



**Out of Africa:
Mysteries of Access
and Benefit Sharing**

a report
by
Jay McGown

edited and introduced by
Beth Burrows

Edmonds Institute
in cooperation with
African Centre for Biosafety

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Mysteries of Access and Benefit Sharing**

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The Edmonds Institute
20319-92nd Avenue West
Edmonds, Washington 98020 USA
Telephone: 001-425-775-5383
E-mail: beb@igc.org
Website: www.edmonds-institute.org

in cooperation with

The African Centre for Biosafety
Suite 3, 12 Clamart Road
Richmond, South Africa 2092
Telephone: 27 11 646 0699
E-mail: mariammayet@mweb.co.za
Website www.biosafetyafrica.net

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Out of Africa: Mysteries of Access and Benefit Sharing

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INTRODUCTION

In late 2005, the Edmonds Institute, as part of a joint project with the African Biosafety Centre, contacted Jay McGown, the biopirate hunter who created such a sensation a while back with his work on Biodiversity Mystery Theatre. (1) At a time when negotiations on Access and Benefit Sharing (ABS) were underway at the Convention on Biological Diversity and the question of certifying sources of biodiversity was heating up patent discussions at the World Trade Organization and the World Intellectual Property Organization, we were hoping that McGown would look into access and benefit sharing in Africa.

Unfortunately, the busy researcher could only agree to a month's work of research. About four weeks later, he sent the Institute a report of his work. It listed the "discoveries" he had made and the problems he had encountered along the way.

As you will see, McGown's frustrations were the typical ones of the biopirate hunter. He was operating, after all, in a complicated world where some still maintained that there is no such thing as biopiracy. Where national rules of access and benefit sharing do not exist, or where those rules are not recognized by or known to biodiversity prospectors or the companies and countries they come from, it is difficult to make claims of theft, much less to verify such claims. Nevertheless, in just one month, McGown did find a considerable amount of suspicious biodiversity acquisition that needs to be explained and accounted for.

Several factors may have operated to narrow McGown's view of what is happening in Africa: First, there was the severe time constraint on his research. Second, he was working mainly in English, using databases available on the Internet. (2) Third, his working method was unlikely to capture any biodiversity that had been "biopirated" and become hidden from view as part of someone's "trade secrets". Fourth, he had little or no contact with indigenous peoples or local communities or African non-governmental organizations. Thus, he had no way to estimate how much, if any, "illegal" acquisition of biodiversity or use of traditional knowledge he might be missing.

McGown may have missed a great deal and, in doing so, might have minimized the amount of biopiracy going on. On the other hand, if the benefit sharing agreements McGown sought were secret or archived off the Internet, he would not have been privy to them and so he might have overstated the volume of biopiracy in Africa -- assuming, of course, that the prior informed consent of the ABS contracts he could not find was all in order.

McGown and the Institute had agreed on a working definition of biopiracy:

Where there is access to or acquisition of biodiversity (and/or related traditional knowledge) without prior informed consent, including prior informed consent about benefit sharing, on the part(s) of those whose biodiversity (or traditional knowledge) has been "accessed" or "acquired", there is biopiracy -- i.e., theft.

But, as matters turned out, the definition presented problems for McGown, especially in the absence of accessible, written access and benefit sharing agreements: How to determine whether "prior informed consent" had taken place? By what standard to judge? With so much of his information coming from patent databases and with no requirements on patent applications to

certify under what circumstances biodiversity had been obtained, how to be sure that anyone had sought and obtained the valid prior informed consent of indigenous and local communities whose biodiversity and related traditional knowledge may have been taken? How to be sure that consent in such cases, if it were gained at all, did not come only from national governments? And if consent had been obtained only from a national government, when had it been granted, under whose authority, and with what return to the country and/or indigenous peoples and local communities involved, and how to find out the details?

The difficulties embedded in McGown's task were huge and not always surmountable. To mention a few of the problems:

- How to fix the exact date of accession or acquisition when the only date discoverable is the date on a patent application? The date of accession is important because that is the date which may determine the applicable national rules of access. For some countries, access rules changed after they became parties to the Convention on Biological Diversity.

- How to verify the exact country from which material has been taken when the written record about an acquisition may only describe the origin as "African"? (McGown opted to consider any countries or regions mentioned in the relevant patents to be the country or countries "out of" which the biodiversity might have been taken.)

- How to deal with prior informed consent and benefit sharing issues or even determine who may properly consider themselves to have been robbed (biopirated) when the material or knowledge taken may be widely available in (or endemic to) several places? How to deal with access and benefit sharing issues related to biodiversity not well covered by established treaties, as in the case, for example, of biodiversity taken from the sea? Put another way, how to deal with issues that may fall outside the ambit of international law but not outside the bounds of human decency?

- How to track whether anyone - national authorities, appropriate indigenous authorities, or local communities - has given prior informed consent when there may be no written record of such?

- How to verify that valid and appropriate prior informed consent has been gained *prior* to access of the biodiversity in question? The research goal was not simply to verify equitable benefit sharing after access, but to validate prior informed consent before access.

- How to track the fate of biodiversity that may have been accessed but may not yet be commercialized? At present, much of the paper trail for biodiversity depends on patent applications. As already noted, anything that has been acquired but not yet been made the subject of a patent application may not have been discoverable by McGown's research method -- despite the fact that, as McGown's work makes clear, some patent offices are granting patents for "inventions" of questionable novelty. Further, how to deal with the difficulty of tracing biodiversity when some source countries do not concern themselves with benefit sharing issues until and unless a commercializable product is in sight? Such post-access concern for benefit sharing tends to preclude the valid prior informed consent of indigenous peoples and local communities and create effective biopiracy.

- How to understand who has played what role and with what responsibility in biodiversity deal-making? How to differentiate poor bookkeeping, lack of transparency, lack of law, lack of

enforcement, and corruption? How to assess the role, performance, and loyalties of (biotrade) intermediaries, including botanical gardens that long ago acquired material in the absence of access and benefit sharing agreements?

- How to know whether any access and benefit sharing (ABS) agreement ever existed when none could readily be found? No centralized, publicly available registry of ABS agreements yet exists.

Despite all the difficulties, Jay McGown did uncover a great deal that is suggestive of biopiracy. While his report may seem preliminary and his sketches incomplete, he has indicated potential next contacts for verifying and clarifying and extending much of what he has found.

Obviously, much remains for others to do. Hopefully, that “further research” will be done by people working in other languages and from other sources, particularly people whose lives and livelihoods - not to mention cultures, cosmologies, and sovereignty - may be put at risk by those in search of biodiversity and related traditional knowledge. There is little time left.

In a personal note he attached to his report, Jay McGown wrote:

It's a free-for-all out there, and until the parties to the Convention on Biological Diversity (CBD) solve the problems of access and benefit sharing, the robbery will continue. They've got to declare a moratorium on access until a just protocol on access and benefit sharing is finished and implemented. Until they slog through that terrible work - and that includes all the hard questions indigenous peoples and local communities are asking and all the hard questions about the sources of biodiversity mentioned in patent applications - until that work is done, the biopirates will keep on shouting in the ears of their victims, "There's no such thing as biopiracy!"

And, at the rate discussions are going, the biopirates and their associates may just be able to access everything there is before an agreement is finalized. If that happens, of course, there really may be no such thing as biopiracy. There will only be patent and trade secret transgression.

-- Beth Burrows
President/Director
Edmonds Institute
January, 2006

MEDICINE FROM BIODIVERSITY



Diabetes Drug Produced by a Microbe -- Out of Kenya

Many of those who suffer from Type II diabetes can thank a microbe from Kenya's Lake Ruiru for a drug that improves their lives. Type II diabetics frequently take acarbose, a drug better known by its trade names Precose (in the US and Canada) and Glucobay (in Europe and elsewhere). (3)

The drug is an "alpha glucosidase inhibitor", meaning that it works by regulating absorption of glucose into the bloodstream, thereby preventing potentially dangerous spikes of glucose ("blood sugar").

Acarbose is sold by the German pharmaceutical giant, Bayer. How is it made? In 1995, five years after Glucobay was commercialized in Europe and one year before it was released in North America, Bayer filed for patent on a new way to manufacture the product. The patent application, which subsequently issued in Europe, the US, and Australia, (4) reveals that an *Actinoplanes sp.* bacteria strain called SE 50 had unique genes that enable the biosynthesis of acarbose in fermentors. The strain comes from Kenya's Lake Ruiru.

In 2001, in an article in the *Journal of Bacteriology*, a group of Bayer scientists and German academics confirmed that SE 50 was being used to manufacture acarbose. (5) In the article, they described manufacture of acarbose and related compounds. Although their paper did not mention Kenya or Africa, it did say that "*The oral antidiabetic agent [acarbose] is produced by fermentation of the actinomycete Actinoplanes sp. strain SE50.*"

SE50 is the same strain that was identified as Kenyan in the patent application filed six years before.

In 2004, Bayer sales of acarbose totaled €278 million (US \$379 million, as of 31 Dec 2004). (6)

I could find no evidence of a benefit-sharing agreement related to this extremely valuable microbe.

Potential contact for more information:

Dr. Wolfgang Plischke
President and General Manager
Bayer Pharma Division
Bayer AG
51368 Leverkusen Germany

Tel: +49 214 301 (switchboard)



A Treatment for Diabetes -- *Out of Libya*

Sometimes pharmaceutical companies admit that there are traditional uses for plants that they seek to patent, but almost always they allege that the “new” use claimed in their patent application is different than the “old” use employed by indigenous peoples or traditional medical practitioners. Rare are the cases in which the patent applicant openly admits to appropriating traditional knowledge. Few are as clear as the words in US patent 6,350,478 (issued 26 February 2002), which belongs to Phytopharm plc of Cambridge, UK. The patent covers the use of extracts of *Artemisia judaica*, a North African medicinal plant, for the treatment of diabetes.

The patent could not make the origin of Phytopharm’s treatment any clearer: “*Artemisia judaica is used in Libyan traditional medicine as an infusion for the treatment of "wasting disease", almost certain diabetis mellitus [sic].*” The last clause of the sentence should obviously read “*almost certainly diabetes mellitus*”.

In other words, Phytopharm admits that Libyans have used the plant that the company wishes to patent for the same use that the patent application claims as an “invention”. Scientific literature reveals that the plant is also used in Egypt and other North African countries. (7)

Despite this explicit declaration of a lack of novelty, the US Patent Office granted the patent. So, a British company discerned a traditional Libyan treatment for diabetes and then successfully claimed that treatment as its own invention in the US, where the patent office apparently did not notice (or care) that the “invention” was – by the company’s own admission – not novel.

I found potentially relevant (if vague) company policies. According to its website: “... *there has always been a strong emphasis at Phytopharm on the broader implications of its core activity in developing world-class pharmaceutical products based on traditional medical knowledge. I am glad to say that the Company has continued this culture of care and responsibility within the wider community.*” There was no elaboration of what the company believes a “culture of care and responsibility” means in relation to patent claims. Phytopharm also says that it maintains good agricultural practices to minimize environmental impacts, by “*working with local agronomists and horticulturalists in each of the countries where we are growing crops*”. (8)

I could not find a company intellectual property policy on the traditional knowledge it patents nor any evidence of a benefit sharing agreement related to this patent.

Potential contact for more information:

Dr. Richard Dixey, CEO
Phytopharm Plc
Corpus Christi House, 9 West Street
Godmanchester, Cambridgeshire, UK

Tel: +44 1480 437697
Fax: +44 1480 417090
E-mail: info@phytopharm.com



Antibiotics from a Termite Hill -- Out of The Gambia

In 1964-65, the Canadian Medical Research Expedition landed at Easter Island (Rapa Nui), Chile's outpost in Polynesia, and took samples of its biodiversity. In the 1970s, a *Streptomyces* sample that the expedition had collected yielded rapamycin, an immunosuppressive drug that is used in medicine, for example, to prevent rejection of organ transplants.

The discovery of rapamycin sparked a search for other *Streptomyces* that produce similar compounds. SmithKline Beecham (now Glaxo SmithKline) has claimed a compound from a *Streptomyces* strain that, according to its patent, (9) “was isolated from a termite hill at Abuke, Gambia”. The strain produces a rapamycin-related compound called 29-desmethyrapamycin and, according to the patent, it is useful both as an anti-fungal and as an immunosuppressant.

The patent states that the Gambian strain was deposited in a UK culture collection in 1990, indicating that it was collected before the CBD entered into force. The US patent application wasn't filed until September 1994. The application in Japan, however, was filed in January 2001.

It is unclear what research and development has been conducted by Glaxo on 29-desmethyrapamycin. The 2001 patent application indicates recent interest in the candidate drug. Generally, rapamycin and related compounds remain a subject of considerable scientific interest.

I could not locate any information about any benefit sharing arrangements between SmithKline Beecham and Gambia or between Glaxo and Gambia.

Potential contact for more information:

Dr. Tadataka Yamada, Chairman
Research and Development
GlaxoSmithKline plc
980 Great West Road
Brentford UK

Tel: +44 (0)20 8047 5000 (switchboard)



An Antifungal from a Giraffe -- Out of Namibia

Etosha National Park in northern Namibia is one of the country's great attractions. The park entrance at Namutoni is recommended for tourists who hope to see a giraffe because it is near a waterhole favored by the long-necked animals.

Clearly, however, not everyone who has visited Namutoni has had the typical tourist interest in giraffe. At least one visitor has been more interested in the dung of the giraffe.

Pharmaceutical giant Merck has claimed its piece of the park, specifically, by patenting a substance produced by a fungus that was found in Namutoni giraffe dung. The fungus, a strain of *Sporormiella minimoides*, produces a compound that attacks other fungi.

According to Merck's patent, (10) it has "*broad spectrum antifungal activity against both human and plant fungal pathogens*". Use in both pharmaceuticals and agriculture is claimed. Merck first filed claims on the Namibian fungus in 1996.

I could locate no information on any benefit-sharing agreements.

Potential contact for more information:

Chief Licensing Officer
WS2A-39, 1 Merck Drive
P. O. Box 100
Merck & Co., Inc.
Whitehouse Station, NJ 08889 USA

Tel: +1 908-423-1000



Infection-fighting Amoeba -- Out of Mauritius

Sutherland Maciver lectures at the University of Edinburgh (UK) and is a Director of Amoebics, Ltd. (11) Maciver says that he has discovered a way to stop bacterial infections, and he has filed for a patent. (12)

Maciver's technique depends on proteins produced by two amoebas (*Acanthamoeba sp.*). One is called "St. Louis, Mauritius". The other is named "Ven", from Venezuela, South America. The amoeba proteins are claimed to be effective against *Staphylococcus*, *Enterococcus* and *Streptococcus* bacteria, including the problematic methicillin resistant *Staphylococcus aureus* (MRSA), the cause of so many hospital-acquired infections.

Amoebics, Ltd. receives financial support from the British government through the Scottish Co-investment Fund and the UK Department of Trade and Industry (DTI), among other government agencies. (13)

I could not find any information on a benefit sharing agreement between any institution in the UK and Mauritius (or Venezuela) in relation to this patent application.

Potential contact for more information:

Dr. Sutherland Maciver
Amoebics
49 Castle Gate
Bothwell Lanarkshire G71 7HU UK

Tel/Fax: +44 1698 816100
E-mail: smaciver@staffmail.ed.ac.uk



A Treatment for Impotence -- Out of Congo (Brazzaville)

Impotency drugs are a major source of pharmaceutical company income. In 2004, global sales of Viagra and other prescription treatments for impotence totaled about US \$2.5 billion. But, as recently reported by the *New York Times*, sales are not as strong as once expected. One of the main reasons why, according to the Times, is consumer doubt about drug companies: “many patients [are] angry about drug prices and worried that companies are playing down side-effects...” (14)

Enter Canada’s Option Biotech. (15) The Montreal-based company has patented the seeds of *Aframomum stipulatum*, obtained from the Congo, (16) for use in an anti-impotency drug it calls “Biovigora”. A member of the ginger family, *A. stipulatum* rhizomes have documented uses in Congolese traditional medicine. (17)

Option Biotech tries to exploit the side effect suspicions about Viagra reported by the *New York Times*, claiming that, “*Biovigora is not a chemical medication*” and further noting that it “*was used (and still is used) centuries ago by certain African tribes without unfavourable side effects.*” [sic] (18)

Option Biotech doesn’t stop there. It also plays on offensive stereotypes, suggesting that sex with younger women can result from taking its product:

For centuries, the men of some tribes in Africa were recognized by the surrounding tribesmen for their particularly high vitality and their sexual capacities. Up 'till now, older men married and had children with considerably younger women. For unfound reasons, they remained sexually active all their life ... research led to a remarkable discovery: the performance of those men was the result of Aframomum, a rare spice that grows in Africa...(19)

While “Biovigora” may never rival Viagra as a multi-billion dollar moneymaker, it is a patented Option Biotech property sold at more than 750 stores across Canada. A bottle of 24 capsules costs about CDN \$34.99 (US \$30).

I reviewed the available information from Option Biotech and could not find evidence of a benefit sharing agreement with the Congo or any other country where *A. stipulatum* is used.

Potential contact for more information:

Option Biotech
Montreal, Quebec Canada

Tel: +1 866 379 6969 (inside Canada only)
E-mail: info@optionbiotech.com



Vaccines from Microbes -- Out of Egypt

Not all biodiversity is necessarily beneficial to people; but sometimes even seemingly undesirable biodiversity - such as disease agents - can generate benefits.

For decades, the US Navy has maintained biomedical research labs in other countries, including Italy, Peru, Indonesia, and Egypt. These labs conduct research and perform diagnoses in cooperation with national researchers, but the labs have also been controversial. For example, before the US renounced offensive biowarfare in 1969, its biomedical research labs quietly gathered and assessed disease strains for further evaluation by the US military. Since 1969, the labs have remained controversial - sometimes because of biopiracy issues. (20)

In Cairo, at a US Navy lab called NAMRU-3, researchers have collected disease-causing *E. coli* strains. At least 12 such NAMRU-3 *E. coli* strains were acquired by Acambis, a Cambridge, UK-based vaccine maker with tight links to the US military. With funding from the US Defense Department, (21) Acambis deleted portions of the genome of five of the Egyptian strains and filed for a patent on the engineered microbes for use as vaccines against diarrhea. (22) Dubbed “HolaVax-ETEC”, one candidate vaccine has passed four phase 1 human trials. (23)

In 2005, Acambis licensed that vaccine to Cambridge Biostability Ltd, while retaining an option for North American rights. (24) Cambridge Biostability’s main asset is a stabilized vaccine technology that the company says will obviate the need for a refrigerated “cold chain” to prevent vaccines from spoiling. The Cambridge company receives funds from the British government and the US biodefense program. (25) It aims to commercialize the ETEC vaccine with a “Third World First” strategy.

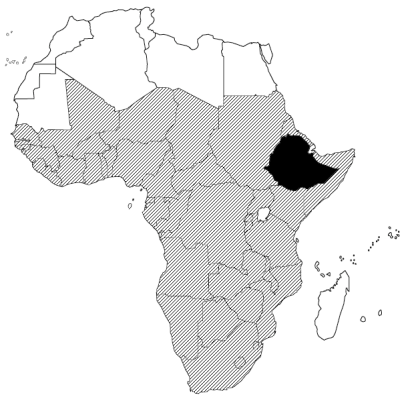
While Cambridge Biostability’s press releases and other public materials are laden with language suggestive of philanthropy and aid to developing countries, it is a private company that aims to profit from vaccine sales, both in developing and developed countries, where the vaccine will be marketed for “traveler’s diarrhea” and military use. In March 2005, another patent application was filed on the technology, after the vaccine development program was transferred from Acambis to Cambridge Biostability. (26)

I scanned the information available about Cambridge Biostability and found a lot of discussion about how the company intends to create products that will be useful in developing countries. However, I found no evidence that the company intends to share any benefits from the Holovax-ETEC vaccine. Ironically, Egyptians could wind up paying a British company for treatment with a modified form of a bacteria collected by the US in Egypt itself.

Potential contact for more information:

Paul Rewrie
 Commercial & Operations Director
 Cambridge Biostability Ltd, NIAB
 Huntingdon Road
 Cambridge CB3 0LE UK

Tel: +44 (0)1223 279000
 Fax: +44 (0)1223 279089
 E-mail: paul.rewrie@biostability.com



Four Multipurpose Medicinal Plants -- Out of Ethiopia and neighboring countries

A researcher in Tennessee (US) has obtained a US patent on four African medicinal plants. (27) The patent makes sweeping claims for preparations of the plant extracts and against “breast cancer, leukemia, melanoma, and myeloma” and “viral infection, diabetes, Parkinson's disease, tuberculosis, or fungal infections.”

The patent covers use of *Millettia ferruginea* alone or with one or more of the other three medicinal plants that are claimed. All of the plants grow in Ethiopia and have medicinal uses there and, in some cases, other countries.

Scientific name	Common names
<i>Glinus lotoides</i>	Metere, Lotus sweetjuice, Damascisa
<i>Ruta chalepensis</i>	Tena Adam, Egyptian rue, Fringed rue
<i>Hagenia abyssinica</i>	Kosso, Kouso, Habbi
<i>Millettia ferruginea</i>	Birbira, Sotallo, Zaghia, Yego

Despite the patent, little appears new about the medicinal uses claimed for these plants and it would seem that the US Patent and Trademark Office did not make much of an effort to investigate and validate the novelty of this patent’s “inventions”.

Traditional medical uses of all of the patented plants are well-documented. These include use of *Millettia ferruginea* to treat skin disorders, as noted in the US government’s own genetic resources database (ARS-GRIN) and the Botanical Dermatology Database in the UK.

There are many citations on the medicinal uses of *Glinus lotoides* in Ethiopia and elsewhere, including Egypt and Mali. And *Hagenia abyssinica* is a well-known treatment for tapeworms in humans and livestock, in Ethiopia and elsewhere, including Tanzania and Kenya. (28)

Medicinal use of *Ruta chalepensis* is particularly associated with Ethiopia, where it is a household remedy. (29) Use of the plant has also spread to other parts of the world, including the Middle East, Near East, Europe, and the Americas. The plant is believed to have been brought to the Americas by Spanish conquistadores. The variety of uses for the plant is too long to list here. Ironically, *Ruta chalepensis* is even used in US traditional medicine, particularly in the southwestern US states of Texas and New Mexico. (30)

I was unable to locate any information about the inventor's use of these medicines apart from the patent and, consequently found nothing about a benefit-sharing agreement.

Potential contact for more information:

Tesfaye Yigzaw
631 Glastonbury Rd
Nashville, TN 37217-5015 USA

Tel: +1 615 365-0021



Hoodia, the Appetite Suppressant -- *Out of Namibia, South Africa, Angola, and Botswana*

Capitalizing on the traditional knowledge of the San people, in 1997 the South African Council for Scientific and Industrial Research (CSIR) patented extracts from several species of the Hoodia cactus. The lead compound was a promising appetite suppressant. CSIR sold exclusive rights to the patents to Phytopharm, a British drug company, which dubbed the extract "P57" and in turn granted a license to drug maker Pfizer. P57 was poised to become a major weight loss drug.

But all of this wheeling and dealing took place without anyone bothering to contact the San. When the story attracted media attention, Phytopharm found itself under an unfavorable media glare, and drew derision from indigenous people when it defended its actions by claiming that the 100,000-strong San people were all dead. (31) (The San, once called "Bushmen", live in the Kalahari desert region of southern Africa, including in the countries where Hoodia is found.)

In 2003, a deal was struck in which CSIR pledged to give a proportion of the royalties it receives from Phytopharm to the San. But to many observers, the deal didn't look just. The royalties that the San gained were estimated to be 0.003% of retail sales of any products commercialized. (32)

Not long after this deal was announced, Pfizer terminated its Hoodia research, returning its P57 rights to Phytopharm. More than a year later, in December 2004, Phytopharm again licensed Hoodia, this time to a larger company: Unilever, maker of "Slim Fast" and other diet foods. Unilever claims it will not make pharmaceuticals from Hoodia. Instead, the company says that, in less than three years, it will sell "functional food" products made from Hoodia. The company

says these new products will be covered by new patents, but it is unclear how the new claims and new patents will impact benefits to the San. Their benefit-sharing arrangement was negotiated while Pfizer was still interested in P57.

Only time will tell if the San's miniscule royalty will amount to anything significant, although Phytopharm has received US \$12.5 million from Unilever and is waiting to receive more \$27.5 million more, plus an undisclosed royalty once the Unilever products are commercialized. (33)

But the story doesn't end there. The attention surrounding Hoodia has induced irresponsible marketing and a raft of additional intellectual property claims. In October 2004, Hoodia was placed in Appendix II of CITES. Today, a variety of quasi-legitimate and outright disreputable companies continue to heatedly market products that allegedly contain Hoodia extracts.

In addition to the P57 patents licensed to Unilever, Phytopharm has acquired two additional patents on Hoodia extracts, for use in treating gastric disorders. The company has also filed additional Hoodia-related patent applications. (34) Some of the applications that have recently been filed in the US are summarized below:

NUMBER/DATE	OWNER/INVENTOR	TITLE	WHAT IS CLAIMED
20050276869 15 Dec 2005	Century Systems (Atlanta, GA, US)	Appetite-Suppressing, Lipase-Inhibiting Herbal Composition	<i>Hoodia gordonii</i> with <i>Cassia nomame</i> , a Japanese plant.
20050276839 15 Dec 2005	Bronner, James S. (Atlanta, GA, US)	Appetite satiation and hydration beverage	<i>Hoodia gordonii</i> and other plant extracts in a beverage
20050079233 14 Apr 2005	Phytopharm, plc (Godmanchester, UK)	Gastric acid secretion	Reducing Gastric acid secretions with Hoodia
20040265398 30 Dec 2004	Fleischner, Albert M.; (Westwood, NJ, US), head of Goen Tech. Inc.	Herbal composition for weight control	Hoodia, with or without other plant extracts, before meals to reduce appetite
20040234634 25 Nov 2004	CSIR (Pretoria, South Africa)	Pharmaceutical compositions having appetite suppressant activity	Pharmaceutical formulations of Hoodia extracts and their use

Finally, and perhaps most interestingly, the original CSIR patent on P57 Hoodia extract appears to have been a key inspiration for a variety of biomedical research on melanocortin agonists. P57 was the first melanocortin agonist ever described that was not a bare peptide. (35) Pharmaceutical companies are interested in melanocortin receptors not only because they regulate appetite and, as the name suggests, pigmentation, but also because they appear to be related to sexual dysfunction and the operation of certain glands, including the pancreas, prostate, saliva, and sweat glands.

Thus, even if CSIR and Phytopharm patents ultimately prove to be unprofitable, the San traditional knowledge that those patents incorporated may serve to benefit a wide array of commercial biomedical research. If that happens, it seems unlikely that the San or South Africa will share benefits from any of the resulting uses.



Antibiotics from Giant Land Snails -- Out of West Africa, from Sierra Leone to Nigeria

Germany's Max Planck Institut für Kohlenforschung is staking out patent claims on antibiotic compounds found in West African snails. (36) A patent has issued in Europe and an application has been filed in Canada. According to Planck's international (PCT) application, it also intends to seek patents in the US and Japan. (37) The patents are assigned to

Studiengesellschaft Kohle MPG, a technology transfer entity that manages the institute's patents.

The European patent claims antibiotic compounds produced by snails from the Archachatina genus, commonly known as Giant African Land Snails or Achatina Snails. The snails grow as large as 15 cm and are native to West Africa, from Sierra Leone to Nigeria and probably beyond.

The patent emphasizes *A. amarginata*, but also says that antibiotics are found in *A. degneri*, *A. ventricosa*, *A. batteata*, and other related snail species. The patent suggests that the compounds are useful against a variety of infections, including methicillin-resistant *Staphylococcus aureus* (MRSA) strains, a cause of hospital-acquired infections and a growing problem worldwide.

I was not able to find any information concerning a benefit sharing agreement. The Studiengesellschaft Kohle website does not list the snail patents among those it is offering for license, (38) suggesting that rights may already have been acquired by another entity.

Additional research is needed to find out if and how this patent is being further developed.

Potential contact of more information:

Prof. Dr. Manfred T. Reetz
Max-Planck-Institut für Kohlenforschung
Kaiser-Wilhelm-Platz 1
45470 Mülheim an der Ruhr Germany

Tel. +49-208-306-2000
Fax +49-208-306-2985
E-mail: reetz@mpi-muelheim.mpg.de



Drug Addiction Treatment from Iboga -- Out of Central and West Africa

For a very long time, Iboga (*Tabernanthe iboga*) has been used in Central and West Africa. In low doses, the plant serves as a stimulant to maintain alertness, for example, while hunting. In larger doses, it is a hallucinogen, traditionally used for religious purposes by shamans and in initiation rites.

In more recent years, Iboga (also spelled Eboga or Eboka) has come to be used as a (non-addictive) recreational drug by a small number of people in Europe and North America. This experimentation, while frequently illegal, has led to interest in iboga by drug addiction researchers. Iboga reportedly has the effect of ending cravings for addictive substances, both illegal (such as heroin) and legal (such as nicotine). Patents on this kind of use for iboga stretch back to 1985 (US 4,499,096).

Today, there is a burgeoning scientific literature about iboga, fueled by researchers who experiment with iboga and iboga-like compounds and try to more precisely elucidate iboga's biochemical effects on the brain.

In the United States, where iboga is listed as one of the most illegal narcotics, there are treatment centers which illicitly use iboga to cure heroin addicts and other drug users of their addiction. In other jurisdictions, therapeutic use of iboga is legal. (39)

Clearly, there is growing interest in the apparently miraculous ability of iboga to cure some drug addictions. Iboga is gaining scientific respectability and may, in short order, become a hot pharmaceutical property. I could find no discussion of benefit sharing related to iboga.

Patent applications on iboga have been made very recently by Myriad Genetics and by Washington University, one of the most prominent biomedical research campuses in the US. Here is a selection of iboga patents and patent applications filed in the last decade:

US Patent or Application Number	Title	Owner/ Inventor	Comment
Application 20050288375, published 29 Dec 2005	Method and composition for treating neurodegenerative disorders	Myriad Genetics, Salt Lake City, UT, US	Claims ibogaine (and other compounds) used with an NSAID <i>“for treating and preventing neurodegenerative disorders like Alzheimer's disease, dementia, mild cognitive impairment.”</i>
Application 20050222270, published 6 Oct 2005, and patent 5,958,919, issued 28 Sep 1999, and others	Prolonged administration of NMDA antagonist drug and safener drug to create improved stable neural homeostasis	Washington University, St. Louis, MO, US	Use of ibogaine to enhance safety in a technique to <i>“ease problems such as addictions to illegal or pain-killing drugs, nicotine, or alcohol, compulsive or criminal behavioral problems, severe depression, obsessive-compulsive disorders, phobias, etc.”</i>
Patent 6,416,793, issued 9 Jul 2002	Formulations and use of controlled-release indole alkaloids	BioResponse, LLC, Boulder, CO. US	Ibogaine (and yohimbe) formulations with enhanced absorption by the body
Patent 6,348,456, issued 19 Feb 2002, and Application 20030153552, published 14 Aug 2003	Method of treating chemical dependency in mammals and a composition therefor	Mash; Deborah C. (University of Miami professor) and co-inventors	Claims noribogaine, a variant of ibogaine suitable for pharmaceuticals, and its use to treat addiction to <i>“heroin, cocaine, alcohol, nicotine, amphetamine, methamphetamine, opium, methadone, hycodan, morphine and caffeine.”</i>

Patent 6,211,360, issued 3 April 2001	Ibogamine congeners	Albany Medical College (Albany, NY, US) and the University of Vermont (US).	Ibogamine-derived compounds for treating drug addiction
Patent 5,616,575, issued 1 Apr 1997	Bioactive tricyclic ibogaine analogs	University of Minnesota, US and University of Miami, US	Ibogamine-derived compounds for treating drug addiction



Multipurpose Kombo Butter -- Out of Central and West Africa

Kombo butter, an extract of the African nutmeg (*Pycnanthus angolensis*), (40) has been used in Europe and North America since at least the 1970s, when it was identified as the source of cetyl myristoleate, a “dietary supplement” used to treat arthritis. The plant is native in Central Africa, and is found as far west as Sierra Leone. One of its market advantages is that

it is a vegetable-derived fatty acid, suitable for personal care products. Because it is of plant origin, it can be used in products that are Kosher, Halal, and “non-animal”.

A new wave of intellectual property claims are being made on kombo butter.

Rutgers University, a public institution of the State of New Jersey in the US, has filed for patent on Kombo butter and on related extracts from *P. angolensis*, claiming use as antioxidants and inflammation inhibitors. (41)

Two of the six inventors indicated on the Rutgers patent are Ghanaian, while the remainder reside in New Jersey. The lead inventor, Dr. James Simon, is an American professor who identifies his specialty as flavor, aroma, and medicinal natural products. In the description of one government-funded grant that he leads, it is noted that, “*Value added or new use agriculture is vital for the economic sustainability of New Jersey crop farmers. The medicinal plant germplasm collected from Eastern African Countries may provide new crops opportunities for New Jersey or for other regions of US and Canada.*” (42) In addition to the Kombo butter patent, he holds two plant patents on basil (*Ocimum basilicum*) varieties. The professor’s website has no information concerning benefit sharing. (43)

In addition to the Rutgers patent application, a US patent has been granted to a Tennessee inventor for use of kombic acid, a component of kombo butter, to lower cholesterol and fight cancer. Further, a New Zealand company has patented use of cetyl myristoleate for irritable bowel syndrome, (44) while a handful of other inventors have claimed various nutraceutical and dietary supplement uses of kombo butter and its constituents.

Although African exporters are presumably being paid as suppliers of raw or semi-processed kombo butter, I could find no evidence of any benefit sharing agreement related to use of *Pycnanthus angolensis* as a genetic resource.

Potential contact for more information (on the Rutgers University patent application):

Dr. James Simon
Plant Biology and Pathology
Foran 306
59 Dudley Road
New Brunswick, NJ 08901 US

Tel: +1 732-932-9711 x355
Fax: +1 732-932-9441
E-mail: jesimon@aesop.rutgers.edu

COSMETICS FROM BIODIVERSITY



Skin Whitener from an Aloe -- Out South Africa and Lesotho

Unigen, a US subsidiary of South Korea's Nam Yang Aloe Corp., has obtained a patent for an extract from *Aloe ferox*, a plant found in southern Africa. (45) The patent claims the extract will whiten skin by inhibiting the production of melanin. Dubbed "Aloewhite", the product has recently been introduced to the US as a bulk ingredient for use in personal care products sold by other companies.

In an April 2005 interview with a trade magazine, Unigen officials refused to say which US products contain the *Aloe ferox* extract, although they predicted that a multinational company would market it "within the next twelve months". In South Korea, it is sold by Nam Yang in products such as "Rament Active Aloewhite Intensive Concentrate". According to Regan Miles, Unigen's President, the patent is critical to his company's aims. "We see more and more that companies don't want to evaluate a product unless it is unique and has a patent," he told the magazine. (46)

By all accounts, *Aloe ferox* is a well-known medicinal plant with many traditional uses. In fact, there are so many claims made about *Aloe ferox* by businesses that it can be difficult to distinguish the truth from wishful thinking. Despite the confusing claims, one thing is clear: Unigen did not invent use of *Aloe ferox* extracts on the skin for medicinal and cosmetic purposes. Presumably, southern Africa will provide *Aloe ferox* to Unigen; but as a raw material used by the company. (Already, the trade in *Aloe ferox* is so large that the plant is now covered by CITES.)

I was unable to find evidence of a benefit sharing agreement for Unigen's use of this plant.

Potential contact for more information:

Derek H. Hall, CEO
Unigen Pharmaceuticals, Inc.
2660 Willamette Drive NE
Lacey WA 98516 USA

Tel: +1 360-486-8200
Fax: +1 360-413-9135
E-mail: contact@unigenpharma.com



Beauty and Healing from Okoumé Resin -- Out of Gabon and West Central Africa

In 2004, a French luxury goods maker, the Dior Group, was granted US and European patents on okoumé tree resin for use in cosmetics and pharmaceuticals. (47) The patents claim use of the resin “*in the form of a cream, a gel, a balm, a mascara, a foundation, or a preparation for the nails*”.

Found in Gabon, Cameroon, Congo (Brazzaville), Equatorial Guinea, and possibly other countries of western central Africa, the okoumé tree (also spelled okumé and n’koumi) is an important wood export used in specialty plywoods, veneers, and paneling. The wood of the okoumé tree can be found in furniture, boats, and other items.

Okoumé resin has traditional uses, including application to the skin. Dior was aware of the traditional uses and even described them for the patent examiners to read: “... *okume resin was used in Gabon to make torches used during initiation ceremonies. That use which persists to the present day in villages, is extended in towns during family gatherings. In missionary stations, it is used as a substitute for incense. In folk medicine, it is used to bring abscesses to a head and in the treatment of wounds where it activates healing.*”

According to Marthe Praxede Mapangou of the Gabonese NGO Education for the Defence of the Environment and Nature (EDEN), “[the] *resin is exploited mostly by the local people [of Gabon] who use it essentially for its mystical-medicinal properties. The resin is generally used for manufacturing traditional torches used during certain initiation rites (by, amongst others, the Bwiti, Njembe, Okuku ethnic groups), for the purification of water, for the treatment of abscesses and as an insecticide and deodorant.*” (48)

The Dior Group, whose 2004 sales totaled €13.4 billion (more than four times Gabon’s GNP), controls global brands through its subsidiary Christian Dior as well as through Moët Hennessy Louis Vuitton, a public company in which the Dior Group has a large interest. I was unable to identify a specific Dior product that uses okoumé resin. I must admit, however, that Dior’s complicated corporate and brand structures makes an exhaustive search difficult. Mapangou reports that Dior’s demand for the resin exceeds what can be supplied by IPHAMETRA, (49) a Gabonese government institute that, as of 2003, was the only entity authorized to produce it for international commerce. IPHAMETRA made experimental

quantities for Dior in an arrangement that included the French Foreign Ministry and Pro-Natura, an NGO funded at least in part by Shell, Elf, and Ricoh. Mapangou says that because demand has outstripped legal supplies, unauthorized companies have begun to sell the resin.

I did identify several non-Dior cosmetics with okoumé ingredients sold in Europe, the US, and Australia. These include “Age Correct” nail polish from Sally Hansen, the top US brand of such products, and creams made by Nuxe Laboratories of France. It is not clear if these products utilize Dior’s patent. I could not discern how the companies acquire okoumé resin.

To the extent that Dior and others obtain resin from IPHAMETRA, the trade may be covered by a benefit sharing agreement under the Biodivalor project, a cooperative agreement funded by the French GEF. Led by Pro-Natura, Biodivalor was set up in 2001 and includes Dior, Aventis, GlaxoSmithKline, AstaZeneca, and Roche as commercial partners. (50)

According to the Pro Natura website, Biodivalor includes a benefit-sharing mechanism: “*In accordance with the Convention on Biodiversity, an innovative legal framework has been set up and a special Fund collects the money provided by the sale of samples from the forest as well as from royalties. This Fund is managed by a Council drawn from representatives from the local communities (both elected people and traditional authorities), Government and local scientific institutions.*” No more detailed information is available, such as a copy of the agreement(s) or a more detailed accounting of benefits distributed or benefits promised. According to one academic source, no indigenous people serve on the Biodivalor fund’s council. (51)

A French academic report says that the Biodivalor project has sold 2100 samples from Gabon at a price of €50 each and that Dior is interested in purchasing more okoumé resin. A glossy French government publication puts the number at 1200 samples sold at an average price of €125 each – and doesn’t mention Dior or okoumé. (52)

Whatever version of the actual price and number of samples sold is correct, the funds raised for local communities by the sale of samples are very limited (\leq €150,000 before costs) and likely do not match the funds provided to NGOs and IPHAMETRA to manage of the project. Thus far, commercialization of the resin (at least for Gabon) amounts to a raw materials trade and not a valorization of genetic resources. (53) Further, it appears that Dior’s interest in okoumé has spurred other companies to purchase the resin – possibly without benefit-sharing agreements.

I was unable to find what relationships exist, if any, between the Dior patents and Biodivalor.

Potential contact for more information:

Sidney Toledano, CEO
Christian Dior
11bis rue François 1er
75008 Paris France

Tel: + 33 1 40 73 54 44
(Dior switchboard)



Skin and Hair Care from the Argan Tree -- Out of Morocco

In an effort to promote sustainable use, Moroccans have worked for years to protect and utilize the argan tree (*Argania spinosa*). In the southern Agadir region, argan forests are both a defense against desertification and a valuable resource. Argan has been central to GTZ- and IDRC-supported projects involving women's cooperatives, projects that have won the "Slow Food Prize" and established a market in Europe for the high-value oil produced from the tree.

Argan is also important for its traditional uses. In 1998 in the *Journal of Ethnopharmacology*, Moroccan chemist Zoubida Charrouf described the tree's many uses: "*As cosmetic, the oil is traditionally indicated to cure all kind of pimples on the skin and more particularly juvenile acne and chicken pox pustules. It is also recommended to reduce dry skin problems and slow down the appearance of wrinkles. It is also used in rheumatology...and is traditionally prescribed as hepatoprotective agent, or in case of hypercholesterolemia or atherosclerosis.*"

Since late 2000, the Cognis Corporation has filed US and European patent applications that claim "*A cosmetic and/or dermatopharmaceutical preparation containing native proteins from the plant Argania spinosa as care agent for skin and hair*" and "*A cosmetic and/or dermatopharmaceutical preparation containing leaf extracts from the plant Argania spinosa as care agent for skin and hair.*" (54)

The patent applications list Charrouf, author of the 1998 article on traditional use of argan, as one of four inventors. The other three inventors work at Laboratoires Serobiologiques, a French subsidiary of Germany-based Cognis. Like Charrouf, the Cognis inventors apparently studied traditional uses of argan quite carefully. In 2005, they wrote that argan "*is used by Berber women for skin, hair and nail care and is found in hundreds of different beauty recipes.*" (55)

Cognis sells three argan products: Arganyl (leaf extracts), Argatensyl (fruit extracts), and Lipofructyl Argan (oil). In contrast to the frank language of the *Journal of Ethnopharmacology*, Cognis uses more evocative terms. For example, in referring to Moroccan non-food use of argan, Cognis dubs the traditional use to treat pox pustules and acne as "*ancestral beauty rituals*".

Cognis says it works in partnership with local groups, but I could not find documentation of a benefit-sharing agreement for Cognis' patent applications and sale of argan products. One article by Cognis authors claims that the company's argan products are "fair trade"; but Cognis' idea of fair trade sounds strange: "*The cooperatives agree to sell the fruit of their enterprises at market prices that ensure an adequate return to sustain their activity. Furthermore, from an economic point of view, they ensure that women receive a salary equivalent to the local minimum wage...*" (56) Cognis says this arrangement is particularly helpful to women; but market prices that simply "*sustain their activity*" and a minimum wage don't sound out of the ordinary to me.

If a benefit agreement that valorizes genetic resources or traditional knowledge exists, it may not be public. At any rate, I did not find it. In any case, there is substantial latitude to question

whether the Cognis "inventions" should be patentable at all because they very closely correlate with traditional uses of argan and it is unclear what patentable innovation the company has contributed. Although Moroccan communities may be receiving some benefit from Cognis - perhaps as minimum wage suppliers of raw material or perhaps more - it appears that Moroccan traditional knowledge has been claimed as the intellectual property of a German company.

Cognis' French subsidiary Laboratoires Serobiologiques (57) has many products that emphasize links to indigenous peoples and traditional communities of the developing world, particularly Africa. I identified other cases of bioacquisition that merit further investigation, including the three items below (Pharaoh's Wheat, the Bambara Groundnut, and the "Resurrection Plant").

Some of Cognis' marketing strategies seem strange to me, but this is big business. In 2004, Cognis had sales over €3 billion. (58) Clearly, many people find the products compelling.



Skin Care Plus from "Pharaoh's Wheat"? --Out of Egypt?

Cognis also sells a "revitalising and energysing" cosmetic for men that it says comes from the leaves of what it calls "*the Pharaoh's wheat*". Cognis claims this wheat was found in an 8,000 year old Egyptian tomb. The cosmetic is marketed to urban men in wealthy countries, so-called "metrosexuals", who spend heavily on their appearance. Cognis says the cosmetic protects against pollution from car exhausts.

Cognis' information on origin of the product, which the company calls Egyptyl®, is confusing. A company flyer says that Egyptyl® was inspired by a "*male beauty rites ... found in the Ancient civilisations, particularly in the Egyptians,*" and that "*we have studied ingredients described in the ancient texts, finally selecting an ancestor of the present hard wheat, pharaoh's wheat.*" Getting more specific, Cognis says its product comes from an archaeological find, from a plant that "*disappeared long ago [but] was rediscovered in an 8,000 year old stone box in a pyramid in the Dashare region of Egypt.*"

Cognis says its product comes from *Triticum turgidum*, a hard wheat whose types include durum and spelt (also called emmer or farro). (59) "*Triticum turgidum*" is a designation that potentially includes the "Kamut" variety, a plant breeders' rights protected type of *T. turgidum*, which some claim comes from an ancient Egyptian burial. Others, however, including the Kamut Company, which owns the variety, disagree about *T. turgidum*'s ancestry, saying, "*most scientists believe the Kamut® grain was not taken from a tomb but probably survived the years as an obscure grain kept alive by the diversity of crops common to small peasant farmers in Egypt.*" (60)

Is Egyptyl® the product of overzealous marketing, biopiracy, both, or neither? I don't know. I can't say for sure whether Egyptyl® came from an Egyptian wheat variety, perhaps Kamut, or if it was squeezed from the leaves of any old wheat plant. When Cognis says that Egyptyl® can "*provide the modern man with all of the energy and strength of his ancestors,*" (61) the company clearly wants its customers to think that they are buying a piece of ancient Egypt.



Skin Care, Etc. from Bambara Groundnuts -- Out of Sub-Saharan Africa

Cognis has obtained US and European patents on the cosmetic use of a simple extract from the bambara groundnut. (62) Cognis controls the extracts for a plethora of uses, including “products for the face and body, day or night products, solar products, anti-wrinkle hygienic products, or thinning products [and] lotions or shampoos, creams, mousses, protective products, separators, softeners, [etc...]”

The bambara groundnut (*Vigna subterranea*) is an important African food crop. (63) Exactly where it was first domesticated is unknown. Wild relatives are found from Senegal to Cameroon. (64) The plant’s name stems from the Bambara, who are an important ethnic group in Mali. The Bambara groundnut is now sown across most of Africa.

Tolerant of dry and harsh conditions, the bambara groundnut has recently received attention as a “forgotten” crop important to African food security. (65) Ironically, considering that Cognis is based in Germany, much of the attention has come via international cooperation programs of ZADI, the German government’s Centre for Documentation and Information in Agriculture.

I doubt that Cognis invented the idea of applying bambara groundnut to the skin, hair, or fingernails; but it has nevertheless obtained patents. I have not found a specific Cognis product that is advertised for its bambara groundnut content; but such a product may be under development. And, I have not found any benefit sharing agreements.



Skin Care from the “Resurrection Plant” -- Out of Southern and Eastern Africa

In mid-2005, Cognis launched a new skin care product based on an extract from *Myrothamnus flabellifolius*, a desert plant from southern and eastern Africa. (66) Cognis has filed in the US and Europe for patents on cosmetic and pharmaceutical use of *M. flabellifolius* extracts. (67) Cognis says that its extract, which it has dubbed “PA Reviviscience”, keeps skin moist and protects against heat, cold, and sun. (68)

There is an extensive scientific literature on *M. flabellifolius*. It has been investigated for many years because of the plant’s ability to recover from drought and drying. Not surprisingly, there are many reports of traditional medicinal use of the plant. *M. flabellifolius* is one of several species sometimes called “resurrection plants” because they appear to “come back to life” following severe drying.

It is not clear whether Cognis has knowingly utilized someone else's traditional knowledge. In any case, I could find no mention of benefit sharing agreements.

Potential contact for more information about Cognis and its claims:

Dr. Gilles Pauly
Laboratoires Serobiologiques
Cognis-France
3, rue de Seichamps
54425 Pulnoy France

Tel: +33 3.83.29.97.92
Fax: +33 3.83.29.98.65
E-mail: customer-service.LS@cognis.com

AGRICULTURAL AND HORTICULTURAL PRODUCTS FROM BIODIVERSITY



Endophytes and Improved Fescues -- *Out of Algeria and Morocco*

Three North African microbes that improve insect resistance and feed quality of tall fescue grass have been patented by AgResearch New Zealand, a state-owned business. According to AgResearch's US patent, issued in 2000, (69) the fungal endophytes are from the genus *Neotyphodium*. One was found in fescue seeds from Algeria and two in Moroccan samples. All three seeds were deposited in a culture collection in 1998.

Endophytes are microorganisms that live inside a plant without causing visible disease. According to the patent, the North African endophytes are beneficial in two major respects. The first is nutrition: Tall fescue (*Festuca arundinacea*) is grown in many countries for animal pasture, hay, and silage, but ruminants can have problems with the grass because it produces a toxin called ergovalene. The North African endophytes reduce ergovalene production, thereby improving fescue's feed qualities. Secondly, the endophytes make the fescue itself healthier because they produce peramine, a chemical that improves insect resistance.

AgResearch's patent covers the endophytes themselves, as well as their introduction into commercial fescue cultivars sold in New Zealand (e.g., Grasslands Advance), the United States (e.g., Kentucky 31 and Georgia 5), and elsewhere. AgResearch additionally claims seed harvested from fescue plants inoculated with any combination of the endophytes.

The patent explains that the organisms are from Morocco and Algeria, and that they were deposited in a culture collection in 1998, but it does not state when the collections were made, who made them, and how they arrived at AgResearch. Published papers offer possible clues: A 2001 article by US researchers notes the potential value of African fescue endophytes and

describes a US-Australian expedition, in 1994, to collect *Neotyphodium* in North Africa. (70)
 Another mentions New Zealand researchers working with African fescue seeds in 1991. (71)

How, and under what terms, did the New Zealand researchers acquire the valuable endophytes?
 What were the access and benefit-sharing terms of the collection, if any? Was acquisition
 facilitated by an intermediary? If so, under what terms? What commitments –if any – were made
 to Algeria and Morocco? I was unable to locate any benefit sharing information.

Potential contact for more information:

Andrew West, Chief Executive
 AgResearch New Zealand
 Ruakura Research Centre
 East Street, Private Bag 3123
 Hamilton New Zealand

Tel: +64 7 834 6600
 Fax: +64 7 834 6640
 E-mail: andy.west@agresearch.co.nz



More Endophytes for Improving Fescues -- Out of Morocco and Tunisia

New Zealand’s researchers aren’t the only ones interested in North African fescue endophytes. In July 2005, two professors at the University of Arkansas in Fayetteville filed for a patent on five more organisms. Four of the organisms come from Morocco, and the fifth is from Tunisia. Like the organisms AgResearch New Zealand has patented, Arkansas

claims North African endophytes for their value in increasing pest resistance and nutritional characteristics of fescue. The US application adds use of the endophytes in *Lolium* grasses.

I found no evidence of a benefit sharing agreement for this patent application. The patent application makes reference to plants being inoculated in Morocco, suggesting the possibility of Moroccan partners. The application also states that some strains were obtained from the US Department of Agriculture collection in Pullman, Washington.

Based on the patent application and searches in the US Department of Agriculture’s genetic resources information system, here is a summary of the claimed organisms: (72)

Accession Number	Country	Locality	Date Collected
USDA PI 269850	Tunisia	<i>Not indicated</i>	1960
UARK4	Morocco	Ijoukak	<i>Unknown</i>
KBG-5921	Morocco	Boumalne-de-Dades	<i>Unknown</i>
USDA PI 516560	Morocco	Ain-Benimathar	1983
KBG-5892	Morocco	Oujda	<i>Unknown</i>

Potential contact for more information:

Dr. Chuck West
Forage Physiology and Ecology
Crop, Soil, and Environmental Sciences
1366 W. Altheimer Drive
Fayetteville AR 72704-6898 USA

Tel: +1 479 575-3982
Fax: +1 479 575-3975
E-mail: cwest@uark.edu



Nematocidal Fungi -- Out of Burkina Faso

The Casale Group, a Swiss agrichemical multinational, owns two fungi from Burkina Faso with use as biopesticides. “Invented” by a French scientist, the fungi are strains of the species *Arthrobotrys conoides* Dreschsler. They are nematophages, meaning that they attack nematodes, a class of parasitic worms. The fungi are used in soil preparations and are said to be effective against gall nematodes, which affect plants including lentils and maize.

Patents for the fungi – which also include claims on three European strains - were applied for in the US, Europe, China, Norway and in the OAPI states of Africa. (73) While the patent application lapsed in the EU, its status in other jurisdictions is unclear. (74) A patent was granted in the US in September 1998.

The US patent indicates that the Burkinabe strains called 42A and 42A’ come from Fada N’Gourma and Leguema, respectively. Fada N’Gourma is a city located east of Ouagadougou in Gourma Province, while Leguema is in Houet Province, southwest of the capitol.

The patent identifies where the fungi were collected, but it does not say who collected them, when, and what benefit sharing arrangements, if any, are applicable. The patent was originally issued to a Swiss firm named IDRO 2000.

In December 2004, the US patent became property of the well-established Casale Group of Lugano, Switzerland. (75)

Casale has filed two new international patent applications related to the fungi. (76) Published in 2005, the applications list the same inventor as was listed on the original patent. The new applications cover large scale fungus production methods and formulation of biopesticide granules. It thus appears that Casale is moving forward to commercialize.

There is no information about fungi or benefit sharing information on the Casale website.

Potential contact for more information:

Casale Holding S.A.
via Giulio Pocobelli, 6
6900 Lugano Switzerland

Tel: +41 91 960 72 00
Fax: +41 91 960 72 91



Groundnuts -- *Out of Malawi*

The University of Florida has a prolific groundnut (*Arachis hypogea*) breeding program. It has filed for plant breeders' rights on eight varieties of groundnuts since 2000, more than any other US groundnut breeder. One of those varieties, called C-99R, is a "runner" type, a kind favored in the Southeastern US. Runner types constitute about four fifths of US production and are primarily used in peanut butter. (77) C-99R has important African origins.

C-99R's agronomic advantages include a larger seed and good disease resistance, particularly to leaf spot and tomato spotted wilt virus. As of 2003, C-99R had captured about 5.5% of peanut seed market in the US. (78) The University of Florida has licensed C-99R to the Golden Peanut Company, a vertically-integrated peanut processor with operations in major peanut-producing areas of the US as well as in Argentina. (79)

C-99R's parentage involves University of Florida breeding lines whose origins are unknown; but plant variety registration materials make clear that one of C-99R's major and direct parents is a USDA plant introduction (PI 259785) from Malawi. (80) PI 259785 was collected almost fifty years ago, in 1959, five years before Malawi gained independence from the United Kingdom. The Malawi variety bears important disease resistance characteristics that are present in C-99R.

I found no evidence of benefit sharing with Malawi. The peanut's 21st Century contribution to the University of Florida and Golden Peanut's profits stand as a stark reminder of the unresolved problems of benefit sharing and ex-situ collections not covered by the FAO seed treaty. (81)

It also should be noted that full variety descriptions are not yet available for several other peanut varieties for which Florida has recently claimed US Plant Variety Protection. These varieties may also depend on Malawi or other African germplasm.

Potential contact for more information:

Dr. Dan Gorbet
North Florida Research & Education Ctr.
3925 Hwy 71
Marianna FL 32446-7906 USA

Phone: +1 850 482-9956
Fax: +1 850 482-9917



More Groundnuts -- Out of Senegal, Mozambique, Sudan, and Nigeria

According to a 2003 report by the US Department of Agriculture's peanut germplasm committee, US production is threatened by a narrow genetic base of commercial varieties as well as by weaknesses in the US germplasm collection. Although peanuts originated in South America, a number of important traits have been isolated from farmers' varieties of peanuts collected in Africa.

Varieties of peanuts exhibiting resistance to a number of diseases, including leaf spot and tomato spotted wilt virus (TSWV) have been collected in Sudan, Nigeria, Senegal, and Mozambique. A 1960s collection brought from the Sudan has been particularly useful to US breeders. (82)

In their report urging new collections, the USDA peanut germplasm committee acknowledges the CBD and does not express disagreement with its goals. It complains, however, about "cumbersome" access regulations which it claims are "obstacles to international collaboration". Despite the perceived difficulty, the report calls for two major types of new collections -- collection of wild relatives of cultivated peanuts, mainly in Paraguay and Bolivia, and collection of potentially very important peanut varieties that are resistant to multiple diseases. For the latter, the disease resistant peanuts, the USDA committee called for plant collections in Africa, specifically suggesting Senegal and Mozambique.



Impatiens with a Trailing Growth Habit -- Out of Tanzania

Swiss biotechnology giant Syngenta thinks its new "Spellbound" impatiens plants are commercial winners. In the UK and Ireland, the potted plants went on sale in April 2005 with a television, radio, and newspaper advertising blitz. The plants were even given their own mascot, a blonde doll that Syngenta called "Lizzie the Spellbound Fairy". To reinforce the notion that these "Spellbound" impatiens are somehow "magical", Syngenta sent some customers on free trips to Disney World.

What's special about these potted plants? Syngenta says that they are the first *Impatiens walleriana* plants with a trailing growth habit that makes them very well-suited for hanging baskets and tall containers. (83) The plants tops remain bushy as heavily-flowered branches spread outward, draping the container in which it is planted. The shape is favored by gardeners.

In the UK, the impatiens retail prices vary from £2 for a single small potted plant to £10 for a hanging basket. "Spellbound" is also sold in the US, where impatiens represent the fourth largest

annual ornamentals market, worth US \$148 million wholesale in 2004. (84) Syngenta has also introduced “Spellbound” in Canada, France, Germany, Italy, and other countries.

The key to Syngenta’s new product is not magical fairy dust but *Impatiens usambarensis*, a little-known plant that is not itself a commercial species. As its name suggests, the plant is from Tanzania’s Usambara Mountains. Located just south of Mount Kilimanjaro, the Usambaras are a green “island” rising above drier plains. Their unique biodiversity is thought to be a relic of tropical forests that once stretched across Africa from the Atlantic to the Indian Ocean. The mountains are a biodiversity “hot spot” known for a high degree of endemism.

By crossing the Usambara native with *I. walleriana* plants (also native to East Africa), Syngenta transferred the trailing growth habit to commercial varieties. Although such crosses are known to occur naturally, Syngenta has filed for patents in Europe and the US, claiming all trailing growth habit crosses of *I. usambarensis* and *I. walleriana* as its property, (85) including all plants, sexually or asexually-produced, seed, ovules, embryos, and pollen. The patent application even claims putting the plants in a hanging basket, or any other “ornamental arrangements”. Syngenta’s patent applications do not explain how it obtained *I. usambarensis*. The interspecific crosses that Syngenta has commercialized so far are sterile and must be asexually propagated.

I reviewed the relevant Syngenta websites in search of information about benefit sharing. The only mention I found of anything related concerned Syngenta’s donation of a portion of its profits from impatiens to a British hospice for ill children. While a very nice gesture, it did not seem at all related to benefit sharing as envisaged in the Convention on Biological Diversity.

None of the websites I reviewed discussed benefit sharing. One site said that the “Spellbound” impatiens is “*the result of many years of research*”, but there was no mention of Tanzania.

Potential contact for more information:

Mr. Michael Mack, COO
Syngenta Seeds
P.O. Box
4002 Basel Switzerland

Tel: +41 61 323 11 11 (switchboard)
Fax: +41 61 323 12 12



Molluscicides -- Out of Somalia, Ethiopia, Egypt, and elsewhere

Because of its cool and wet climate, UK gardeners have few greater enemies than the slug. Several species of the soft-bodied molluscs inhabit the British Isles, leaving slimy trails on foliage and munching on everything from spring flowers to fall potatoes. Every year, British gardeners spend £30 million (US \$52 million) on products to defeat the slugs, frequently on

poisonous slug baits that can be harmful to wildlife and even domestic animals.

Professor Ifor Bowen of Cardiff University in Wales recently turned his attention to the problem, looking for less toxic slug repellents. Bowen is working in collaboration with Compton Developments, Ltd., a subsidiary of the privately-held Compton Group, whose interests include real estate development, insurance, ceramics, and pharmaceuticals. (86) Compton's lead on the project is Ahmed Ali, a Welsh-born biologist of Somali descent. The collaborative project is specifically focused on African plants and is partially funded by the Welsh Development Agency, part of the UK government. (87)

The first product to emerge is an anti-slug formulation of an ancient medicinal plant, myrrh (*Commiphora molmol*). (88) Sold for £6 online and at Welsh shops, (89) the myrrh molluscicide is called "Slug Barrier". Patents for "Slug Barrier" are pending in Europe, Canada, and the US. The international patent application indicates that the inventors intend to pursue patents in other parts of the world. (90)

"Slug Barrier" appears to contain myrrh as its only active ingredient, although the patent applications also claim *Commiphora guidotti*, or scented myrrh. Also claimed are molluscicide use of extracts of *Boswellia* species, the source of frankincense. Several *Boswellia* species are common in the Horn of Africa, Egypt, and the Arabian Peninsula, as well as in India. In all of these places *Boswellia* species have many traditional uses.

The Bowen/Ali patent application further claims molluscicide use of *Detarium microcarpum* (which the patent spells incorrectly), a medicinal plant whose native range extends from Senegal to Sudan, where it is used for diuretic, anti-inflammatory, and anti-parasitic properties. (91)

But that's not the whole story. *Polygonum limbatum* is also claimed as a molluscicide. *P. limbatum* is another African plant used from Ouagadougou to Gaborone. In fact, Nigerian scientists documented molluscicidal properties of *P. limbatum* more than 15 years ago. (92)

The story still isn't over. The patent application also claims molluscicidal use of *Ximenia americana*, known as "false sandalwood" or "tallowwood". *Ximenia americana* is a plant native in large parts of Africa, Asia, and Central and South America.

Bowen and Ali claim not only use of each species, they claims all plants in each genus when used against any mollusc.

I searched for information about a benefit sharing agreement and could find none. With respect to myrrh, according to the Slug Barrier website, it is collected in Somalia, where "*Right of ownership is not an issue: the land is traditionally open to nomadic grazing*" and "*(c)ollection of the resin is a part time activity practiced by nomads and local rural communities... according to demand.*" The website goes on to cite a publication which indicates that families who collect myrrh in nearby regions of Ethiopia typically earn US \$80 per year doing so.

I found no indication that any benefit sharing is taking place apart from the payment of small amounts to Somali collectors of raw materials.

The Slug Barrier website states that the inventors now aim to commercialize an anti-slug aerosol spray and an anti-fouling paint to repel barnacles and other molluscs that colonize boat hulls.

Potential contact for more information:

Dr. Ifor Bowen
Cardiff School of Biosciences
Biomedical Building, Museum Avenue
Cardiff CF10 3US UK

Tel: +44 (0)29 20 874304
Fax: +44 (0)29 20 874654
E-mail: BowenID@cf.ac.uk

BIODIVERSITY ACQUISITIONS FOR FURTHER INVESTIGATION

I came across many more suspicious patents and other IPR claims than I can possibly research in full in the time I have allotted to the task. Here are very brief summaries of additional cases that deserve further investigation to determine if they are cases of biopiracy:



Ocean Riches -- Out of Cape Verde, Comoros, Egypt, Eritrea, Kenya, Mauritius, Mozambique, Seychelles, and South Africa

Since the entry into force of the Convention on Biological Diversity, patenting of marine resources has been on the rise. Marine organisms are viewed as a source of valuable products including scientific research tools, industrial processing, and drugs.

A recent report from United Nations University noted that clear rules are needed to govern deep sea bioprospecting. (93) At the moment, the rules are not clear:

Bioprospecting in the seabed within territorial limits is currently regulated by the UN Convention on the Law of the Sea (UNCLOS), which determines states' jurisdiction, rights and obligations in the oceans, as well as in the Convention on Biological Diversity, which governs access to genetic resources and benefit-sharing.

While most countries have regulations on marine scientific research in their waters and seabed, only a few have legislation regulating access to and exploitation of their marine and other genetic resources.

Many of the world's unique seabed ecosystems lie in international waters beyond national jurisdiction with no international rules. And no state has yet adopted measures addressing bioprospecting undertaken by its nationals in international waters.

Many recent patents (see below) have been issued for what many would consider African marine resources. An exhaustive account would span many pages. More could be found with further effort. I was not able to find a benefit sharing agreement related to any of these patents. If there are agreements, their terms appear to be private.

COUNTRY	ORGANISM	OWNER	NUMBER(S)	COMMENT and/or QUOTE
Cape Verde	Sponge extracts (<i>Pachastrella sp</i>)	Harbor Branch Oceanographic Inst. Florida, US	US 6,384,187, (7 May 2002)	From the patent: "A sample of the sponge [was] collected by dredge at a depth of 1000 feet off the West Coast of Ilha São Vicente, Cape Verde."
Comoros	Tunicate extracts (<i>Cystodytes violatinctus</i>)	Instituto Biomar, S.A., Ozonilla, Spain	US 6,350,743 (26 Feb 2002)	"collected by SCUBA at 5 m depth on Prevoyante reef in lagoon of Mayotte (Comoros islands) [sic] ... during April 1996." Mayotte is claimed by Comoros; but is ruled by France.
Egypt	Coral extracts (<i>Sarcophyton glaucum</i>)	-	None (yet)	Anticancer compounds have been found in samples from the intertidal and reef areas near Hurghada, on the Red Sea. (94)
Eritrea	Sponge extracts (<i>Raspailia sp.</i>)	Instituto Biomar, S.A., Ozonilla, Spain	US 6,420,357 (16 Jul 2002)	The extracts are named "Asmarines" (as in Asmara), also recently found in Kenya. From the patent: "collected in Dahlak Archipelago, Eritrea by SCUBA diving to a depth of 23.5 m in May 1997. A reference sample is deposited in Tel Aviv University (ET-338).
Kenya	Sponge extracts (<i>Raspailia sp.</i>)	-	None (yet)	In 2004, Tel Aviv University reported two new Asmarines found in a Kenyan sponge. (95)
Mauritius	Sea Hare extracts (<i>Dolabella auricularia</i>)	Arizona State University, US	US 6,239,104 (29 May 2001)	The latest in a long series of patents on dolestatins, a family of with anti-cancer potential. The sea hare was collected in 1972; but it and other collections continue to provide patented compounds for Arizona State University.
Mozambique	Bacteria extracts (<i>Micromonospora sp.</i>)	PharmaMar S.A., Madrid, Spain	US 6,214,793 (10 Apr 2001) US 5,849,540 (15 Dec 1998) US 5,681,183 (28 Oct 1997)	Anticancer and antibiotic drugs. From the patents: "The organism was isolated from an unidentified marine soft coral collected at the Indian Ocean [sic] near the coast of Mozambique."

Seychelles	Sponge extracts (<i>Plakinastrella sp.</i>)	Harbor Branch Oceanographic Inst. Florida, US	US 6,521,661 (18 Feb 2003)	The patent says: “collected at a depth of 25 ft in the Seychelles on the west coast of Felicite Island.”
Seychelles	Sponge extracts (<i>Phakellia mauritiana</i>)	-	None (yet)	Source of dibromophakellstatin, a potential anticancer compound, under research by the Arizona State University (96)
South Africa	Tube worm extracts (<i>Cephalodiscus gilchristi</i>)	Arizona State University, US	US 5,583,224, (10 Dec 1996)	Source of cephalostatins. The patent says: “In 1972, <i>Cephalodiscus gilchristi</i> ... was collected in False Bay, Cape Province, Republic of South Africa. All subsequent recollections were also taken from the same general area.”
South Africa	Sponge extracts (<i>Haliclona tulearensis</i>)	PharmaMar S.A., Madrid, Spain	US 6,635,656 (21 Oct 2003)	Source of toxins. From the patent: “collected in Sodwana Bay, Durban, South Africa”
South Africa	Sea pen extracts (<i>Gyrophyllum sibogae</i>)	-	None (yet)	PharmaMar scientists have recently reported finding anti-tumor compounds in this species. (97)

Potential contacts for more information:

Ms. Isabel Lozano, CEO
Pharma Mar, S.A.
Avda. de los Reyes, 1
Pol. Ind. La Mina-Norte
28770 Colmenar Viejo
Madrid Spain
Tel: + 34 91 846 6000
Fax: + 34 91 846 6001
E-mail: pharmamar@pharmamar.com

Dr. Amy E. Wright, Director
Division of Biomedical Marine Research
Harbor Branch Oceanographic Institution
5600 US 1 North
Fort Pierce FL 34946 USA
Tel: +1 772 465 2400
Fax: +1 772 467 2061
E-mail: wright@hboi.edu

Dr. George R. Pettit
Department of Chemistry &
Biochemistry
Arizona State University
Tempe AZ 85287-1604 USA
Tel: +1 480 965-3351
Fax: +1 480 965-2747
E-mail: BPettit@asu.edu

Dr. José Luis Fernández Puentes
Instituto Biomar, S. A.
Edificio CEEI.
Políg. Ind. Onzonilla
24231 Onzonilla León Spain
Tel: +34 987 84 92 00
Fax: +34 987 84 92 03
E-mail: ibiomar@institutobiomar.com



Cosmetics from “Kokori Fruit” -- Out of Nigeria?

A inventor near Los Angeles, California has obtained a US patent (6,146,646, issued 14 Nov 2000) on the use of the “kokori fruit” in cosmetics. According to the patent, “*Kokori fruit grows naturally on trees and is commonly found in Nigeria*”. Perhaps the kokori fruit is commonly found in Nigeria; but if so, it may be called something else. I found an oilfield and people in Nigeria named Kokori; but not a fruit.

Remarkably, the patent was issued without the scientific name of the fruit or even a drawing or photograph. Why was the patent issued? What is this fruit? What traditional uses, if any, does it have? And who, if anyone, is due some benefit sharing?

Potential contact for further information:

Fatimat Yusuf
2421 Foothill Blvd #21H
La Verne CA 91750 USA



A Skin Treatment from Tamarind -- Out of Africa?

The Universities of Texas and Georgia have obtained a US patent (6,251,878, issued 26 Jun 2001) on prevention and treatment of sunburned skin. Their “innovation”: applying an extract of tamarind seed to the skin.

Tamarind (*Tamarindus indica* L.) is an African native that has spread throughout the tropical world. A cursory look at ethnobotanical studies of African uses of tamarind casts doubt on whether researchers in Texas and Georgia are the first to use it on burned skin. (98) Is this really a patentable invention? And who might be due for some benefit sharing?

Potential contact for further information:

Dr. James C. Arie, Director
University of Texas Medical Branch
Center for Technology Development
Customs House
Suite 1.200, 1700 The Strand,
301 University Boulevard
Galveston TX 77555-0926 USA

Tel: +1 409 772-7953
Fax: +1 409 772-7954
E-mail: jarie@utmb.edu



The Cancer Fighter from Bitterleaf -- Out of Most of Sub-Saharan Africa

A scientist at Jackson State University in Mississippi has obtained a US patent (6,849,604, issued 1 Feb 2005) on extracts of *Vernonia amygdalina*, an African medicinal plant sometimes called Bitterleaf (or Bitter Leaf). According to the patent, the extracts are effective against cancer. The inventor obtained samples in Benin City, Nigeria.

The plant is native to most of sub-Saharan Africa and is used in many countries. Is this invention actually new? Whose traditional knowledge might this be? Will benefits be shared?

Potential contact for further information:

Dr. Ernest Izevbigie
Department of Biology
Jackson State University
1400 Lynch St
Jackson MS 39217 USA

Tel: +1 601 973 3464
Fax: +1 601 979 2349
E-mail: ernest.b.eizbigie@jsums.edu



Infection-Fighting Mycobacteria -- Out of Uganda

A mycobacteria collected in Uganda in the 1970s has been patented at least five times in the US. The latest is number is 6,596,282, issued on 22 July 2003. It covers use of a *Mycobacterium vaccae*, called R877R, against chronic viral infections, including HIV. According to the patent, "R877R was originally isolated from mud samples from the Lango district of Central Uganda." The owner is SR Pharma, plc (formerly Stanford Rook, Ltd.), a British company.

More R877R patents and commercialization may be coming soon. According to SR Pharma's website, it has R877R-related deals with Japan's Sakai Chemical Industry Co. and Genesis Research and Development Corporation of New Zealand., as well as another R877R-derived compound, SRP312, that it is seeking to license. I found no mention of benefit sharing. (99)

Potential contact for further information:

Dr. Iain Ross
SR Pharma plc., 26th Floor
Centre Point
103 New Oxford Street
London WC1A 1DD UK

Tel: +44 (0) 20 7307 1620
Fax: +44 (0) 20 7307 1680
E-mail: mail@srpharma.com

BIODIVERSITY ACQUISITIONS UNDER INVESTIGATION

In a number of cases, the acquisition of particular biodiversity was under investigation before this project was undertaken. Below are brief descriptions of some of these earlier cases, along with citations for publications where more details may be found.



Industrial Enzymes from Microbes -- *Out of Kenya*

Teenagers, pop stars, and other wearers of blue jeans have more trendy looking clothes, thanks to unique fading enzymes from a microbe collected in Lake Nakuru in Kenya. Not only that, but the clothes are probably cleaner, thanks to another Kenyan microbe whose enzymes are used in Procter & Gamble's global detergent brands.

Both microbes, and the key enzymes they produce, are owned by California-based Genencor, a biotech company purchased in 2005 by Danisco of Denmark, a 10,000 employee food and life sciences company with about US \$3.4 billion in annual revenues.

What's the problem? The Kenyan government, for one, says that the collections – made in 1992 by a British researcher and later patented by Genencor – were not approved and, further, that the country is not receiving benefits from the commercialization of the enzymes. In September 2004, Kenya filed suit against the company in US courts. For more information on this case, see:

Barnett, A. Multi-million bio-piracy lawsuit over faded jeans and African lakes, in *The Observer*, 5 September 2004, URL:
http://observer.guardian.co.uk/uk_news/story/0,,1297590,00.html

US Patent 6,291,229, issued 18 September 2001, URL:
<http://patft.uspto.gov/netahtml/srchnum.htm>

Press Release. Genencor and Procter & Gamble Sign Global Contract for the World Wide Supply of Protease Enzymes, Five-year deal estimated to be worth up to \$600 million for Genencor, 7 November 2001, URL: http://www.genencor.com/wt/gcor/pr_1005091211

Potential contact for further information:

Dr. Robert Mayer, CEO
Genencor International, Inc.
925 Page Mill Road
Palo Alto CA 94304 USA

Tel: 650-846-7500
Fax: 650-845-6500

Faded blue jeans and better detergents aren't the only industrial uses for bacteria from Kenya's lakes. According to US Patent 6,140,095 (issued 31 October 2000), bacteria "isolated from soil and water samples collected in the environment of alkaline soda lakes in Kenya" may also lead to a cleaner process for making paper. That's because enzymes produced by the Kenyan bacteria can bleach wood pulp, enabling white paper while reducing the use of chlorine in the manufacturing process. The patent is owned by DSM, a diversified Dutch multinational, although some of the inventors listed on the patent are also associated with Genecor. DSM had more than 24,000 employees and €7.7 billion in sales in 2004. For more information, see:

DSM's website: <http://www.dsm.com>

US Patent 6,140,095, issued 31 October 2000, URL:
<http://patft.uspto.gov/netahtml/srchnum.htm>

Potential contact for further information:

Mr. Peter Elverding, CEO
DSM Corporate Secretariat
P.O. Box 6500
6401 JH Heerlen The Netherlands

E-mail: corporate.governance@dsm.com



Teff (...Yes, Teff!) -- Out of Ethiopia

In 2004, a small Dutch company called Soil and Crop Improvement summarily informed the Ethiopian Government that it "has acquired intellectual property for growing the teff crop as well as for the production of all products containing teff or teff-flour." By leveraging this alleged intellectual property – which actually refers to a patent application, not an issued patent - the company apparently sought to entice Ethiopia to negotiate away ownership of teff varieties.

Public attention was drawn to the case in 2004, when Soil and Crop Improvement was awarded a "Captain Hook Award" at CBD COP-7 by the NGO Coalition Against Biopiracy.

But bad press has not yet deterred the Dutch company from continuing to try to advance its claims over one of Ethiopia's most critical crops. Soil and Crop Improvement's teff patent application was published by the European Patent Office in March, 2005. Working with Wageningen University scientists, the company is trying to adapt teff varieties to grow in The Netherlands. For more information, see:

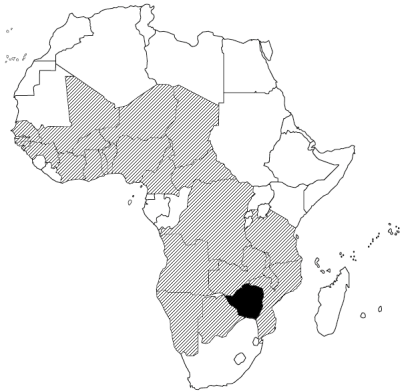
The 2004 Captain Hook Awards, URL: <http://www.captainhookawards.org/>

PCT publication WO2005025319, "Processing of Teff Flour", available from the EPO, URL: <http://v3.espacenet.com/origdoc?DB=EPODOC&IDX=WO2005025319>

Tielens J. *Wageningen researchers involved in international conflict over teff*, in the Wageningen Student International Paper, October 2004, URL: http://www.wb-online.nl/index.php?wispr_archives/w2004_10_04.htm

Potential contact for further information:

Mr. Jans Roosjen
Soil and Crop Cruise Control B.V.
Hoofdvaartsweg 130
9406 XD Assen The Netherlands



The Infection Fighter -- Out of Zimbabwe

Swiss researchers at the University of Lausanne have obtained a US patent (5,929,124, issued 27 July 1999) on *Bobgunnia madagascariensis* (formerly *Swartzia madagascariensis*). The scientists obtained their samples in Zimbabwe, although the plant is native as far north as Chad. According to the patent, the extracts are effective against infections from various kinds of yeast, fungi, and bacteria.

The University of Lausanne sold its "invention" to US-based Phytera, a company that was subsequently taken over by privately-held Galileo Pharmaceuticals, also of the US. According to the deal with Phytera, the company would pay a 1.5% royalty on net sales any drug and, in turn, the University of Lausanne would hand over 50% of that amount (i.e. 0.75%) to the National Herbarium of Zimbabwe.

African NGOs have denounced the deal, pointing out that traditional healers were not consulted and never consented to the patent and that some provisions of the benefit sharing agreement have been ignored. For more information:

Raghavan, C. Bio-piracy in Zimbabwe, patenting by Swiss university denounced, in SUNS, 26 Apr 2001, URL: <http://www.twinside.org.sg/title/denounced.htm>

Berne Declaration (Switzerland) and Community Technology and Development Trust (Zimbabwe). Government and University of Zimbabwe Determined to Stop Biopiracy by Swiss University, 28 Feb 2001, URL: <http://www.evb.ch/en/p25000453.html>

Potential contact for further information:

Lloyd Kunimoto, CEO
Galileo Pharmaceuticals, Inc.
5301 Patrick Henry Drive
Santa Clara CA 95054 USA

Tel: +1 408 654 5830 x123
Fax: +1 408 654 5831
E-mail: lkunimoto@galileopharma.com



Medicinal Plants -- Out of Gabon and Nigeria (and possibly other places)

(A) European-based multinational Sanofi-Aventis has patented the pharmaceutical use of extracts from *Uvaria klaineri*, an African plant. Sanofi-Aventis says that the plant was collected in the Gamba region of Gabon and that plant extracts can be used to fight tumors. Sanofi-Aventis' patent application was initially made in Europe and has issued in the United States as US patent 6,579,903. Applications have also been made in Japan (2002547918), Canada (2430466 A1), Taiwan (TW593306), and Argentina (AR035512 A1).

Many members of the *Uvaria* genus have documented traditional uses in Africa, in countries as diverse as The Gambia, Sierra Leone, Ethiopia, Tanzania, and Congo (DR). The Sanofi-Aventis patent does not say how the company obtained the plant, although it does reveal that it has determined how to synthesize the compounds, making further *U. klaineri* collection unnecessary.

For more information, please consult:

Edmonds Institute. Biodiversity Mystery Theater: The Case of the African Tumor Fighter, URL: <http://www.edmonds-institute.org/mystery.html>

Potential contact for more information:

Dr. Gérard Le Fur
Vice President Science & Medical Affairs
Sanofi-Aventis
174, av. de France
75013 Paris France

Tel: +33 1 53 77 40 00 (switchboard)

(B) For many years Nigerian scientist Maurice Iwu, has been involved in bioprospecting projects in Africa. His research has resulted in three US patents, one issued to bankrupt Shaman Pharmaceuticals (US 5015980), and two to the US military (US 5290553 and 6403576). Iwu's most recent patent application, published in the US in August 2003, is for extracts from five

species of African medicinal plants: *Aframomum aulocacarpus*, *Aframomum danellii*, *Dracaena arborea*, *Eupatorium odoratum*, *Glossocalyx brevipes* and *Napoleonaea imperialis*. The patent application (US2003157197) claims the extracts used against parasites and fungal infections.

The assignee of the 2003 patent application is the US Army, which is offering the plant extract intellectual property for sale. For more information, please consult:

Edmonds Institute. Biodiversity Mystery Theater: The Pentagon's Big African Knowledge Grab, URL: <http://www.edmonds-institute.org/mystery.html>

US Army Medical Research and Materiel Command. Technology Available for Licensing: Plant-Derived Anti-Parasitic and Antifungal Compounds and Methods of Extracting the Compounds, <http://tinyurl.com/dpkzn> (100)

Potential contact for more information:

Dr. Paul C. Mele, Director
Research and Technology Applications
US Army MRMC
MCMR-ZA-J 504 Scott St.
Ft. Detrick MD 21702-5012 USA

Tel: +1 301 619 6664
Fax: +1 301 619 5034
E-mail: usarmmcora@det.amedd.army.mil



Skin Cream from Coco-de-Mer -- Out of Seychelles

The Tokyo-based Kao Corporation sells a skin cream based on a rare palm tree endemic to two islands in the Seychelles. Called the coco-de-mer (*Lodoicea maldivica*), (101) the tree's nuts are the source of a cream that is sold by Kao's luxury goods subsidiary, Molton Brown of the UK. Kao bought Molton Brown in July 2005 for £170 million.

Dubbed "Ultra Smooth Coco de Mer Body Lotion", a 200 ml bottle sells for about US \$25 in stores across Europe and North America. In the US, Ultra Smooth Coco de Mer Body Lotion can be purchased at such upscale stores as Barney's New York, where it is sold alongside \$2000 ladies handbags. The lotion can also be found at Blue Mercury, a store whose motto is "indulgent lifestyle essentials". Moulton Brown recently announced a deal to sell its products at Douglas perfumeries, an 800-store European chain.

It is unclear if "Ultra Smooth Coco de Mer Body Lotion" actually contains any coco-de-mer. There are not believed to be any stands of coco-de-mer outside the Seychelles that are sufficiently large to sustain commercial production. The government of the Seychelles, which is looking into the matter, has not identified any Seychellois partners of Molton Brown. It did,

however, find evidence of patent applications in Europe for the coco-de-mer product. For more information:

Country presentations by the Seychelles at the Regional ABS Capacity-Building Workshop for Eastern and Southern Africa, 2-6 October 2005, in Addis Ababa, URL: <http://www.abs-africa.info/seychelles.html>

Potential contact for more information:

Motoki Ozaki, CEO
Kao Corporation
14-10, Nihonbashi Kayabacho 1-chome
Chuo-ku, Tokyo 103-8210
Japan

Tel: +81 3 3660 7111
Fax: +81 3 3660 8978
E-mail: ir@kao.co.jp (for investor relations)



Cosmetics from the Baobab Tree -- *Out of Africa*

Cognis, the same German-based multinational that patented Morocco's argan tree, has also staked out a claim to one of Africa's most widely-known plant symbols: the baobab tree. (102) The claims were first filed in France in 1997 and have issued in many countries, including the US. The patents cover use of baobab leaf extracts in "*a cosmetic product for at least one of the skin, hair, eyelashes and nails of a human*". (103)

The baobab (*Adansonia digitata*) grows on savannas in much of Africa. It has a striking shape and a remarkable trunk, which stores water and can grow to 11 meters in circumference. It is difficult to overstate the cultural and symbolic significance of the baobab. Botswana's tourism ministry says, "*Undoubtedly this magnificent colossus is the most frequently-discussed botanical phenomenon in Africa.*" (104) One of Senegal's best-known bands is Orchestra Baobab, and Cote d'Ivoire has dubbed an oilfield "Baobab". The Baobab even lent its name to characters in the Star Wars movie series.

Cognis' "invention" is to use the baobab leaf mucilage as a soothing cream, termed an emollient in more technical language. (105) But baobab has a wide variety of traditional medicinal and other uses in Africa, including use of the leaves and use on the skin.

Because the uses span most of the continent, a comprehensive review would take pages. One medicinal plant database has 51 citations describing traditional uses from Mauritania across West Africa, down to South Africa, and back north through East Africa to Ethiopia. (106)

It seems most unlikely that Cognis was the first to discover the soothing effects of baobab mucilage when applied to the human body.

ENDNOTES

- (1) See Edmonds Institute. Biodiversity Mystery Theatre. URL: <http://www.edmonds-institute.org/>
At the same URL, see also Teatro Misterios de Biodiversidad, Biodiversity Mystery Theatre Special - “Biopiracy in Progress?”, and Biodiversity Mystery Theatre Special - “Government-Financed Biopiracy?”
- (2) McGown’s method was similar to that outlined in the Biodiversity Mystery Specials “Biopiracy in Progress?” and “Government-Financed Biopiracy?”. See URL in endnote (1).
- (3) Also sold under the brand names Glucor and Prandase.
- (4) US Patent 5,753,501, EP0730029 (B1), and AU706116 (B2).
- (5) J Bacteriol. 2001 August; 183(15): 4484–4492.
- (6) Bayer 2004 Annual Report, URL: http://www.bayer.com/annualreport_2004_id0109/
- (7) Liu, C. W. et al. Regeneration of the Egyptian medicinal plant *Artemesia judaica* L. Plant Cell Rep. 2003 Feb. 21(6):525-30.
- (8) See the “Quality Assurance” section of Phytopharm’s website, <http://www.phytopharm.co.uk>.
- (9) US Patent 6,358,969, issued 19 March 2002. Also patented in Europe (EP0572454) and Japan (JP2001226380).
- (10) US Patent 5,801,172, issued 1 Sep 1998.
- (11) Maciver’s academic URL: <http://www.bms.ed.ac.uk/research/idg/gendev/SKMaciver/S.Maciver.htm>
The Amoebics Inc URL: <http://www.amoebics.com/>
- (12) US Patent Application 20040058361, filed 25 Mar 2004.
- (13) See National Biomanufacturing Centre already providing assistance to UK Biotech companies, URL: www.merseybio.com/news/newsitem.asp?recordid=222
- (14) Berenson, A. Magic gone, Viagra sales begin to droop, New York Times, 5 December 2005.
- (15) Formerly called Oasis Biotech. The company’s website is URL: <http://www.optionbiotech.com/>
- (16) US Patent 5,879,682, issued 9 March 1999.
- (17) See, for example, J Ethnopharmacol. 2002 Feb, 79(2):213-20 and Citation in the Prelude Medicinal Plants Database, URL: [http://www.metafro.be/prelude/view_symptom?si=H\(152](http://www.metafro.be/prelude/view_symptom?si=H(152)
- (18) Quoted from “Is Biovigora safe?”, at the Option Biotech website, URL: <http://www.optionbiotech.com/en/securitaire.htm>
- (19) Ibid.
- (20) In November 2005, Indonesia threatened to close the US Navy NAMRU-2 facility in Jakarta. According to press reports, Indonesia wants access to any H5N1 influenza vaccines derived by NAMRU-2 from types infecting Indonesian patients. However, it isn’t clear if the US Navy will grant Indonesia rights. For more information, see AP, Indonesia wants Navy lab’s flu vaccine, The Navy Times, 7 Dec 2005, URL: <http://www.navytimes.com/story.php?f=1-292925-1399098.php> and Gibbs, W. Indonesia Plays a Dangerous Game with Avian Flu, Scientific American (online), 7 Dec 2005, URL: http://blog.sciam.com/index.php?title=indonesia_plays_a_dangerous_game_with_av&more=1&c=1&tb=1&pb=1

- (21) Acambis. "Acambis Awarded Two US Grants For Vaccine Programs" (press release), 27 June 2001, URL: <http://www.acambis.co.uk/default.asp?id=310>
- (22) US Patent Application 20040253710, 16 Dec 2004.
- (23) Cambridge Biostability Ltd. "Cambridge Biostability signs license agreement with Acambis for Holovax-ETEC vaccine" (press release), 10 May 2005, URL: http://www.biostability.com/Cambridge_Biostability_signs_1.196.0.html
- (24) Cambridge Biostability Ltd, 10 May 2005.
- (25) Cambridge Biostability Ltd., "DFID boost for new vaccine technology" (press release), 19 Oct 2004, URL: <http://www.biostability.com/fileadmin/resources/PR002.doc>
- (26) US Patent Application 20050054075, 10 Mar 2005.
- (27) US Patent 6,811,795 issued on 2 Nov 2004.
- (28) See Minja, M. M. J. The Maasai Wonder Plants. Paper presented at the People and Plants training workshop, Tropical Pesticides Training Institute, Arusha, Tanzania, 15-18 March 1999, URL: <http://www.tanzaniagateway.org/ik/docs/PEOPLEANDPLANTSWKSHP.pdf> and Githiori J. Evaluation of Anthelmintic Properties of Ethnoveterinary Plant Preparations Used as Livestock Dewormers by Pastoralists and Small Holder Farmers in Kenya, Doctoral thesis, Swedish University of Agricultural Sciences, Uppsala 2004, URL: http://diss-epsilon.slu.se/archive/00000514/01/John_Githiori_Thesis.pdf
- (29) Woldemichael, Worku Abebe. Some Aspects of Traditional Ethiopian Medicine. Addis Tribune, 28 Jan 2005.
- (30) Gonzales Stuart, A. Rue. (Herbal Monograph series), University of Texas at El Paso / Austin Cooperative Pharmacy Program & Paso del Norte Health Foundation, 2005. URL: <http://www.herbalsafety.utep.edu/herbs-pdfs/rue.pdf>
- (31) See, for example, Harry, D. and L. Kanehe. The BS in Access and Benefit Sharing (ABS): Critical Questions for Indigenous Peoples. In Burrows, B., ed. The Catch. The Edmonds Institute, 2005.
- (32) Wynberg, R. Sharing the Crumbs with the San. March 2003, BioWatch South Africa, URL: <http://www.biowatch.org.za/main.asp?include=docs/clippings/csir-san.htm>
- (33) Phytopharm plc Interim report for the six months ended 28 Feb 2005, URL: <http://www.phytopharm.co.uk/press/Interim2005.pdf>
- (34) US Patent 6,488,967, issued 3 Dec 2002 and US Patent 6,808,723, issued 26 Oct 2004.
- (35) Chaturvedula, P. et al. US Patent Application 20040224901, 11 Nov 2004 (Assignee: Bristol-Myers Squibb).
- (36) This institute was established for coal research (Kohlenforschung). These patents stem from the institute's organic chemistry program. The lead inventor, Manfred T. Reetz, has a webpage at this URL: http://www.mpi-muelheim.mpg.de/kofo/english/mpikofo_home_e.html
- (37) European Patent EP1196439 (B1), issued 17 April 2002. The Canadian patent application, which is in English, is CA2372468 A1, published in amended form on 7 Nov 2001. These patent applications were filed before the US began to publish applications, thus, it is quite possible that a US application has been filed; but has not been made public.
- (38) The Studiengesellschaft Kohle MPG website is at the URL: <http://www.sgk.mpg.de/>

- (39) Two Village Voice articles by Aina Hunter describe current goings-on with Iboga in the US. See: The Drug to End All Drugs, 18 Feb 2005, URL <http://www.villagevoice.com/news/0508,hunter1,61311,6.html> and Busted for Iboga, 20 Dec 2005, URL: <http://www.villagevoice.com/people/0551,hunter,71171,24.html>
- (40) Also called *Pycnanthus kombo* and by the common name ilombo.
- (41) US Patent application 20050003030, published 6 Jan 2005.
- (42) See http://aesir.rutgers.edu/njaes/viewproject.cfm?Project_Number=12504
- (43) Rutgers University Cook College/NJAES Faculty Expertise Database, entry for Dr. James Simon, URL: http://www.aesir.rutgers.edu/njaes/viewfaculty.cfm?Last_Name=Simon&First_Name=James
- (44) Kombic acid: US Patent 6,713,512, issued 30 Mar 2004. . Cetyl myristoleate for irritable bowel syndrome: US Patent 6,696,491, issued 24 Feb 2004.
- (45) US Patent 6,083,976, issued 4 Jul 2000. Remarkably, the US Patent and Trademark Office issued this patent without it including the scientific name of *Aloe ferox*. The patent instead refers to “Kenya Aloe” throughout.
- (46) Halliday J. Unigen adds antioxidants to patent store. Nutraingredients-USA, 27 Apr 2005, URL: <http://nutraingredients-usa.com/productnews/news.asp?id=59666&k=unigen-adds-antioxidants>
- (47) US Patent 6,676,952, issued 13 Jan 2004 and EPO patent EP0948313. The scientific name of the okoumé tree is *Aucoumea klaineana* Pierre. It is also known in English as “gaboon”. Other common names include bengouma and angouma.
- (48) Mapangou, M.P. “Illegal exploitation of Gaboon resin in Gabon”, pp. 62-65 in Forest Management Transparency, Governance and the Law, Prepared for the Ministerial Conference on Africa Forest Law Enforcement and Governance (AFLEG), Yaoundé, Cameroon, 13-16 October 2003
- (49) IPHAMETRA’s website URL: <http://www.refer.ga/cenarest/recherche/labo/iphametra.htm>
- (50) The Italian businessman Brando Crespi claims credit for Biodivalor. Crespi is Pro-Natura’s director of strategy. His marketing background includes selling perfumes and “Thigh Master” weight loss equipment. In 1998 Crespi was given an award by the Fragrance Foundation, self-described as “the non-profit, educational arm of the international fragrance industry”. Crespi received the award after he organized a bioprospecting trip to Guyana. A man of diverse interests, Crespi is also the co-founder of an “applied parapsychology lab” specializing in “remote viewing”. Remote viewers are allegedly able to visualize real places and events – past, present, and future - of which they have no personal experience. Crespi claims that “remote viewers” at his company in California located lots of archaeological sites in Egypt. See: <http://tinyurl.com/amkn6>
- (51) Trommeter, M. Biodiversity and international stakes: A question of access. In Ecological Economics (in press).
- (52) “Biodiversité & Humanité: nos vies sont liées” from The French Global Environment Facility, see URL: <http://www.ffem.net/jahia/Jahia/pid/349>
- (53) Trommeter, M. Op.cit.
- (54) US Patent applications: 20030138394, published 24 July 2003, 20040042996, published 4 Mar 2004, and 20040047832, published 11 March 2004 and linked European and PCT applications, including EP1430900 (A1) and WO0245728 (A1)
- (55) See http://www.laboratoires-serobiologiques.com/LSvi/en/prod_2.html and click on “Discover the LS Argan Program”.

- (56) Stussi, I. et al. Argania spinosa - How Ecological Farming, Fair Trade and Sustainability Can Drive the Reasearch [sic] for New Cosmetic Active Ingredients. SOFW-Journal, Oct 2005, 131: 35-46., URL: http://www.laboratoires-serobiologiques.com/pdf/Article_LS-Argan-Program_SOFW_10-2005.pdf
- (57) The Laboratoires Serobiologiques catalog is here: http://www.laboratoiresserobiologiques.com/LSvi/en/prod_1.html
- (58) Press release. Cognis 2004 annual results show significant improvement, 5 April 2005, URL: http://www.cognis.com/framescout.html?/Press/PressReleases2005/2004_Annual_Results_eng.html
- (59) Triticum is part of the multilateral system established under the International Treaty on Plant Genetic Resources for Food and Agriculture; but the scope of that agreement is limited to – as its name indicates – food and agricultural uses. It thus appears that this cosmetic use of triticum may be outside the scope of the FAO treaty.
- (60) See “Origin and Taxonomy” on the Kamut website, URL: <http://www.kamut.com/english/history/origin.htm>
- (61) The Egyptyl® brochure quoted in these paragraphs can be downloaded at the Laboratoires Serobiologiques URL: http://www.laboratoires-serobiologiques.com/LSvi/en/prod_1.html
- (62) US Patent 6,391,320, issued 21 May 2002 and EPO Patent EP0973495 (B1) issued 16 Jan 2002.
- (63) Also named *Voandzeia subterranea*, the name that is used by Cognis in the patents.
- (64) Goli, A.E. Bibliographic Review. In Proceedings of the workshop on Conservation and Improvement of Bambara Groundnut, 14–16 Nov 1995, Harare, Zimbabwe, published by IPGRI, URL: <http://www.ipgri.cgiar.org/publications/pdf/499.pdf>
- (65) A wealth of information about the bambara groundnut can be found at the website of Bamnet, the International Bambara Groundnut Information System, at the URL: <http://www.genres.de/bambara/>
- (66) The name *M. flabellifolia* is also used. The USDA’s GRIN database indicates that it is native in Angola, Botswana, Congo (DR), Kenya, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.
- (67) US Patent Applications 20040081714, published 29 April 2004 and 20040109880, published 10 June 2004.
- (68) See Pittman, S. Cognis launches natural-based skin moisturizer. In Cosmetics Design (online), 24 August 2005, URL: <http://www.cosmeticsdesign.com/news/ng.asp?n=62086-cognis-ls-moisturiser-pa-revivicience>. Cognis’ informational flyer on this product is at this URL: http://www.laboratoires-serobiologiques.com/pdf/MP_PAREvivicience_EN.pdf.
- (69) US Patent 6,111,170, issued 29 Aug 2000.
- (70) Crop Science 41:570-576 (2001).
- (71) Mycological Res. 97:1083–1092.
- (72) While the origin of the “KBG-5891” and KBG-5892” accession numbers noted on the chart is not stated in the patent, numbers beginning with “KBG” are used by Kirstenbosch Botanical Garden in South Africa. This suggests – but does not conclusively prove – that the US researchers obtained two of the five samples from a South African source.
- (73) For a listing of the patent family, see <http://v3.espacenet.com/textdoc?DB=EPODOC&IDX=US5811092&F=1>
- (74) No legal status information is found in the European Patent Office’s INPADOC database.

- (75) See URL: <http://www.casale.ch/>
- (76) WO2005089556, published 29 September 2005 and WO2005078067, published 25 August 2005.
- (77) USDA Peanut Crop Germplasm Committee (2003). A Report on the Status of Arachis Germplasm in the United States. URL: http://www.ars-grin.gov/npgs/cgc_reports/Status11.pdf
- (78) Ibid. p. 27.
- (79) See Golden Peanut's website at URL: <http://www.goldenpeanut.com/>
- (80) Crop Science 42:2207 (2002). Registration of 'C-99R' Peanut, URL: <http://crop.scijournal.org/cgi/content/full/42/6/2207>
- (81) Groundnuts (Arachis) are not among the food and forage crops included in the multilateral system for access and benefit-sharing established by the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR). URL: <http://www.fao.org/ag/cgrfa/itpgr.htm>
- (82) USDA Peanut Crop Germplasm Committee. Op. cit. pp.17, 62.
- (83) Impatiens are divided into two groups according to species origins. There are "New Guinea impatiens" and "African impatiens". Material in this paper, including figures cited, refers to African impatiens only.
- (84) USDA Economic Research Service. Floriculture and Nursery Crops Situation and Outlook Yearbook. June 2005, pp. 78-79. URL: <http://usda.mannlib.cornell.edu/reports/erssor/specialty/flo-bb/flo2005.pdf>
- (85) UK Patent Application 0402658.9, 6 Dec 2004 and US Patent Application 20050177905, 11 Aug 2005.
- (86) See brief Compton Group profile online at <http://www.pro-bio-faraday.com/members.htm#compton>
- (87) See the Compton website, URL: <http://www.slugs.biz/press.htm>
- (88) Myrrh has an important symbolic role in Christianity, particularly in relation to African churches. Myrrh was a gift to the baby Jesus from the "Three Wise Men", or Magi, who followed the Star of David to Bethlehem. In some traditions, myrrh was from an African magi, sometimes described as a "Nubian King" or as the "King of Ethiopia".
- (89) See the website <http://www.slugs.biz>
- (90) See the European Patent Office's summary of the patent family at this URL: <http://v3.espacenet.com/textdoc?DB=EPODOC&IDX=US2005163815&F=0>
- (91) See the University of Lisbon's web page Medicinal plants from Guinea-Bissau, where several relevant publications can be downloaded, including Carbohydrates from Detarium microcarpum bark extract. Carbohydrate Research 337 (2002) 1663 – 1666, URL: http://www.dq.fct.unl.pt/qoa/abreu/guinea_bissau.htm
- (92) Kela, S.L. et al. Rev Elev Med Vet Pays Trop. 1989, 42(2):189-92,195-202. Abstracts available by searching "Polygonum limbatum" on PubMed, URL: <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?DB=pubmed>
- (93) See "Clear rules needed to govern deep sea bioprospecting: UNU" report. URL: http://www.innovations-report.com/html/reports/environment_sciences/report-45199.html
- (94) Toxicology 1998: 131(2-3): 133-43.
- (95) J Nat Prod 2004; 67(1):106-9.
- (96) J Nat Prod 1997; 60(2):180-3.

- (97) J Nat Prod 2004; 67(7):1190-92.
- (98) For example, the Metafro Prelude Medicinal Plants Database, which specializes in Central Africa, returned 69 citations when searched for “Tamarindus indica”. URL: <http://www.metafro.be/prelude>
- (99) See URL: <http://www.srpharma.com/science/mvaccae.htm>
- (100) This abbreviated address is provided by a service that creates shortened URLs that are easier to type. The full URL is: http://www.federallabs.org/ContentObjects/Technologies/Biotechnology_and_Medicine/20030157197_WRAIR_98-36_Plant_Derived_Anti_Parasitic_Cmpds_Okunji.pdf
- (101) The huge nuts are famous seafarers, washing up on remote shores, where they are collected by beachcombers. They are probably the most coveted kind of such “sea nut” in the world. Before their Seychelles origin was discovered, it was mistakenly thought that the nuts came from the Maldives, hence the “maldivica” in the coco-de-mer’s name is an erroneous reference.
- (102) Baobab is sometimes spelled “baobob”. There are at least seven species of baobab in Africa and one in Australia. Most of the African species are mainly found in Madagascar. One, *Adansonia digitata*, is widely-distributed on the continent and is the species most commonly referred to as the African baobab. It is also the species to which this paper refers.
- (103) US patent 6,274,123, issued 14 Aug 2001. The Cognis patent emphasizes extracts from *Adansonia digitata*, but also claims extracts from six other baobab species.
- (104) See the Ministry’s webpage on baobab, URL: http://www.botswana-tourism.gov.bw/flora_and_fauna/baobab.html
- (105) The mucilage is simply a plant substance which forms a viscous mass in the presence of water. In the baobab, mucilage is formed when leaf material contacts water. Another example of plant mucilage is the slimy fluid found in okra. Many treatments for bowel discomfort use plant mucilages, such as those from psyllium, which absorb excess water and promote normal functioning.
- (106) The citations are in the Metafro Prelude Medicinal Plants Database, an initiative of the Belgian Directorate General for Development Cooperation, at the URL: http://www.metafro.be/prelude/view_plant?pi=00470

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