral knowledge that has not yet fallen into the public domain.

Claudio: If I may, I have a question, actually two questions for Manuel. As you know, we are in a phase where the Protocol has been ratified and is entering into force. From a practical point of view, while it is really interesting to think outside the box of other models that would work better, what would be the advice you would give as of today, to countries thinking of setting up their own ABS system? So as to minimize the negative aspects of the bilateral access system. I am thinking of what could you do with the genetic sequence data if there were a community of users who were willing to be proactive in that sense. What kind of best practices? Or simply advice with respect to that. Practical things that we can do today.

The second question is what are the practical things that you would recommend that would lead us from our current situation to where we get to a better model, noting the difficulties of that. I am thinking of the FAO Treaties, for instance, that since 2001 we have a list of crops in the Annex which are shared. In the Annex there is no agreement in expanding that apparently, until now. So, there is a clear reluctance. The political possibility to make it happen remains quite slim. And in terms of the benefit sharing. We are discussing now on how to change that system. The monetary benefits, at least, they have not come to fruition. So, there are some practical questions that have to be addressed. My questions are really from a practical point of view. What should NGOs, countries, Users, do that responds better to conservation, fairness, and equity and sustainable use?

Manuel: Thanks, Claudio. It is a tough question. I have had my own doubts in terms of the practical and political viability of this. I know it is an uphill battle. In fact in my personal case, I was involved in developing the original

Andean bilateral legislation in the early nineties. To some extent, I think I am responsible for that model evolving. But a few years later, I have come to realize that we need to take another course. I think it is a tough choice. But we actually use in the book a proverb, a Turkish proverb, in terms of "no matter how long you have moved in a certain direction, if you are not going in the right direction, just turn back". That is easy to say but difficult. Where you have a ball moving in a certain direction. It is very hard to pull back. But once we start looking and analyzing some of the examples that Klaus has provided, and some of the sort of conceptual elements, which this type of approach brings together, I think it is a win-win situation for Users and for Providers at the same time. So I would say, and I know this won't change at this COP, of that I am sure. But I think that people come to this side event could probably benefit also from people looking at these types of ideas, looking at the economics behind some of these ideas, which is something that has not permeated sufficiently even since the early times of the CBD in the early 1990s.

It is quite striking how some of this very sort of basic economic thought has not been incorporated into the policymaking process. So, I don't have a direct answer to that, but I just hope that at some point we start moving in the another direction to what I see is a much more practical solution to what we have at this moment. The transaction costs of negotiating extremely complicated contracts is just bewildering.

The first requests which sometimes countries which are developing their ABS frameworks come up with: we want capacity building in negotiating ABS contracts. [gasping in disbelief]. I honestly don't know how you can build capacities of countries when you have these shortcomings in terms of the possibilities of negotiating upfront for things, which as Klaus mentioned in his example, that occur twenty, twenty years down the line.

So, my modest hope is that some of these ideas permeate some other groups and that a few years down the line, we have some considerable shift in the thinking, and we hopefully can find an avenue, maybe through the Nagoya

Protocol and Article 10 and 11, with some creative interpretation, through which we at some point can ideally come up with a protocol which incorporates some of these approaches and ideas. So that would be my initial thought anyway.

Claudio: Thank you for much Manuel.

Sabrina: Well, I am going to try to jump in on that and maybe think of a thing. This is an intriguing idea and one approach for the interim may be to have a parallel track. So you have the bilateral contract negotiation model, but at the same time, one could start setting up a fast track. I think of sometimes when I take my kids to an amusement park. There is generally two options. I can buy a band, in which case they can run around like lunatics and ride whatever they want. Or I can pay by the ride. And I often choose the band, because it is less hassle and I don't have to deal with the transaction costs of dealing with: Can I go on this? Can I go on that? Even here in Cancun look how many people have this band. Manuel is. You can eat how much you want [from audience "or drink", muted laughter]. How many people have this band? So, if we ended up having an ABS fast track where corporations, for example, could get an ABS band and they would be allowed to prospect, utilize resources whatever it is, hat provided that they agree they could agree at a one-stop thing that in the event that in that anything is commercialized they could pay a certain percentage. We have a difference here. The lawyer versus the economist. The economist thinks, my G-d, you can charge $3,000 for a drug and I think those people are going to be hauled before Congress. Now there could be a discussion. There could be the open access what is realistically you are trying to sell the genetic arm band and you try to make it attractive to the Users and then also start off with the mega-diverse countries. If you get all the mega-diverse countries to start buying into the arm-band approach. And the bilateral thing stands side by side. If you as a User do not want to buy into the arm-band approach, then you get hassled by your children all the way through and you do it on an a la carte model.

Participant from Audience (Henrik Toft Simonsen): I am normally hanging around in a biotech lab and look at the beads and such. I actually think that this is a compilation of information. I think that is very important to understand. That it is not just a gene string and stuff like that. One of the things I find very intriguing about this is not so much that how much the companies have to pay in percentage to buy the arm band. But the fact that you will be able to build a system where the countries as such would actually benefit from actually protect and go out and study. And if you have to go out and study, you have to train some body to go out and do it, unless you want to buy my students from Denmark which are pretty expensive. Then you will have to train your own and go out and that would than give a better economy as a whole in your country. I just see that as an open access or better said open policy to your biodiversity and trying to protect your biodiversity with an open mind. And say let's look at what's out there and find out if there is anything at all. Most likely there is not going to be that much. But instead of building barriers and that is how I see the ABS system. You build these fences that in many situations, if you come from a country like where I live, where the ABS is pretty simple. Come have a look and you don't find anything because we have already been there, if you find anything then you are really really lucky and then you go ahead and do whatever you like. The likelihood that you put jobs in our country is pretty high if you are open to actually share. That is what I think, this system I don't how as I am not a lawyer of how to put this together. But I like the idea that you actually create an incentive to actually protect your things and actually go and explore. Only through that will we actually be able to explore the world as a whole. How you are going to do it in the end, I don't know but that is really important.

Claudio: Thank you for the comment. Is there another question?

Participant from audience: [Name inaudible] from Panama. If you understand that the material there is natural information, I want to comment. Who is in the capacity to understand this information today? Who is in the capacity to read, to understand and translate? Only the governments of the countries that have the technology. Not the other countries. Because it is

information that someone has to know how to read it, to know how to read it and to understand it and translate it. For this reason, just today in a presentation, I said that what I would like for the Nagoya Protocol is to improve that each country can have the possibility to develop to know what they have there. So, each country has to become to have the capacity to understand to read what is there. To understand what is there. If you don't understand what you have, then you don't know what you have you can't make a negotiation. You don't know the value of what you have. That is what I want to say. That is a major point. I come from Panama, it one of the countries that has high biodiversity. You don't know what you have there. Because you do not know what you have. If you go to hotel and pay $200 per night because you know what you will get. If you go to another country, another hotel, you can pay $1000, because you know what you will get there. But it is not so easy and I think that global institutions, or whatever, what we have to help to do is that each country develop their own capability. So that you can negotiate. If not, everyone will come, everyone will study and what you will get, you don't know.

Claudio: Reaction to the last two comments.

Sabrina: I have a reaction.

Participant from audience: (Geoff). I like to pick up on something that Sabrina said, which I think is very important. As ABS evolves it leads to be tailored to economic efficiency, to the removal of barriers. And there are several ways that can be done. One way is to maximize non-commercial research. Most research is non-commercial in its character and style. Remove barriers are. Forget about fees. Take paper work and reduce it to its absolute minimum. Instead of something that requires months and months, make it a two-page two-signature document. That has been done in Australia, because the intention was to try to make it an attractive place to do work. The second thing and perhaps the more interesting thing has come out of the work of OECD in the [inaudible] and that come out of a a mega-diverse or a low-diversity country. I can think of two examples that I can give off straight off

the top of my head. The first [inaudible] elucidates the bioactive compounds and makes them available to world's industry. The state of Queensland, which perhaps has about 5% of the world's biodiversity, access to 5% of the worlds' biodiversity, has taken its Natural History Museum contents and said "OK go for it". So they have actually put it in there and they have an ABS agreement. In Japan, there is a Japanese national institute, NIT, Japanese Institute of Technology and Evaluation, which has numerous ABS access agreements and has accumulated a huge amount of biological material which it makes available primarily to its own biotechnological industry and people have an incentive to work with NIGT because it does capacity building and it has reliable ABS agreements. I think I have got that fairly accurate as I have submitted some. So, that is the intermediate evolutionary response to trying to speed up and make the system work. I think that tailored-made is an essential ingredient for the future for us.

Claudio: Sabrina.

Sabrina: I just had two comments for two of the points that were made. The first was made for this gentleman about capacity-building and how do countries know what is there? That I think that the world we are operating in. No one really knows. It is a lottery whether something is there or not. Interestingly enough, the patent system has the same issue. Ninety-four percent of patents generate nothing. Getting a patent is basically a lottery. Maybe you will be the 6% that gets the iPhone or whatever. But that doesn't mean that there can't be value added. And that people can't try to do things particularly in their own countries. And I think this gentlemen was really point to things that things that can be done. Countries themselves, the closer that you are to the resource, the more likely you are going to be, it seems to me, to have a hunch of what might be useful and what might not. The second point that I wanted at least put some pushback on is the combination, that had been flagged by this gentlemen (indicating the man in the audience) of genetic resources with traditional knowledge. I think these issues need to be separate. I don't agree with them being linked on this slide.The reason is that CBD basically gives the nod with respect for genetic resources to sovereign states.

Traditional knowledge, the ownership interests really should remain with traditional communities and shouldn't go into some kind of of fund where the monies then goes to the governments many of whom have subjugated the indigenous communities that have that knowledge unless the fund itself would have some sort of mandatory diversion of money directly indigenous communities. But I do not think these things should be linked in this way, because of the interests, the human rights interests of indigenous communities.

Claudio: Thank you Sabrina. May be just as a quick follow-up that on that. Actually, in WIPO there is a long-standing discussion on the identification of beneficiary in the text that is being negotiatied on IP and Traditional Knowledge.There are some draft articles. Just one week ago there was the last session of the IGC. There are different views. There are some member states which see themselves as being the beneficiary for widely dispersed traditional knowledge. While some others, particularly Latin America , they see local communities as the primary beneficiaries. But even there, there is an important debate on how you would qualify the beneficiaries in order to benefit from protection.

Participant from Audience: (Pierre). I just want to say that there are always traditional knowledge that is incredibly widely held by hundreds of groups of peoples. In that case, it doesn't solve the problem to give ownership to any particular group. But at present, it doesn't seem fair and equitable in in cases like that that there should be a free-ride. I think in cases like that it makes sense to have a global solution. I think that once you find a global model of a benefit-sharing mechanism, you would have to look at the TK issue very carefully. And probably ring fences for TK. But I don't (voice trails off). ...

Claudio: Thank you very much Pierre. I think we have exhausted our time and all the burning questions. I thank you all very much for your participation. Would you like to say a few words in conclusion? Thank you again for being with us.

Manuel: Just to thank you for coming. Thank you Claudio for chairing.