Salsa, sauce, and other ingredients: nature, evolution and conservation of cultural heritage

Edgardo I. Garrido-Pérez, Katia Laura Sidali*

Introduction

All cultures may have evolved from one single culture

When the first *Homo sapiens* left East Africa and spread around the world (Underhill *et al.*, 2000) they were bringing their own culture, which – with further diversification –gave birth to all of the other cultures of the world. This is the most plausible working hypothesis for studying the origins of today's cultural diversity,including the diversity of food and music. In other words, everything we cook and eat, dance, sing, play, paint, perform, and even the sculptures and buildings we construct should be considered as modified versions of the cultural practices of our very first ancestors. Other explanations seem less realistic and less testable: (a) humans may have learned how to make culture from other animals, (b) fromvisitors coming from other planets, or (c) from supra-natural forces. More realistic than all these is considering: thatcultural manifestations evolve from previous ones, that cultures of today evolved from the culture of the very first *Homo sapiens* inhabiting Earth, and that the processes endangering cultural diversity are a man-made part of such evolution. If this is true, then the processes reducing cultural diversity can be holistically understood based on cross-case studies instead of extrapolating theories from single cases. As a by-product of such a pluralistic (not individualistic) approach, scholars can propose criteria on how to protect endangered cultural heritage using Geographic Indications (GIS), UNESCO-categories, and even patents.

* Edgardo I. Garrido-Pérez, Universidad Autónoma de Chiriquí (UNACHI, Panamá), Katia Laura Sidali, University of Goettingen (Germany).

But eugenics, social Darwinism, and racism make some social scientists to abhor cultural evolutionism. That has resulted in very heated, still open debates already summarized by Lewens (2012) and Boyd and Richerson (2000). Readers interested in our position on that subject may read **Appendix 1**. We included it there because it belongs more with philosophy than to the science of studying food, music, their economics, and the challenge of preserving cultural heritage. In that appendix we summarize why ideologies like social Darwinism, eugenics and racism have no place in Evolutionary Biology. We ask both supporters and non-supporters of cultural evolutionism to notice that our paper is a paper about how culture evolves, not about the role of culture on the evolution of humans. Other authors (e.g. Richerson *et al*., 2010, Cavalli-Sforza and Feldman, 1981) have been already covering that topicfor many years.

What to protect as a cultural heritage?

In this paper we propose that many cultural practices of people are cultural heritage in the sense that they have been practiced across generations. Still we propose that only cultural manifestations demonstrated to have been practiced by people throughout many generations could be considered to be protected using heritage discourses such as in the case of the European legal system of geographical indications or the *UNESCO world heritage's label*. Cultural manifestations resulting from the creativity of individuals instead of the "nursery" of a succession of previousgenerations are not inherited and may try to gain protection under another name/protection tools such as brands or patents. We also propose that not all cultural heritage needs protection, but only the ones suffering from a cross-generations decline in the number of practitioners (or collectors in the case of paintings, sculptures, and keepers in the case of architecture works). For example, German Polka is less played and danced to than Cuban Yambú, so if both types of music were competing for protection, Polka will be the priority. But if the so called Cuban Salsa and Cuban Yambú were vying for protection, we propose Yambúwould get the protection because it stays strongly attached to the "old fashioned" ways of playing and dancing while "salsa" has overwhelmingly more non-inherited variation added by single individuals as a simple "trend". In other words, we affirm that deciding what cultural practices to protect, calling them "heritage" demands: (1) disentangling whether it is culturally inherited instead of an invention or "trend". (2) Checking whether the heritage is endangered.

Complex and diverse phenomena like the astonishing diversity of cultural heritage demand a systematic approach. That means, it demands the search

of general principles by comparing many cases instead of extrapolating general theories from singular case studies. Even being controversial for social scientists, Evolution has such principles, while cultural heritage studies still suffer a paucity of cross-case systematization. The goal of this paper is not to provide a last word about how culture evolves and how to protect cultural diversity. Rather, we seek to provide easy-to-falsify (and even easy to surpass) principles borrowed from Evolution in order to help social science to understand diversity.

Why music and food as examples?

Social and natural scientists eat food, drink beverages, and listen music. Indeed, culinary art and music provide a common terrain for a fluent dialogue between natural and social sciences thereby reducing misunderstandings among disciplines. For example, social scientists tend to think that biologists consider single genes or traits, instead of whole individuals, as the units of selection and populations as the units of evolution. Such misunderstandings were expanded into the theory of memes (see review in Lewens, 2012). But when people choose to eat spaghetti bolognese, they are choosing the whole "species", not the salt, meat, tomato sauce, or pasta separately. Similarly, when a shark eats another fish, the shark is eating the whole genes and the whole traits of the fish, not just a specific gene or trait separately. This illustrates why biologists have largely stopped thinking that natural selection operates upon genes; unfortunately, social scientists who argue against memes still seem to assume that biologists think that natural selection operates on genes instead of whole individuals. That occurs because social scientists know as much about biology as biologists know about the society, so both sides need a common language. We wrote this paper about food and music not to necessarily illustrate a "last word" on how food and music evolve, but at least to reach a common terrain for the dialogue between natural and social sciences. That improves the process of checking for agreements and disagreements better than spending too much ink on nice, still philosophical discussions departing from science.

Pizza may have evolved from something else, presumably from the same "culinary ancestor" as Latin American "empanadas". Pizza continues to evolve and diversify into the many different kinds of pizzas found today. Such evolution of pizza has been partly due to the migration of Italians around the world (see further). Music after the African diaspora provides another example of diversification from "ancestral cultures". Moved away from their homes, Africans continued playing and singing their music as a way to spread out and preserve their heritage. At the same time, African

music diversified into different genres in the English – (Marley, 1984), Spanish – (Rivera, 1978), French-and Creole speaking Antilles (Jean-Claude, 1975) as well as in Brazil (Gil, 1972), and the USA (Brown, 1969). Thus, African music after the diaspora is a dynamic whole too. It keeps the African "axis" inherited from previous generations, still innovating to the extent of generating a wide range of music genres and variation within genres.

The main questions of this paper and the importance of cross-case comparisons

The main questions of this paper are the following: (1) How does cultural diversification occur? (2) What causes cultural manifestations to increase, spread, decline, get extinct, and how do you reverse the decline to avoid extinction and keep cultural diversity? (3) When is it necessary to stop paying for the protection of a heritage in order to use the same money to protect another, more endangered heritage? Answering such questions focusing on single case studies is not sufficient. The diversity, change, interplay, and risks of extinction of any highly diverse heritage can only be determined, once again, by means of a systematic approach. Comparing cases, looking for cross-case commonalities and differences is better than extrapolating general rules from single cases that may be exceptions. By systematically looking across cases, diversity studies gain a better platform for further, in-depth understanding of particular cases. That enables any diversity science to propose how to protect endangered single heritages.

In this essay we feature and illustrate six major principles of the evolution of living beings applicable to cultural heritage. Such principles are explained by creating a red line joining more than 80 singular cases coming from a cuisine art, and popular music. By looking into examples from two poorly related cultural manifestations, namely food and music, we perform a first challenge to "our" theory by looking into what extent a body of ideas borrowed from Evolution can work as a starting point for helping the study of culture. Once again, our goal is not to fully explain cultural diversity. We encourage others to go ahead with the study on how culture evolves, check to what extent the theory applies to other cultural manifestations, then test the theory, and surpass it if necessary.

Inheritance and six principles resulting from it

Etymologically, if something is a heritage, then it is inherited; meaning, transmitted from one generation to the next. That is why UNESCO, sui generis protection law (such as GIS), and other regimes exist. They identify cultural

manifestations developed by humans in the past, check whether they are valuable "heritage", then codify them (e.g., inventories, specification sheets) and execute decisions in order to encourage the following generations to keep the heritage instead of letting it disappear. Thus, the recognition of the transmission of cultural processes from one generation to the next is the base of both decisions and bureaucracies devoted to the protection of cultural diversity. Simultaneously, we propose a demographic approach, giving rise to a theory based on six characteristics of cultural heritage to be discussed in this paper: (1) Conservative reproduction, which tends to conserve the cultural heritage throughout generations, keeping each cultural manifestation coherent as a *whole.* (2) Within generation-variability, coming out of the different preferences and creativity of individuals, being part of the variability of the *whole,* facilitating its dynamics. (3) Transformation throughout time, still within the realm of the original cultural manifestation (the *whole* becomes dynamic). (4) Exposure to forces causing trends towards proliferation (higher numbers of practitioners), while other forces cause trends to decline. (5) Exposure to forces tending towards territorial expansion of the heritage (practitioners of the same heritage in far away areas), while other forces tend towards a territorial reduction. (6) Rise of new cultural heritages resulting from previous ones.

There are dozens of principles and concepts in evolutionary biology[1] (Futuyma, 2009; http://en.wikipedia.org/wiki/Evolution#References) making it impossible for one single paper to discuss them all. Here we develop an in-depth discussion of the above six characteristics for the following reasons. (a) The six principles fairly create a fil rouge from the nature – to the transformation – to the diversification of heritage. (b) By featuring such a redline, we try to supply a framework for readers to run further studies of other aspects of evolution. For example, by collecting old recipe books and old music records and written music scores (equivalent to recent fossils in biology), further studies can help to disentangle what current dishes and

1. Here are some of the concepts and principles used in evolutionary biology that are applicable to cultural evolution but are impractical to use in one single paper due to their large number: (1) Adaptation and adaptation, (2) Alleles and Alleles' frequencies, (3) Catastrophism, (4) Co-evolution, (5) Common ancestry, (6) Conservative reproduction and inheritance, (7) Co-operation, (8) Evo-Devo, (9) Extinction, (10) Fitness, (11) Fossil record, (12) Gene flow, (13) Genetic drift, (14) Genetic recombination, (15) Gradualism, (16) Hardy-Weinberg equilibrium, (17) History of life on Earth, (18) Hybridization, (19) Kin selection, (20) Macro- and Microevolution, (21) Meiosis, sex, and genetic recombination, (22) Mitosis and cloning, (23) Modified descent, (24) Molecular clock, (25) Mutation, (26) Natural Selection (Disruptive, Stabilizing, and Directional), (27) Particularized vs "blood-mixing" heritage, (28) Phylogeny, (29) Punctuated equilibrium, (30) Selfish gene, (31) Sexual selection (pre-, during-, and post-copulatory), (32) Speciation, (33) Species (biological, morphological, typological, and other concepts).

music genres have evolved from what others. (c) All six principles come out of, and are closely related to, other key principles: the principle of inheritance (etymologically present in the concept of cultural heritage), the principles of common ancestry and descent with modification (featured in the first paragraph of this paper).

1. Conservative reproduction and acceptance by the youth

As mentioned above, according to the etymology of the word *heritage*, any cultural heritage needs to be able to be reproduced in a conservative way otherwise it cannot be inherited. In this sense, the term *cultural heritage* is consistent with the concept of genes and alleles in biology. Moreover, *cultural heritage* is also consistent to the (still controversial) concept and theory of *memes* proposed by Blackmore (1999). Essentially, she considers each meme as any idea learned by any person from another person and then put into practice. For example, the technique of knocking *claves* in the background of Afro-Cuban *son* music is the so-called *3-3-2-2 clave*: a repeated *toc-toc-toctoc-toc*. This sound is a culturally inherited meme, an idea conceived by somebody in the past and passed down from person to person throughout generations until now. Another largely culturally inherited meme is the idea of adding salt instead of sugar when cooking something. For many generations, the great majority of Italians preferred to produce and eat wheat-derived starch products, mainly bread, cake, pasta, and pizza. German cuisine, on the other hand, tended to restrict the consumption of wheat-derived starches to bread and beer, complementing them with potatoes.

There are at least two kinds of mechanisms for the transmission of cultural features from one generation to the next: (a) conscious imitation, when the young generation looks and imitates old generations and (b) passive acceptance, when the older generations try to instill their behavior into younger generations. In any case, non-rejection of the behavioral pattern by the "catcher generation" warrants successful inheritance, reducing the chances of the cultural heritage to disappear. All these are valid for the ways of producing food and beverages as well as for playing music. The ways of producing wine in Italy and beer in Germany are not endangered because the youth accepts both methods and continues producing and drinking such beverages throughout the generations. The ways accordions are played by the youth in Panama (e.g. Melvin Gutiérrez, Appendix 2-1) follow the practices of previous generations (e.g. Córdoba, 1942, Cárdenas c.a., 1975) as well. Conservative reproduction supplies two criteria to decide whether to protect a given cultural heritage:(1) Ifreproductive success is declining, then protection

measures may be consideredand (2) Gaining the youth is important for saving a cultural heritage.

Conservative reproduction also helps to clarify the applicability of the concept of cultural heritage. Any innovative cultural product, for example a new type of music, even being very charismatic, is not to be considered a cultural heritage if the trend passes without being transmitted to further generations. In the XVIII century *Parmigiano Reggiano* cheese was produced with the yellow-coloring saffron (Keysler [1758], 1976, 111). Apparently, this innovation was widely accepted by many people but did not continue to be practiced by further generations so it was not a cultural heritage. *Boogaloo* music (e.g. Bataan, 1968) was widely danced to but, as far as we know, further generations did not play and dance to it so *bogaloo* was only a fashion. In contrast, *cha-cha-cha* was invented during the 1950's (e.g. Jorrín c.a., 1951), but further generations continued playing it (e.g. De León, 1983) until today (e.g. Charanga Junior; Appendix 2-2) so *cha-cha-cha* is a heritage. Decision makers deciding which human-made products need to be protected under the "heritage" name may first look whether the item exists due to cultural inheritance.

Usefulness of the meme concept

It has been argued that meme theory is reductionist by saying that cultural evolution is reduced to the evolution of memes (see review in Lewens 2012). The statement is based on an idea already abandoned by many biologists: the idea that natural selection and its resulting evolution operates upon genes instead of individuals (Appendix 1). We do not consider cultural heritage and its evolution to be reduced to the memes and their change. Spaghetti is much more than simply starch, and beer should not be reduced to simply fermented wheat. When people prefer spaghetti Bolognese to a hamburger they are not simply choosing between the meme "use natural tomato" and the meme "add ketchup". People are rather choosing whole dishes made after applying sets of memes; one set of memes is called spaghetti Bolognese, the other is a hamburger. Thus, while waiting for social scientists to reach an agreement on the meme-theory, we keep the concept as a first approximation to the nature of cultural heritage. In concrete, a cultural heritage may be considered a set of memes conservatively transmitted from one generation of people to another.

Lewens (2012) and Boyd and Richerson (2000) supply deeper explanations on the meme theory. They expose the reluctance of some social scientists to accept the concept and theory of memes too. Unlike detractors of the meme theory and the European protection system of GIs (including the Traditional Specialty Guaranteed, TSG) seemingly apply the meme concept. In order to

be protected by a GI, a given product needs to demonstrate not only that its ingredients come out of its *terroir*, but also that the procedures follow recipes (sets of memes) historically developed in the *terroir*. TSG applies to recipes (sets of memes) using traditional ingredients independently of who is applying the recipes and where. UNESCO is potentially assuming the existence of memes too. UNESCO-cultural heritage protection is granted to uses, customs, pieces of art, and other products demonstrated to be the patrimony of specific groups of people, such as of ethnical groups among other criteria. By doing this, UNESCO implies that a cultural heritage is: (a) a set of memes (they protect the product, not its separated ingredients), (b) generated, "nursed", and reproduced by previous generations, (c) belonging to populations of people (the sets of memes are shared), and (c) needing protection to avoid other people to fraudulently use the same sets of memes.

Thus, even being controversial, the meme concept is useful enough for: (a) exchanging ideas between natural and social science concerning cultural heritage, and (b) suggesting how to protect it without departing too far away of mainstream laws and organizations taking care of cultural diversity. What we wanted to stress in this section is the following: independently of the theory of memes, efforts for conserving any cultural heritage need to convince younger generations to continue to practice and to consume the heritage. After all, if something is not inherited, it is not a heritage. Bolognese sauce and "Salsa" music are not endangered because young people are still cooking, eating, playing, and dancing to them.

2. Within-generation variability

Food specialties protected with geographical indications can be considered examples of conservative reproduction since their producers are forced to respect the code of practices that are protected by European Union law (cf., EC Regulations 2081/1992, 510/2006, 1151/2012). Though in spite of this, variation exists due to the "personal touch" of the producers (Sidali *et al.* 2013a) or to the specificities of raw ingredients (cf., milk from the plain *versus* milk from the mountains in Sidali *et al.*, 2013b). Thus, any cultural heritage changes across peopleof a given population practicing it; *Chef-de-Cuisine* championships exemplify that. In these contests different chefs are asked to prepare the same specialty but according to the individual creativity of each cook. One instance is the famous "Olympiade der Käse" (Mountain cheese Olympics, Obersdorf, Germany, Appendix 2-3). Among other activities, both experts and amateurs judge the changing flavors and recipes of the different variants of PDO Allgovian Emmentalerin a local competition; eventually the cheese producer with the highest score is awarded a price. China's *chop suey*

is cooked following a basic recipe, but its flavor changes according to the creativity of each person cooking it. Music also provides examples. *Mambo*, a Cuban music genre, was contemporarily played in different ways by Dámaso Pérez-Prado (1956), Machito and his Afro Cubans (1948), Tito Rodríguez (1950), and Tito Puente (c.a. 1957) and is still played in many different ways by current musicians. Diversity of the way of practicing any cultural heritage makes it prone to suffering a transformation as we proceed to explain.

3. Transformation throughout time

When a cultural manifestation is diverse, people consuming it are more able to choose their favorite variation. One example isthe many different variation of Mexican *huevos motuleños*, made in the city of Motul, Yucatan, Mexico (see photos at the link shown after the list of references). Variation favored by more people of a given generation will be practiced more frequently during this generation. When such favored variation are somehow different to the ones preferred by previous generations, evolution occurs by means of a sort of "cultural selection". Wine provides an example. A popular type of wine consumed by ancient Romans was the *conditum*: a spiced wine mixed with several ingredients such as honey and ground black pepper (Kelsey, 1991, 166-170). Since it had a taste resembling vinegar, Romans used to add honey to the beverage to make it more palatable. Nowadays, and many generations after ancient Romans, wines taste remarkably different. That change is a consequence of the interaction between the intrinsic variations of wine, on the one hand, and the further selection by drinkers on the other.

During the 1950's, the diversity of the Dominican Republic's *merengue* music included at least three different ways of playing it. The first is the "perico ripia'o" small band format: only three musicians, who also sing, while playing the accordion, the guiro, and the tambora-drum. The second was the "conjunto"band format: usually 5-6 musicians with a salient saxophone, a good example being Angel Viloria and his Conjunto Típico Cibaeño (Viloria, 1953). The third format was larger "orquestas", like Luis Alberti's *Orquesta Santa Cecilia,* including trumpets and piano (e.g. Alberti c.a., 1955). After several decades, the orquesta format became relatively more common, particularly during the second half of 1970's, the 1980's (Vargas and his Beduinos, 1976; Esteban and Patrullaquince, 1984), and even nowadays (e.g. Mákina, 1997). Pericoripia'o and conjuntos did not disappear, but became less frequently listened to. As a result, the *merengue* of today commonly does not sound the same compared to older *merengue*. All these are consequences of the interactions between the intrinsic variations of *merengue* during the 1950's, on the one hand, and the further selection by

dancers and listeners who favored the sound of brasses, on the other. Similar processes occurred with Cuban *son* and Colombo-Panamanian *cumbia*.

Evolution of cultural heritage adds more than mere 'selection by consumers' processes. There are other intervening processes such as top-down policies, convenience trends in the market of cultural change as well. For example, preferences for certain types of *merengue* during the 1950's were not only determined by the taste of the dancers, but also by the imposed will of the Dominican dictator Rafael Leonidas Trujillo, who paid bands to publicly play his favorite variations of *merengue* (Ventura, 1999). Record companies are recognized as playing a major role in music production and change by shaping (Peterson and Berger, 1975) and taking advantage of different ways of playing popular music as well (Lopes, 1992). Thereby, altering the sounds being listened to today compared to the sounds listened to by previous generations of dancers. More examples from the culinary world come from Latin America and Italy. *Pulque* is a traditional beverage in Mexico. The government banned the drink for some time after the Mexican Revolution because of cases of "illness" due to difficulties by the government in regulating the quality of Pulque's production. The result is that very few Mexicans drink Pulque today. Large food retailers and producing companies are also changing what people eat and drink. The number of Italians making their own pasta at home is being reduced because it is easier to buy it in shops or supermarkets. The same is also valid for tortillas in Mexico and *arepas* in Colombia and Venezuela. All these processes may have reduced culinary, and thereby cultural diversity has diminished to the extent that some authors speak of food illiteracy (Alonso, 2010; Jaffe and Gertler, 2006). But changes to the cultural heritage introduced by top-level processes or external actors only becomes part of the heritage if the public accepts such changes, either voluntarily or under the influence of propaganda and/or advertisements. Henceforth, decision makers should take into account that by favoring single variants of a cultural heritage, they can affect other variants thereby contributing to reduced cultural diversity (cf., Sidali and Spiller, 2014). A possible solution is considering to temporally favor endangered variants just to avoid their extinction during competition with others. Once the protected heritage is safe and strong, re-allocating resources to protect another heritage can be considered.

4. Exposure to forces causing trends to proliferation-and decline trends

In response to declining preferences across generations, a given cultural heritage can, consciously or not, modify itself in a way that it remains attractive to the youth in order for the public to not stop liking it, and thereby reducing its chances of its decline. For example, milk fermen-

tation for producing *Parmigiano Reggiano* cheese is generally started using calf's abomasum (calf rennet), something that irritates the growing market segment of vegetarians. Thus, in order to appease the latter, some producers have adapted *Parmigiano Reggiano* by introducing a variety of the same cheese using a plant starter, not calf rennet, for starting the fermentation. Sometimes the adaptations contribute to the acceptance of a cultural heritage in a place far away from its center of origin. Pizzas are an outstanding example. In Italy, the core of pizza includes four main varieties: *Margherita*, *Quattro stagioni*, *Napoletana* and *Capricciosa*. However, when pizza moved to other areas of the world lacking preeminently Italian ingredients, but having others, pizza evolved into forms like "Hawaiian Pizza" by adding pineapple[2]. Adaptive change can lead to niche specialization. Two varieties of *Parmigiano Reggiano* cheese, namely the "Rossa" and "Bianca Modenese"[3], are restricted to a small number of gourmet and/or sustainability-conscious consumers who are even willing to pay a premium price for such varieties of *Parmigiano Reggiano.* The same is valid for the consumers of alcohol free beer, which has been sold in Germany for many generations. In the music field, *merengue* music-maker Johnny Ventura introduced the beat of a bass drum in the background of *merengue* (e.g. Ventura, 1981) because Ventura himself realized that the youth was dancing less to *Merengue* and more to pop music from the USA and England (e.g. *The Bee Gees*) because of the passion of young people for that beat (Ventura 1999). Further, *merengue* players accepted this adaptive change in *merengue* (e.g. Mákina, 1997; Crespo, 1998) so the change became part of the heritage. For aiding an endangered cultural practice, decision makers may look into each case and choose between gaining the youth for rescuing the practice in its original form, or adaptively changing the cultural heritage in order to make it more "palatable" for the youth.

It is pertinent to add two comments here. Firstly, perfect adaptation does not exist because it is impossible to make all consumers of any product evenly and highly satisfied everywhere, all the time. Secondly, if there were a perfect adaptation, then cultural change would reach a dead end when "perfection" is achieved. No further cultural change throughout generations would occur anymore because of the dominance of a single, perfectly adapted variant. For further selection to occur, more than one variant of the cultural manifestation must exist. All these are valid for the evolution of living

2. As a matter of fact, only the so-called Pizza Margherita is recognized as the traditional 'Pizza Napoletana' and henceforth protected by the quality label TSG (Traditional Specialty Garanteed).

3. These varieties of ParmigianoReggiano linked the production of the cheese to the milk of endangered cattle.

beings, helping to explain why social Darwinism, racism, and similar ideas are ideologies, not invented by biologists, and largely rejected by current Evolutionary Theory. For a further overview of the Evolutionary Theory see Begon *et al.* (2008, 3-30). As explained in the introduction, we are proposing the use of the fundamentals of Ecology and Evolution to be used for saving the diversity of cultural heritage, not for the search and justification of "super cultures" and other chimeras.

5. Exposure to forces tending to territorial expansion and reduction

Since Christopher Columbus started the globalization of the distribution of food species, Eurasian rice, wheat, and their products have spread over the Americas. While corn, avocado, papaya, and cacao spread from tropical America to other places in the world, and Asian and African products like plantain, cola, cattle, sheep, and other species were moved and spread in the Americas. People all over the world widely use tomatoes and hot chili that originated from Mexico. Proliferation is related to territorial expansion, but does not automatically means territorial expansion. Italian heritage, like pizza, pasta, and gnocchi, is widely spread in the Western Hemisphere. In contrast, a Panamanian soft drink called *arroz-con-piña* (literally rice-and-pineapple) is widely consumed in Panama, but only in Panama. This is also valid for Panamanian folk music. Moreover, the worldwide spread and proliferation of a cultural heritage on an area does not automatically mean the conquest of every place. For instance, rock music conquered the USA and many other parts of the world, but the Latino community in the South Bronx of New York preferred and still prefers *salsa* instead of rock (Colón, 1999).

All this suggests that successful territorial expansion of a cultural heritage demands the fulfillment of two requirements. Firstly, 'propagules'[4] need to reach an area outside the range of origin of the heritage. Examples of such propagules include recipe books and TV programs showing cooks at work. Other propagules are people themselves who migrate from one area to another bringing their knowledge and putting it into practice. Secondly, host people need to accept arriving 'cultural propagules'. Italian emigrates convinced their host to cook and eat spaghetti, but Panamanian emigrants have not managed to convince people outside Panama to make and drink *arroz-con-piña*. For music, good examples of acceptance of cultural

4. A propagule is "a structure with the capacity to give rise to a new plant, for example a seed, a spore, or a part of the vegetative body capable of independent growth if detached from the parent" (www.encyclo.co.uk/define/propagule) thereby being able to propagate (spread) the species.

propagules from one region by people living somewhere else are how bands in China (Mandarina China Band, 2006) and Japan (Orquesta de la Luz, 1990) emulate Afro-Caribbean people by playing their music. Still, we need to wait and observe whether further generations of Chinese and Japanese continue playing and dancing to Afro-Caribbean music.

Enhanced geographic spread in the past can also provide bases for conserving and restoring endangered cultural manifestations in the present. For instance, Afro-Cuban music was relatively less accepted by the Cuban youth during late 1960s and early 1970s when many preferred The Beatles (Padura Fuentes, 1999). But the vigorous colonization of New York, Puerto Rico, Venezuela, Panama, Colombia, and Peru by Afro-Cuban music that occurred before "Beatlemania" helped to keep Afro-Cuban music alive, and eventually re-bounding into Cuba (Padura Fuentes, 1999; Álvarez, 1999) and contributed to the efforts made by Cubans who stayed playing their own music. Besides that, the government facilitated the revival of the African side of Cuban music (Hernández, 1998). All this resulted in a further re-empowerment of the Cuban-made *son* both inside and outside of Cuba. On the eve of the 21st Century, Cuba became, once again, the core of Afro-Cuban music. That invites decision makers interested in saving any cultural heritage to look at maps, try to locate areas where the mentioned heritage is located, and consider enhancing cultural interaction between these areas and the ones where the heritage needs protection.

6. The rise of new cultural heritage from previous ones

Here we feature three possible mechanisms for the rise of a new cultural heritage from previous ones: (a) *Hybridization*, by cross-cultural interaction, (b) *sudden, small change* due to the creativity of individuals, and (c) *geographically mediated differentiation* fueled by regional variations of the original cultural heritage.

Hybridization

Many cultural heritages exchange elements or 'memes' (Blackmore, 1999) with each other. Using tomatoes for making sauce is a Mexican tradition, making noodles is a Chinese tradition, but hybridizing both of them into one single dish, namely spaghetti, is an Italian idea. Another example is the combination of rice (from China) and beans from the tropical Americas that gave rise to "rice and beans", widely eaten in the Caribbean and Brazil[5].

5. Examples and variants of rice and beans are: "Moros y cristianos" (Cuba), "Feijoada" (Brazil), "Arroz con porotos" and "Guacho" (Panama), "Gallo Pinto" (Costa Rica), among others.

German-speaking countries' "Müsli" is a hybrid including cereals like oats, on the one hand, and bananas from tropical countries, on the other. Mexican guacamole is a hybrid mixing avocado from the tropical Americas with lemon and onions from Eurasia.

Memes from West-European music, like brass instruments, the piano, and even the violins are found in Afro-Caribbean(e.g. Palmieri, 1974), and USA-Afro-American heritage (e.g. King and Taub, c.a., 1953) suggests that such music is a hybrid from African and West-European heritages. Memes of the Andalusian ways of singing are present in Afro-Caribbean (e.g. Lavoe and Colón, 1971), Afro-Peruvian (e.g. Avilés and Cavero c.a., 1974) and 'Andean' music (e.g. Savia Andina, 1977), suggesting that Andalusian heritage experienced hybridization with African and Native American heritage as well.

All these hybrid cultural practices are transmitted from one generation to the following and stay evolving as distinguishable heritage with respect to the ones that they originated from. Parent cultural heritage of a hybrid one are reservoirs of characteristics potentially useful to save the hybrid. For example, Afro-Peruvian music is more directly related to Andalusian and African heritages so, in the hypothetic case that Afro-Peruvian music would get endangered, borrowing musicians from Andalusian, Africa, and the Caribbean would be more effective for preserving Peruvian music than borrowing musicians from Vienna (Classic music) or California (Rock).

Sudden, small change (mutation) radically altering a heritage

One Chinese culinary specialty, namely the Major Alemán soup (in Spanish *Sopa Mayor Alemán*), was created in Panama during the early 1940's; the name of the soup is due to its very first consumer: Panama's war veteran Major Alfredo Alemán. All of the soup's ingredients are preeminently Chinese (e.g. noodles, Wonton, duck, shrimp, etc.), but the mixture of all of them was a personal idea of one individual. Major Alemán soup rapidly became served and eaten in all Chinese restaurants in Panama, even 3-4 generations after its origin. So it was not a mere fashion, but a new cultural manifestation. But Panamanians cooking sopa Mayor Alemán are the Chinese-originated population. Therefore, if sopa Mayor Alemán would get endangered, protection measures should focus on the young Chinese cooks from Panama for preserving it. If Chinese-Panamanian cooks were too few, Chinese cooks from other countries could probably help to restore sopa Mayor Alemán better than Panamanian cooks without Chinese cultural background. In fact, the latter are not accustomed to preparing gwang-tang, duck and the other ingredients of the soup.

Another example is the origin of Cuba's *mambo* (e.g. Pérez-Prado, 1956) from *danzón* music (e.g. Acerina and his Danzonera c.a., 1950) thanks to

the creativity of Orestes and Israel 'Cachao' López (López, 1999). *Danzón* starts with relatively slow movements remaining for the great majority of the music piece; just at the end the music turns faster. Orestes and Israel López composed a *danzón* piece, but gave much more time to the fast movement; the name they gave to that piece was the "Mambo". This sudden change is clearly interpreted in the version of *mambo* played by Arcaño and his Maravillas (c.a. 1944) as well as by Cachao himself (López and Valdés, 1959). Some years afterwards, many other bands were similarly playing that type of music so the name *mambo* became widely accepted as a new music genre persisting till today as part of the *Salsa* movement (Machito and his Afrocubans, 1948, Pérez-Prado, 1956; Roena, 1974, and Van-Van, 2004). Because *mambo* is essentially a slightly modified *danzón*, preserving and enhancing the interactions between musicians playing *mambo* and *danzón* can reduce the risks of decline of these music genres. All these are valid for *cha-cha-cha*, which originated as a mutation from *danzón* as well thanks to the individual creativity of Enrique Jorrín.

Geographically mediated differentiation (geographic speciation)

When a geographic barrier separates people practicing a given cultural heritage, the cultural heritage continues changing in each place separately. After a number of generations this may result in clearly different cultural heritages resulting from the original one. Emigration to far-away places is one way of geographically separating the practitioners of a cultural heritage. Spanish, Portuguese, and Africans went out from Europe and Africa to far-away Latin America, putting the Atlantic Ocean between themselves and their sites of origin. One result, after many generations, was the rise of different ways to play guitar, with respect to the Iberian Peninsula, and drums, with respect to Africa (Manuel and Fiol, 2007), besides the already mentioned hybridization of European and African heritages resulting in new music genres. On the culinary side, the Alps separate Italy and Germany, and that may have contributed to fix two different preferences for how to process coffee. Even using the same instruments and procedures at home for preparing coffee, the taste is different on both sides of the Alps because Germans prefer a different way of processing the coffee before selling it compared to Italians. It remains unclear whether German and Italian coffees represent local variants of the same heritage or two heritages fully differentiated from each other.

Geographic differentiation and cultural gradients

Small groups of individuals in a population living in a peripheral area with respect to the rest of the population, and without geographic discontinuity, can exchange memes because of their relatively low isolation with respect

to each other. That can result in new cultural heritage within a cultural gradient. This mechanism seems plausible for explaining the origins of some food specialties and music in the Mediterranean. Apparently, snap shots of a cultural gradient include the following specialties, all them consisting of a wheat-starch, flat-and-round shaped dough: Turkey's *Lahmacun*, Alsatian *Tarteflambée*, Italian *Piadina*, and *Pizza alla Romana*. The closer the relationship between two cultural heritages within the gradient, the more accurate the decisions for saving any of such heritages by borrowing help from one to the other. If Italian *Piadina* were to eventually get endangered, help from Roman pizza-bakers would be more effective than borrowing help from Alsatian bakers as part of a program for preserving *Piadina*.

For music and dance examples we encourage readers to look at the commonalities, and even a "red line" for the following countries, all them located along a fairly continuous geographic line running "counter-clock wise" along the Mediterranean coast (Appendix 2-4): Algeria, Crete, Lebanon, Turkey, Romania, and Italy. Similarities and differences across these "Mediterranean cultural manifestations" suggest that both local differentiation and exchange of memes have been contributing to the high diversity of cultural heritage there.

Concluding remarks

Cultural heritage's name is derived from being conservatively inherited from one generation to the next. All cultural manifestations of the world are the result of the change and diversification of previous cultures, being the culture of the very first *Homo sapiens*, the mother of every other cultural heritage. Such diversification from one single culture is still in motion, as a consequence of the simultaneous operation of the six types of processes discussed in this paper. Such principles are not necessarily in contradiction to other explanations. For example, historic materialism considers the society to be divided in social classes and that top-down influence by ruling classes can act in favor of some cultural manifestations. Still, this theory does not suffice to explain the evolution of culture in the absence of private property, social classes, political institutions, and other entities and processes existing besides social classes. Social scientists are encouraged to look for unifying principles for a better study of cultural diversity and its protection, instead of focusing on single case studies.

Since every heritage is inherited from one generation to the next, the key for ensuring both the change and conservation of any cultural manifestation is the acceptance of both the practice and its change by the youth over successive generations. Legal, financial, and other decisions attempting to

preserve cultural heritage without gaining young producers and consumers are condemned to fail and may be a waste of resources.

Culture is one of the most diverse and vigorously changing phenomena of the world. Studying highly changing phenomena can puzzle science, so moving from single case studies to the search of unifying principles is necessary for both discovering general patterns and formulating hypotheses on why single cases depart away from the pattern. When the departure of a single cultural heritage from the general trends implies a decline of the heritage, scholars can better study the case of the threatened heritage by means of: focusing on the case, comparing it to the general trend, and comparing it to other, non-endangered heritage. As an outcome of the latter, more precise suggestions can appear for the protection of cultural diversity, which is one of the most beautiful patrimonies of our planet.

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Freely available photos of tens of variants of Mexican *huevosmotuleños*

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Appendix 1. Cultural evolutionism, ideologies, and evolution

Prolific research and passionate discussion exist for at least two major aspects of cultural evolutionism (deduced from Lewens, 2012).

a) The brain generates culture and ideas; that means they are not genetically encoded in our DNA. Still, brain generated ideas and culture seem to have significantly contributed to avoid the extinction of the otherwise very weak species *Homo sapiens*. Moreover, the species proliferated more than many others and has even driven many other species to extinction. Thus, the first main discussion of cultural evolutionism spins around the following question: What ist he role and adaptive value of culture for the evolution of humans in habitats ranging from the wild to current cities? Discussions and studies on that are found in Richerson *et al.* (2010), Laland and Brown (2002), and Cavalli-Sforza and Feldman (1981). Such topic is not within the scope of our paper; Lewens (2012) devotes a great deal of his review to this subject.
b) *Evolution is change* – Lewens say, *and a theory on cultural evolution (…) is any theory that explains cultural change, cultural stability, cultural divergence, or cultural homogenization over time* (Lewens, 2012). Our paper fits into that, but Lewens (2012) and Perry and Mace (2010) explain that a large number of social and cultural anthropologists feel irritated by being labeled as cultural evolutionists (Lewens, 2012). Thus, such scholars use to give their backs to Evolutionary Biology. Studying why some scientists do not accept the ideas of others is a topic for journals on philosophy, history or sociology of science, which go beyond the scope of Economia Agro-Alimentare. Still, we believe there is a healthy interest for social scientists to avoid fascist ideologies like "the survival o the fittest". Fortunately, Evolution has surpassed these and other ideologies; here we briefly discuss why.

Some ideologies surpassed in Evolution

1. Natural selection is not considered as "the survival of the fittest". Evolution by natural selection is a consistent change in the average of certain characteristics throughout generations (see also Futuyma, 2009). If only "the fittest" remains, there is no average and no more evolution. In other words, if the fittest is reached, evolution reaches a dead eand and there is no evolution anymore. Moreover, the environment changes so quickly during the life of individuals, that no one is "the fittest". Ecology (see Begon *et al.*, 2008) and Evolution (Futuyma, 2009) largely recognize that species being well adapted to some conditions are constrained for other conditions. For example, tree species "better" adapted to survive, grow, and reproduce under direct sunlight are short lived and cannot perform "the fittest" under shadowed conditions. Therefore, the search for a "fittest" by some humans results from ideology, not from Evolution.
2. Evolution by natural selection is not considered a random process. Even recognizing that the rise of genetic variation by mutations is a random process, and even recognizing that the segregation of pairs of chromosomes during meiosis resulting in reproductive cells is also stochastic, directional natural selection is directional precisely because it does not occur at random. It is the other way round: directional evolution, resulting in adaptations, is directional because it departs from randomness.
3. Natural selection does not select single genes or traits. Rather, natural selection selects individuals belonging to populations. One fish can have "good genes", letting it swim very fast so a shark cannot eat it. But the same fish can have "bad genes" for surviving infections by bacteria, fungi, and parasites. In an environment with a low abundance of parasites, the "good swimmer" is favored by natural selection, but still the selected ones keep "bad genes" for surviving parasitism: the shark eats the whole fish, not some of its genes or characterisitcs. In other words, natural selection operates upon the whole body, not upon single genes. By the way, it helps in explaining why evolutionary biologists do not expect evolution to lead to "perfection".
4. Genetic diversity, enhanced by sexual reproduction occurring according to the fluctuations of sexual attraction, contributes better than racial exclusion to the success and further evolution of many species with sexual. That includes humans. Because humans are not cloning animals, but reproduce sexually. Back to the example of fish, a fish "bad for swimming" can also be "sexy" enough to mate and produce offspring before being caught by a shark. That helps to explain why so many fish are not good swimmers, implying that the "less strong ones" do not necessarily get extinct. Thus, racism is an ideology, not part of current Evolutionary Biology.
5. The idea that evolution leads to "perfection", displays "from primitive to advanced", or goes from "worse-to-better-to-best" is too subjective for being acceptable in biology. "Perfection" can be relative, yet it remains subjective: humans are "more perfect" than apes at walking on two legs, but apes are "more perfect" than humans at climbing. Loosely accepting that evolution seeks perfection would be teleological and may make Evolution become a pseudoscience so the idea has been neglected (see also Futuyma, 2009: 298-301).

Evolution, social science, and pseudoscience

Since Evolution involves the study of the causes of extinction, evolutionary knowledge is useful for better avoiding extinction and conserve biodiversity.

Morally speaking, this is just the opposite of social Darwinism, eugenics, and racism inherited from social pseudoscience of the XIX and early XX centuries. Social pseudoscience put Europeans on the top of biological and cultural evolution, an axiological idea impossible to be tested. Then, social pseudoscience (e.g. Herbert Spencer) misinterpreted biological ideas of its time and published such interpretations in order to look like "science". Human's exploitation, wars, and ethnical cleansing were "biologically justified" by social pseudoscience by arguing that only "the fittest races and cultures" have the "natural right" of dominating, and even annihilating others. Biologists' efforts for preserving the diversity of living beings go on the very opposite direction: preserving diversity, instead of seeking homogeneity.

Interestingly, scholars thinking that Evolutionary Biology is a "nazi idea" rarely realize that Evolution has more in common with dialectical materialism than to any other non-scientific idea developed by humans. By the way, the same is valid for Ecology, the sister discipline of Evolution. For Evolution as well as for all biological sciences, living beings and their change are considered to result from materially traceable processes instead of supra-natural forces. Living beings are accepted to be affected by, and changing in, response to the environment. Living beings cause the environment to change as well. The most spectacular of such changes is the accumulation of oxygen in the atmosphere by algae and plants, making it possible for millions of other living beings to breath air. Yet, it remains unclear why some of the developers of current Evolutionary Theory were or are Marxists.

While social pseudo-scientists were supporting Fascism and Nazism, evolutionary biologist J.B.S. Haldane was voluntarily fighting them during Spain's civil war. Richard Levins and Richard Lewontin are two famous, still living, developers of Evolutionary thought openly recognized as Marxists. Theodozious Dobzhansky did not claim to be Marxist, but he looked into dialectical materialism with explicit respect and encouraged other evolutionary biologists to do the same. Ivan Ivanovich Schmallhaussen explicitly applied dialectics in a very successful way against Stalinist Lyshenko. Finally, other founders of current Evolutionary Biology simply seemed to unconsciously apply dialectics, or at least not to see any reason to discuss it (e.g. George Gaylord Simpson, Ernst Mayr, and G. Ledyard Stebbins). In-depth discussions on why some evolutionary biologists became Marxists, whereas social pseudoscientist who invented social Darwinism while making Biology guilty, goes beyond the scope of this paper. We prefer to contribute to the study of cultural diversity by enhancing the cross-fertilization between natural and social sciences while talking on nicer topics like food and music.

Appendix 2. Freely available videos (non available as records)

1. Panama's young accordion player Melvin Gutiérrez: www.youtube.com/watch?v=QjGTvnPFfzU.
2. Colombia's Charanga Junior: www.youtube.com/watch?v=s9dFTkgYf-k.
3. Germany' "Olympiade der Käse" (Mountain cheese Olympics: www.oberstdorf.de/stichworte/kaeseolympiade.html.
4. Musical gradient along a geographic line in the Mediterranean basin: (a) Algeria: (www.youtube.com/watch?v=bye_2PzlHCk). (b) Crete: (www.youtube.com/watch?v=us6wAXQ7O8Y). (c) Lebanon: (www.youtube.com/watch?v=0h1M-

9ItpNU). (d) Turkey: (www.youtube.com/watch?v=t0z-awq6Uz0). (e) Romania (www.youtube.com/watch?v=mk8XCOLDbtY), and (f) Italy (www.youtube.com/watch?v=zd68UBpmLVU).

Summary

All cultural manifestations of the world, including food and music, were derived from the cultural practices developed by the first *Homo sapiens* who inhabited the Earth. But, with so many cultural manifestations, which ones need protection? Is the meme theory useful as seems to be used by Geographic Indications and other forms of protection? How does cultural diversification occur? How do cultural manifestations increase, spread, or decline and how do you avoid such a decline? How do you detect whether a product is a cultural heritage to be protected and not a mere fashion or creation of single individuals? Here we discuss the nature of cultural heritage by answering these questions for Afro-Caribbean music and culinary art. We collaterally show some evolutionary misconceptions attributed to Biology that have been largely neglected by such a science while being kept by some social scientists (e.g. social Darwinism). Cultural heritage studies used to extrapolate general theories from single case studies, generating too many theories based on poor evidence. We rather coherently join more than 80 cases of music and food along one single theory, able to be tested and eventually surpassed by further research. Six characteristics and principles of the theory are derived from the fact that cultural heritage is inherited from one generation to the next: (1) Conservative reproduction, (2) within generation-variability, (3) transformation throughout time, (4) exposure to forces causing trends to proliferation – and decline, (5) exposure to forces tending to territorial expansion – and reduction, and (6) rise of new culture from previous ones. We provide examples of how new cultural heritage can arise from previous ones by means of: (a) exchange with other cultural heritage, (b) sudden innovation by creative individuals, and (c) geographically mediated differentiation. Inventions made by single individuals or families and being non-inherited from previous generations are not heritage and should be protected under other denominations. Cultural manifestations that suffer a decline in practitioners throughout generations need to be protected by means of legal, technical, educational, and even marketing practices gaining acceptance in the new generations who are to be considered as the key for saving any heritage.

Key words: Afro-Caribbean music, cultural evolution and diversification, food specialties, geographical indications, meme-theory

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Corresponding Author: Edgardo I. Garrido-Pérez - Universidad Autónoma de Chiriquí (UNACHI, Panamá). Herbario y Jardín Botánico. Urbanización El Cabrero - Carretera Interamericana - David - Chiriquí - Panamá.

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