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## Editors' Note

The first issue of the *USC Journal of Research* was launched on December 1, 2008. It has since received numerous accolades from Seventh-day Adventist institutions of higher learning, Caribbean universities, namely, the University of the West Indies and the University of Trinidad and Tobago, local libraries like the Nalis, and academic communities in the Caribbean, the United States, Europe and Asia. We, the editors, are happy to publish the second volume - *USC Journal of Research, 2011*.

The overarching theme in this volume is “Environmental Issues”, with a collection of five papers from the Humanities, Religion, Social Sciences, and Sciences & Technology. They variably touch on socio-cultural, political, religious, ecological and biological concerns. This volume also includes two book reviews. One is by Susan Chand on George Gowrie’s book, *Current Issues in Sociology and Education*, and the other, by Alexander Santrac, on *Proceedings of Conference: Mind of Christ, 2008/2009*. The editors would like to express their gratitude to all the members of the Peer Review Board, the Editorial Board, and the contributors, in making the publication of this volume successful.

# Introduction

Among the most distinguishing marks of a university is the willingness of the institution to find ways to contribute to the existing body of knowledge through faculty research, the proclivity of its faculty to open itself for public collegial examination, and the support that the university receives from its administration for research.

The administration of the University of the Southern Caribbean (USC) continues to demonstrate the institution's commitment to research and scholarship, in its support for the development and staffing of the Office of Research; support for the USC Journal of Research; monies provided for faculty research and grants; time allowed faculty to pursue research ideas; seed funding for the involvement of students in research activities; and promotion and dissemination of research findings in refereed journals.

USC's continued support for research has led to the appointment of Dr. Noel Brathwaite as Director of Research and Graduate Studies. He has served several institutions such as Johns Hopkins University and Florida Adventist Health System on research appointments. Also joining the team as Associate Director for Faculty Research is Ms. Lee Howard, who has served in research capacities at both the University of Michigan and Johns Hopkins University. She has worked with some of the best social scientists in academia. Mr. Anthony Brumble has been appointed to the position of Associate Director for Institutional Research. His research experience is limited to the University of the Southern Caribbean, but we have no doubt that his stellar beginning will serve him well in this capacity.

I welcome you to this second issue of the journal, which continues to engage the interest of people from multiple disciplines, consistent with the mission of the editors.

In this issue, Cummings' "Incidents and Explanations of Romantic Homicide in Guyana" examines the "dysfunctionality of intimate encounter involving Guyanese couples", with implications for rural communities beyond the shores of Guyana. The social environment of the Caribbean is sorely in need of resources and knowledge bases, as provided by Cummings.

In his paper, entitled, "Religion and Conservation: Hardi and Hindu Women in Trinidad", Mahabir provides a religious and ecological dimension to the age-old practice of the medicinal plant, "Hardi" (turmeric), by the East Indian Hindu women in Trinidad. In the face of increasing ecological crises, many medicinal plants around the world are becoming increasingly susceptible to of extinction. This paper is a clarion call to conservationists to adopt new approaches to involve members of religious groups and the public in environmental protection, particularly, in conserving the Hardi plant in Trinidad and other

parts of the world.

Marshall and Wilson assess “the relationship between Western television consumption and the cultural choices of adolescents in Guyana,” which is timely and relevant to the Caribbean community. The rapid growth of the Caribbean in relation to imported foods, music, clothing and other resources will continue to have an impact on the social fabric for the immediate future. Their study opens the way for replication in several other areas of the interaction between western practices and Caribbean acceptance of these practices.

This volume provides for engaging reading. It challenges readers to participate in the continuing dialogue about the social environment. None of us can escape the big questions and responsibilities appertaining to socio-political and scientific decisions about the type of world that we will hand over to posterity. The God of this universe expects us to value His creation and respect the latitude and limits placed on each succeeding civilization.

Noel examines the “Structural Analysis of the Modern Calypso.” His examination leaves us with an insightful “understanding of the culture of calypso.” He looks at the etic and emic perspectives in calypso culture and structure. It is a well developed commentary on one aspect of the Caribbean socio-cultural environment.

Traboulay and Labropoulos provide an insightful and compelling discussion on the environmental and social dynamics that presently engage decisions about environments, truths, ethics, etc. Century-old questions about origins are revisited, and new paths for dialogue encouraged. The authors do not seek to provide answers as much as they set out to challenge us to consider the complexity of what may otherwise seem simple.



**I**

**Social**

**Sciences**



# Incidents and Explanations of Romantic Homicides in Guyana

By

\*Letroy O. Cummings

University of the Southern Caribbean

Key words: *romantic, homicide, intimate partner, murder, suicide*

## Abstract

This paper is on romantic homicides, consistently highlighted in the Guyana media. On a daily basis, the public consume depressing reports of women dehumanized, brutalized, and killed by their male partners. Romantic homicides epitomize the dysfunctionality of intimate encounters involving Guyanese couples living in conjugal, common-law, and visiting unions. The study responds to the need to enhance our understanding of a dark side of romantic relationships. This paper is a qualitative study, based on relational and thematic content analyses of newspaper reports. Findings suggest that romantic homicides are rural phenomena, and there exists a culture of non-interference that impacts the safety of many women. In addition, women compromise their survival chances when they indicate a willingness to leave violent relationships. This by no means suggests that women should stay in unhealthy relationships, but points to the acute predicament they face.

## Introduction

The Guyana media frequently highlight dramatic and fatal incidents of violence involving romantic partners. Several incidents of romantic killings are publicized, indicating the interaction deficiencies associated with romantic relationships. Reported cases raise awareness of the scope of the problem, and indicate the dilemma facing romantic encounters in Guyana. The images that are presented suggest that romantic violence is an issue of serious social concern that has reached catastrophic levels.

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Legal and moral norms seem ineffective in reducing the incidents of violence, particularly involving intimate partners. The proliferation and frequency is an indication of the quality of interaction among individuals, including romantic couples. The killing of a romantic partner exists alongside the expected features of love, harmony, and consensus.

This paper focuses on romantic homicide - the killing of a romantic partner by another. It highlights the dysfunctionality of romantic relationships among Guyanese couples living in conjugal, common-law, or visiting unions. Romantic homicides epitomize the instability and physical conflict between two partners. It is interpersonal and interfamilial violence, which is part of the larger intrasocietal violence that impact social relationships.

This study highlights the incidents of romantic homicides, and seeks to explain their existence. Above all, the aim is to determine the demographic characteristics of victims and offenders, types of acts associated with violent encounters between romantic partners, and the consequences for both victims and offenders. The study offers some plausible strategies for enhancing intimate encounters.

## **Literature Review**

### **Incidents of Romantic Violence**

Homicide is a graphic manifestation of the conflict associated with romantic relationships. Killing a female partner underscores the power dynamics and patriarchal domination, as "... males, relative to females, commit a significantly greater proportion of nonlethal and lethal assault" (Barnett, Miller-Perrin, & Perrin, 2005, p. 263). Spousal murder, followed by suicide, homicide-suicide, intimate partner murder, intimate partner murder-suicide, and intimate femicide-suicide, are some of the names by which romantic killings are known. Perpetrators are intimate lovers with the status of husband, ex-husband, dating or cohabiting boyfriend and ex-boyfriend, or a rejected lover/suitor. After killing a female partner, perpetrators become hopeless and self-destructive.

Van Wormer (n.d.) observed that the U.S. Bureau of Justice Statistics (BJS) estimated that more than three women a day are killed by their intimate partners. It is estimated that roughly two-thirds of women murdered by their current or former intimate partner had previously been abused by that partner (Campbell, 1992, 1995, as cited in Bullock, 2007). Internationally, between 18% and 40% of perpetrators of spousal murder commit suicide afterwards (Mathews et al., 2008).

Fatal violence is embedded within a strong patriarchal culture of a society in which women are subordinate to men, and have been victims of abuse (Bullock, 2007). It is observed that "... battered women's experiences have suggested that

psychological and physical abuse are often intertwined and ... can escalate over time as the abuser tries to maintain control over his victim, sometimes culminating in the victim's death" (Dutton, 1995; Walker, 1979 as cited in Bullock, 2007, p. 3). Patriarchal domination suggests that there exists a socially accepted power imbalance, which influences the bargaining power between romantic couples. Daly and Wilson (as cited in Barnes, 2000) argue that women are viewed as property belonging exclusively to men, resulting in the female partner becoming a "possession" that must be taken along on the journey to death.

An estimate of 261 intimate femicide-suicide cases with a fatality rate of 1.7 per 100,000 women age 14 and older, and a perpetrator fatality rate of 2.0 per 100,000 male 15 and older was found in South Africa (Mathews et al., 2008). Estimates in South Africa for 1999 shows that 19.4% of perpetrators committed suicide, a rate that is at the lower end of the range reported internationally, with similar rates reported for Australia (21%) and North Carolina, USA (24%) (Mathews et al., 2008).

Figures from the U.S. Department of Justice indicate that in 1999, intimate partner homicides accounted for approximately 32% of all murders of women and girls 12 or older in the United States (Bullock, 2007). In Utah between 1994 and 1999, intimate partner violence accounted for 49% of the 131 female homicides (Violence and Injury, 2001 as cited in Bullock, 2007, p. 3). On average, nearly 19 wives were killed by their husbands, while homicide of husbands was an average of nearly 17 in a given state and year (Dee, 2003).

### **Factors Associated with Romantic Homicides**

Mathews et al. (2008) found low intimate-femicide rates among white males, but "suicide among intimate-femicide perpetrators was more likely if the perpetrator was white; employed as a professional or white-collar worker ..." (p. 554). The increased risk for white men matches national suicide patterns in South Africa, where the overall suicide rate is highest (Mathews et al. 2008).

Kozoil-McLain et al. (as cited in Mathews et al., 2008) reported that "intimate femicide-suicide perpetrators are more 'conventional,' employed, and married." Mathews et al. (2008) suggest "... intimate femicide-suicide is a 'middle-class phenomenon,' more common among married men who are employed" (p. 555). Perpetrators from higher socio-economic status have more to lose after killing an intimate partner, and so might choose to commit suicide, on account of unpleasant consequences, such as the shame attached to incarceration and imprisonment (Mathews et al., 2008).

Theories on the cause of intimate femicide-suicide have a common theme of jealousy and possessiveness by the male partner. Some have argued that it is due to depression in the perpetrator, which results in morbid jealousy and delusions

that lead to killing. Intimate femicide-suicide is often premeditated, judging from the short duration between the two acts, as well as suicide notes and a history of stalking. Graser (as cited in Mathew et al., 2008) suggests that this is primarily an extended suicide (i.e. the primary aim is suicide), which is rational and carefully planned, with the homicide being an act of 'taking the family into death'. Intimate femicide may also occur as a spontaneous act of murder occurring in a fit of jealousy, with ensuing suicide being an act of remorse, or stemming from fear of the consequences (Mathews et al., 2008).

Hamptom and Gelles (1994) examined the existence of intimate partner violence within black families. They focused on the incidents, patterns, and causes of husband-to-wife, and wife-to-husband violence. They used the Conflict Tactics Scale (CTS) to measure incidents and frequency of partner violence. In addition, they used a comparative approach to compare the rates of husband-to-wife violence in black and white families. They found that black wives were 1.23 times more likely to experience minor violence, and more than twice (2.36) more likely to experience severe violence.

### **Romantic Violence in Guyana**

The high level of violence in the Guyanese society has overshadowed the problem of violence against women in the home (Insanally, 2006). "While an issue of concern ... domestic violence has not received the ... attention that is accorded drug and gang related violence..." (Insanally, 2006, p. 15). "Anecdotal evidence suggests that domestic violence remains pervasive, even with an increased level of brutality" (Insanally, 2006, p 16). The United States Country Reports on Human Rights Practices for 2007 found that domestic violence in Guyana is widespread across racial and economic boundaries (U.S. Department of State, March 11, 2008).

Results from the 2006 Multiple Indicator Cluster Survey (MICS), indicates that one in every five women believed that it is justified for the male partner to hit his spouse (Bureau of Statistics and United Nations Children's Fund, 2006). Thirty nine percent (39%) of hinterland women, 20% of rural women and 8% of urban women subscribe to such a view (Bureau of Statistics and United Nations Children's Fund, 2006).

Judging from 55% and 47.5% of respondents in a 1998 survey, jealousy and hot temper seem to constitute a common feature impacting intimate interaction and influencing factors of violence against women (Red Thread Women Development Programme, 2000). Apart from that, other factors such as drugs, alcohol abuse, financial pressure, male stress experiences, education and/or paid employment of females, lack of family support, and disapproved relationships function to

perpetuate violence against women.

Males are the dominant perpetrators of high level of violence in Guyanese homes, but it is not gender specific because women do hit back (Shiw Parsad, 1988; Danna & Shiw Parsad, 1988; Danna & Shiw Parsad, 1989). Women who perpetrate violence are really in a retaliatory role in response to the violence experienced from their male counterpart (Danna & Shiw Parsad, 1988; Danna & Shiw Parsad, 1989). Attacks by wives against husbands, if they do not result in injury to the husbands, puts the wives in greater danger of much severe retaliation from men (Straus, 2005).

It has been found that Black women (74%) are more likely than their East Indian counterparts (39%) to hit their male partner (Danna & Shiw Parsad, 1988; Danna & Shiw Parsad, 1989). The low rate of violence of East Indian women against their partner is probably a reflection of the constant brutalisation to keep them in subjection (Morgan and Youssef, 2006). The frequency with which women are killed is indicative of the severity of male dominance and violence directed at bringing women into conformity.

## **Method**

### **Data Collection and Manipulation**

This is a qualitative study based on secondary data derived from a content analysis of online newspaper reports. Articles based on title and content were obtained from Stabroek newspapers, online archive. Accessing the Guyana Chronicle and Kaieteur News prove difficult, due to Internet and website problems at the time. The units of analysis include news items, features, editorials, letters to the editor, and other opinion pieces. Fifty eight (58) articles covering the period January 2003 to December 2008 were selected for analysis. They were checked for relevance and two (2) were excluded, because the incidents occurred outside of Guyana and do not contribute to local statistics. This resulted in a sample of fifty six (56) articles subjected to analysis.

Content analysis provides scope for interpreting past occurrences by seeking in-depth understanding from the interpretative meaning derived from the text. Therefore, it does not allow for the extensive development and use of statistical models. Data was collected, coded, and analyzed simultaneously through a process of selective reduction and thematic analysis. This involved reading and re-reading articles to identify emerging themes, patterns, and relationships.

Simultaneity is consistent with grounded theory (Glaser & Strauss, 1967; Strauss & Corbin, 1990), and is considered appropriate because the intention is to learn about the interaction processes that lead to romantic homicides. Demographic characteristics, incidents and methods of homicide in romantic

setting, investigating romantic disputes, separation and survival implications and non-interference were some major thematic issues that emerged. These were adopted as conceptual frames and codification categories to analyze and organize the data. In addition, they served as organizational frames to articulate the findings that are presented in narrative format, and supported by textual extracts.

## **Findings and Analysis**

### **Social conditions of violence**

Romantic killing has emerged as a depressing feature of rural Afro and Indo-Guyanese families. It is more likely to occur within the confines of the home and in the presence of immediate family members. Victims are younger than perpetrators, ranging from minors to adults. This indicates a disturbing trend that has implications for physical, emotional, spiritual, and social development, as both victim and offender occupy the lower socio-economic status in society with minimal opportunities.

### **Incidents and Methods of Romantic Homicides**

Between January and November 2003, at least 15 women lost their lives as a result of domestic disputes (Gender violence, 2003 as cited in Cummings, in press). In 2005 from January to October, thirty (30) women lost their lives by violence perpetrated by the romantic partner (Cummings, in press). The gravity of the situation is highlighted by several incidents in the following extract:

A reputed wife was murdered by her partner ... after she left the abusive home. A mother of two had her throat slit by a male acquaintance. ... A man shot and killed his wife ... following a row. ... A fourteen-year-old and her lover were shot dead, allegedly by the girl's previous partner... a young wife was fatally stabbed after two years of constant abuse and ... a fisherman stabbed his wife to death ... A scuffle between a couple ended in the man drinking poison. A tragic case involved the death of an eleven-year-old girl and her twenty-year-old lover who were found hanged ... while a jealous man gunned down the reputed husband of the mother of his child ... a man hacked his wife to death before hanging himself ... and a butcher killed his wife in the presence of their children, and then attempted to take his own life by drinking kerosene (The year in review, 2004 as cited in Cummings, in press).

Shooting and stabbing are common methods of killing a romantic partner, while hanging and consuming lethal substance are preferred methods of suicide. A relationship between romantic homicide and suicide is observed, as men are likely to kill themselves after killing their partner. While men are likely to commit



suicide after killing their partner, women are far more likely than men to be killed in romantic encounters. Male partners in particular have killed their mates and themselves with such alarming frequency that it has become a norm for many troubled romantic relationships to end with death.

Many individuals opt to resolve differences with the most extreme form of violence, which suggests the inability to use the weapon of dialogue. While romantic murder may be isolated from public attention, it occurs in full view of family members, especially children, but suicidal behaviour of perpetrators occurs in extreme privacy (Cummings, in press). Exterminating a female romantic partner in the presence of others socializes them to murder as an acceptable way of ending a dispute. It also serves as a lesson to those present, concerning what is likely to befall them if they do not conform. The other dimension of the event is that intimate disputes are open to family members, but not to the public (Cummings, in press). Killing women in the presence of children indicates the amount of control exerted on the family. It seems that perpetrators feel motivated and proud in the presence of others passively observing their conduct (Cummings, in press).

### **Police Intervention and Romantic Killings**

The data suggest that death is a necessary requirement for active police intervention. The aunt of one victim indicated that the police had been called in several times. They eventually arrested the abuser, but he never faced charges, and was never sentenced (“Just another statistic,” 2004 as cited in Cummings, in press). Recounting another incident, the mother of a victim stated that her daughter

... walked away from an abusive relationship and made reports at the police station every day for seven days before she was brutally killed. Prior to those reports, she frequented the station for four years complaining about her abusive reputed husband. Her life was a battlefield ... the young mother of 22 years was always under attack in her own home and ... no matter how much she showed up at the station the police were never too concerned (Seales, 2008).

It is implicit that resolving romantic conflict is the responsibility of victim and perpetrator, but their efforts are often unsuccessful in realizing a peaceful resolution.

Investigations into romantic troubles are sometimes hampered when female partners obstruct and abort the course of police actions. On December 14, 2008, the Guyana Police Force recorded 2,811 reports of domestic violence across the country in 2008, with 1,609 or 57% resulting in mere warnings being given to the perpetrators at the request of the victims (Domestic violence victims file complaints, then withdraw, 2008, as cited in Cummings, in press). This suggests

that wife pardoning is a feature of domestic troubles, casting it in the mold of a conflict resolution strategy, which is protective of the abuser and indicative of structural, material, and social weakness of the victims (Cummings, in press). Further, it exposes the vulnerability of the victims and exacerbates the danger they face. Pardoning a perpetrator is often a response to fear and the dependent relationship in which women find themselves.

### **Separation and Romantic Killings**

The predicament facing many women is indicative of the trap in which they live. They endanger their lives when they seek to leave. Leaving is challenging and risky for those with children, limited finances, and lack of a secure place to go. Terminating the relationship is not a safety strategy as it may appear to be, because it sets the stage for stalking and ultimately, murder. It is a recipe for death as punishment for seeking freedom. Separating from an abusive partner is often challenging, given the length of time women stay in abusive relationships. Time is likely to strengthen the trust male partners have in their spouse, and a decision to move on is likely to be interpreted as failure, weakness, disloyalty, and lack of confidence and trust. All of these combine to impact the ego of a disorientated male who interprets his position as hopeless.

The relationship between separation and death is observed from this extract:

She was among those who one day said enough is enough and decided to move on assuming it would save her life, believing it would protect her children. And in so doing, ... became a statistic in death; added to the list of women brutally murdered by those close to them ("Just another statistic," 2004).

In another incident, a victim was rewarded with a slashed throat when she went to collect her clothes from the home she once lived in. It is clear that some women hardly get a chance to begin life anew.

### **Discussion**

Romantic killing is known by names such as wife killing, spousal murder, intimate partner murder, and intimate femicide. It occurs within conjugal, consensual, and visiting relationships, but seems more likely to exist among common-law couples in rural Guyana. It is premised on the private nature of romantic affairs, coupled with the reluctance of persons to intervene in romantic conflict.

Treating the situation as a private issue depicts intervention as an invasion of privacy. Such attitude contributes to a culture of non-interference, which increases the vulnerability of the victim. The Domestic Violence Act is an institutionalized mechanism requiring anyone, including the victim, to report all forms of abuse.

But in spite of this, spousal killing continues.

Romantic homicide, whether in the presence of others or not, produces a primary and secondary victim. Killing the primary victim impacts secondary victims such as children, other family members, and friends who are left to bear the emotional loss. Children are likely to become orphans, traumatized, and to grow up without the care and protection of caring adults.

It seems that killing, while morally and legally wrong, is a conflict resolution strategy intended to resolve romantic disputes. Further, wife killing seems to imply that the traditional myth, “if I cannot get you no one will”, still has strong cultural roots in modern Guyana (Cummings, in press). Exterminating an intimate partner impacts the emotional state of some men, with implications for suicidal conduct, which is seen as a final escape from romantic troubles and the law. Where the suicidal act is incomplete, it comes across as a drama, as some survive the ordeal and live to face the consequences.

Murder is the most severe form of violence and a dreadful human rights violation that an intimate partner can be subjected to. It epitomizes the tension of romantic disputes resulting in some perpetrators being criminally charged. Stories of female victims of murderous partners are accorded front page coverage by the Guyana print media as sensational news items.

Attempting to break free from abusive relationships exacerbates the anger of the male partners and puts women at greater danger and the likelihood of being killed. “An estimated 75 percent of murders of women by their male partners occurred in response to the woman’s attempt to leave” (de Santis, 1990 as cited in Lamanna and Riedmann, 2006, p. 429). Husbands and ex-husbands have shown enormous persistence in stalking, pursuing, and beating or killing women who try to leave an abusive situation (Johann, 1994; U.S. Department of Justice 1998b as cited in Lamanna and Riedmann, 2006, pp. 429 – 430).

Terminating a relationship has deadly consequences for some women, as some men seem incapable of emotional control when their female partner chooses to move on. The jilted male partner stalks his female romantic mate with a killer instinct. Men who find themselves in this situation have a deliberate mission to kill. It would seem that killing is an inevitable feature of some romantic relationships.

The situation is further compounded when women unwillingly accept their situation because they have nowhere to go, and are economically incapable of supporting themselves and possibly their children. This is not unfounded, as Lamanna and Riedmann (2006) tell us:

Women may live with abuse because they love their partners, depend on their economic resources, and hope they will reform. Battered women who stay with their partner fear the economic hardship or uncertainty

that will result if they leave. They hesitate to summon police or to press charges not only out of fear of retaliation but also because of the loss of income or damage to a husband's professional reputation that could result from his incarceration. Fear of economic hardship is heightened when children are involved. For a mother, leaving requires being financially able to take along her children and support them – or leaving them behind, when they may also be in danger (p. 431).

The social and economic constraints are in fact conditional ties that give male partners a greater control on the relationship. Romantic deaths are indicative of marital relationships being constructed on the basis of power. According to Narin (2004), “Most men are socialized to act from a position of power and control in their interactions with females .... For these males, manhood eventually is defined in terms of power and control over one's spouse/lover and family.” For these men, power and control is translated into violence. But violence is in fact an indication of loss of control:

First and foremost there is a loss of behavioural control on the part of the male caused by unhealthy jealousy, often accompanied by excessive emotional anger or rage. Loss of control implies that the person's behaviour is under the control of strong negative emotions rather than his reason, and that a more primitive part of the brain takes over the person. It is unfortunate that in most societies including Guyana many males equate this type of behaviour with masculinity (Narin, 2004).

Men who are unable to control their emotion are under false perception that they can maintain power through violence.

## **Conclusion**

This was a qualitative study based on a content analysis of newspaper reports accessed from the online archive of the *Stabroek News*. A relatively small sample of articles  $n = 56$  was selected, making it difficult for the findings to be generalized. Therefore interpretations and conclusions must be made with caution. Nevertheless, the study presents some policy implications and future research direction, to enhance our understanding of the subculture of romantic homicide.

The indications are that killing a romantic partner is an alternative course of action in resolving intimate disputes. There seems to be growing acceptance by some men that the only way to deal with a problem is to kill or maim the person (Kissoon, 2004). The high rate of romantic deaths calls for action oriented policy initiatives. The law enforcement agencies should be professionally and legally committed to intervene in abusive situations without a report being filed. Intimate disputes, though private, are potential disruption to the public peace, which the

law enforcement agency has the responsibility to maintain. In addition, both men and women need to be sensitized about what to do when certain behavioural tendencies start appearing. The need to empower partners with coping techniques to amicably negotiate and resolve difficult situations beneficial to both sides is paramount.

There is need for more programmes to help cushion the effects and offer support when love turns to hate. Initiatives need to be put in place to facilitate the establishment of professional counselling services at all levels, rather than rely on the traditional approach of a good friend or someone who lacks the skill of professional counselling.

While this study is limited, it does create a basis for more comprehensive cross cultural studies. Guyana is a multicultural society, and knowledge about the nature of the phenomenon from the perspective of other groups can improve our understanding of the problem. Knowledge of romantic killings is viewed through the lens of wife abuse, which presents an incomplete picture. Future research should seek to examine male spousal abuse. Also, many surviving perpetrators hold valuable clues to improving our understanding of romantic killings. Useful insights into their aggressive and violent behaviour can be gained from case studies and/or biographies on their life.

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# Religion and Conservation: Hardi and Hindu Women in Trinidad

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Key words – *religion and plants, Hindus and conservation, turmeric and medicine, ecology and environment, Trinidad and Tobago.*

## Abstract

Little research has been done in the Caribbean and elsewhere on the inter-connections between religious practices and environmental protection. It is widely known that many medicinal plants face the imminent threat of extinction, as the world advances towards an ecological crisis. Hindus use *hardi*/turmeric (*Curcuma domestica*) more as an object in religious rituals than as a sacred item. They also use the plant as an ingredient in food, cosmetics and medicine. This paper uses ethnographic research to investigate exactly how Hindu women ritualists in Trinidad use, cultivate, and conserve the plant in their gardens for ready use at home and in the community. In their tireless attempts to promote biodiversity, conservationists may have to adopt a new approach by working with religious groups, and demonstrate to the public at large how plant protection is related to religious values.

“Perhaps of greatest interest to me as a conservationist is the fact that most sacred groves survive as protected areas. I have spent years encouraging governments to establish reserves through legislation. Unfortunately, many of these externally imposed sanctuaries fail because they don’t have community support.”

- Paul Spencer Wachtel in *International Wildlife* (1993)

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## The Problem

Trinidad and Tobago, like most parts of the world, is facing a serious ecological crisis (Hilton 2003; Kenny 2003). There is concern about the global decrease and destruction of natural vegetation. Trees and plants that protect water resources, prevent erosion, prevent floods, trap dust, and provide food are being destroyed. In some parts of the world, entire forest trees are being felled to produce paper for books, newspapers, boxes and tissue. Rain forests have fallen victim to lumber and cattle industries. With the rate of destruction of the world's rain forests (which occupy 3.5 million square miles/5.6 million square kilometres), all primeval vegetation will disappear in about 80 years (Cremo and Goswami 1995). The devastation of this natural resource base poses a serious threat to public health.

The loss of vegetation caused by house squatters, bush fires, illegal quarry operators, and slash-and-burn farmers has left the landscape terribly scarred. Among the many subsequent negative social and economic impacts is the ill effect on human health. For allergy sufferers, asthmatic patients, and people suffering from other respiratory diseases, smoke and heat affect them severely. Trees are the largest producers of oxygen, and they also serve as natural air filters in the city. Floods are also likely to increase in the rainy season with the loss of tree covers on the hillsides.<sup>1</sup> Protected wildlife (birds, reptiles, mammals and insects) are forced to flee from their habitat to avoid the inferno (Johnson 2003).

Large acres of hills and forests in the western and central parts of Trinidad are being burnt in the long harsh dry season. Reports are that about 75 per cent of the island's grasslands, including protected areas in the Nariva Swamp, have been burnt (Heeralal 2003). A total of 100 acres/10,000 hectares of vegetation have been ravaged by fire and would require TT\$630 million to "re-green", at a cost of \$63,000 per hectare (Thomas 2003). To add fodder to the raging bush fires, gangs of Government's roadside workers have done "their best to destroy the remaining greenery and trees at the ground level" (De Gannes 2003; see also Williams 2003). Armed with cutlasses, hoes and brush cutters, these cleaners continue to rape and destroy the ecosystem by cutting down all the grass, plants, shrubs and herbs, to render the soil bare.

In 2003, 15 acres/.15 hectares of "prime agricultural lands" at Ramgoolie Trace, Curepe were bulldozed by the National Housing Authority to build houses. These lands, which formed part of St Joseph farm, had been assessed as constituting the "richest soils" in Trinidad (Boodan 2003; Morris 2003). A significant portion of the Caroni (1975) Ltd. agricultural lands is also earmarked for the construction of industrial buildings, shopping malls and residential houses. As part of Government's restructuring plan, *55,000 of Caroni's 77,000 acres/550 of 770 hectares*

(71%) of agricultural lands would go to non-sugarcane enterprises in south and central Trinidad (Mahabir 2003; Webb 2003). One may argue that the state is actively participating in the degradation of the natural environment to build polluted industrial estates and official squatter colonies.

After a prolonged period of rain from the end of 2006 to the beginning of 2007, Trinidad and Tobago was ravaged by unprecedented fires for one continuous week. In 2008, the dry season lasted for about one month, and the valley of Lopinot alone lost some 375 hectares (approximately 926 acres) of forest cover. As part of the Forestry Division's team, fire fighters and volunteers fought to control these fires day and night. Forty-two fires were recorded for that period. There was repeated flash flooding in low-lying areas due mainly to the loss of vegetation and unregulated construction of houses in the hills (Herrera 2009; Trinidad Express 2009).

It is estimated that 25 per cent of higher plant species (ca. 60,000) in the world will become extinct by the year 2050 (Phillipson 1997). There is an urgent need therefore, to conserve tropical plants, trees and forests as biological resources in order to ensure the future use of known, as well as undiscovered, medicinal products. There should be an effective and constructive resource management and conservation plan, based on an intimate understanding of the key factors driving medicinal plant use and loss of biodiversity.

There is a call for spiritual change as a solution to the world's environmental problems. Environmentalists must go beyond identifying problems and proposing end-of-the-pipeline solutions to propose spiritually-oriented solutions. In their book, *Divine Nature: A Spiritual Perspective on the Environmental Crisis*, authors Michael Cremona and Mukunda Goswami (1995:34-35) cite Alan Durning, a senior researcher of the *Worldwatch Institute*, who argues:

In a fragile biosphere, the ultimate fate of humanity may depend on whether we can cultivate a deeper sense of self restraint, founded on a widespread ethic of limiting consumption and finding non-material enrichment.

So far, there has been no claim to an articulated or implemented complete solution to the ecological crisis. Part of the solution may lie in a spiritual programme, which should include people and/or religious values that see the entire world and all her creatures as part of a unified whole.

## **Ethnobotany**

Ethnobotany is a multidisciplinary science defined as the interaction between plants, people and culture. The relationship between plants and culture is not limited to the use of plants for food, clothing and shelter, but also for religious ceremonies, ornamentation, and health care.

Ethnobotany has its roots in botany, the study of plants. Botany, in turn, originated in part from an interest in finding plants to help fight illness. In fact, medicine and botany have always had close ties. Many of today's drugs have been derived from plant sources (Veilleux and King 2003).

In the past, ethno-botanical research merely documented local plants used by villagers for particular purposes. Today, ethno-botanical surveys have extended to quantitative evaluation of plant use, environmental management, and applied work aimed at reducing poverty levels. It is mainly through ethno-botanists and anthropologists that the world has learnt of the damage of the earth's ecological health, and the loss of some tropical forests which once sheltered native cultures.

In recent years, some countries have used ethno-botanical studies for the discovery of new drugs and new drug development. Over 50% of the best-selling pharmaceuticals in use today are derived from natural products (Schuster 2001). The therapeutic treatment of infectious diseases and oncology have benefited from numerous drug classes derived from natural product sources (WHO 2009). The World Health Organization (WHO) estimates that up to 90% of the population in developing countries uses traditional medicine, including medicinal plants, to help meet primary health care needs.<sup>2</sup> In South Africa, this number is increasing because of population growth, rapid urbanisation, lack of alternative medical facilities, widespread poverty, and a belief that certain diseases can only be cured with traditional medicine (Botha 1998).

Herbal remedies have become the most lucrative form of traditional medicine. They now generate billions of dollars in revenue worldwide. As a result, more than one hundred countries have regulations for herbal medicines (WHO 2009). WHO has been promoting traditional medicine as a source of less expensive, comprehensive medical care, especially in developing countries (WHO 2009). In Europe, the demand for medicinal plants is increasing. There are also reports that the international trade is mainly in wild-collection species (Phillipson 1997). The conservation of plants, therefore, especially wild (potentially) medicinal plants, fulfills a need for less expensive alternative therapies, especially in the treatment of chronic illnesses.

## Methodology

This paper on turmeric/*hardi* is the product of a focused research initiative based on the author's earlier published work, *Medicinal and Edible Plants used by East Indians of Trinidad and Tobago* (1990). That work, like this one, is based on personal knowledge, experiences and observations as an Indo-Trinidadian living in the community for more than 40 years, and on field research with informants who claimed to have knowledge of certain plants. Methodology includes in-depth open-ended interviews with six elderly Hindu female ritualists (*naws*). The library and field research began in March 2003, and continued sporadically until June of the same year. Key informants were located in a "snowball" technique that relied on the social network of individuals in the community. Specimen of plants were again identified by the informants and collected. They were photographed and taken to the national herbarium for botanical identification.

It was observed that Hindu ritualists also perform the role of herbalists and healers for other women and children in the community. Additionally, they play the vital role of conservationists of sacred and medicinal plants. In addition to the questions asked in 1990 on medicinal and other uses, I enquired about the ecology, propagation, husbandry, processing, preservation and conservation of *hardi*. I asked questions about the type of soil in which it thrives, how and when it is planted, and how it is dug and prepared for use. Information was also gathered on land preparation, "finger germination," garden intercropping, yield per sprout, number of plantlets, crop harvesting, methods of storage, and possible extinction. Women ritualists invited me the "*hardi* night" [Friday] of three Hindu wedding ceremonies, where I personally observed how the herb was ritually applied to the bride and groom. At these ceremonies, I met other *naws* whom I interviewed and photographed, and who later took me to their homes and gardens.

## Religion and the Environment

The concept of Mother Earth, or the Greek Gaia, has been widely held throughout history. It is part of a belief system, which holds that the earth is the visible form of a goddess (*Bhumi* in Hinduism), who increases or decreases her gifts according to her children's level of spiritual consciousness. The Hindu scriptures (*Vedas*, *Upanishads*, *Bhagavad Gita*, *Ramayana*, *Mahabharata*, and the *Puranas*) demonstrate an early understanding of the need to treat nature and species with respect and care. This essay concludes with a suggestion for building an ecological paradigm and strategy based on ethic of religious values.

At the “Conference on Hinduism and Ecology” at Harvard University Center for the Study of World Religions, Anil Agarwal (1997) argued:

The Hindu beliefs, values and practices, built on a ‘utilitarian conservationism’ rather than a ‘protectionist conservationism,’ can play an important role in restoring a balance between environmental conservation and economic growth.

In June 2003, hundreds of thousands of Hindus and Muslims in Hyderabad prayed for rain and a respite from a killer heat wave that had claimed 884 lives. The Muslims felt that they were following a tradition set by Prophet Mohammed, who is believed to have called upon God for rain more than 14 centuries ago (*Newsday* 2003). In March 2003, conservationists in India extended a hand for help from *sadhus* [ascetics] to protect the endangered Ganges River Dolphin in the state of Uttar Pradesh. The objective was to get the *sadhus* to appeal to the religious sentiments of the people to prevent dolphin poaching. The dolphin is commonly referred to as the “Cow of the Ganges” (Kaur 2003).

The Hindu religion is one of many religious traditions that support ecological conservation and preservation of plants. Hinduism abounds with reverence for the divine in all forms of life and all aspects of nature, including rivers, mountains, animals and plants. Many of Hinduism’s basic tenets reflect the idea that humans are meant to care for their environment. Through the centuries, Hindu religious scripts, mythology, and rituals have attempted to drive home the point of preserving nature by deifying it. In the *Bhagavad Gita* (9.26), Lord Krishna states: “I accept a leaf, flower, fruit or water or whatever is offered with devotion.” Plants like the pipal/peepar/banyan (*Ficus religiosa*), and bael/golden apple (*Aegle marmelos*) are considered sacred and used in worship (*puja*). Some plants such as the coconut (fruit) are offered to certain deities; other plants like the doob/Bahama or Bermuda grass (*Cynodon dactylon*) are believed to have divine healing properties. Mango and neem (*Azadirachta indica*) leaves are used as festoons during pujas and auspicious events. Of great significance is the fact that most of these plants are believed to have medicinal powers.

The *Ramayana* is the most popular sacred text among Hindus in Trinidad and the wider Caribbean, whose grandparents migrated during indentureship (1838-1917), mainly from northern India. The events of the *Ramayana* span the major ecosystems of India, and mentions by name, over 200 species of plants (Lee 1977). The plants mentioned in the *Ramayana* are derived mainly from Northern India, and are used in the stories primarily to highlight their economic and medicinal uses. The descriptions of plants and forests indicate classical attitudes toward nature. To this day in Trinidad, the *Ramayana* remains an endearing influence



on the attitudes of Hindus towards certain medicinal plants. Trees like the tu(a)lsi (*Ocimum sanctum*) for example, are not worshiped as a god, but as manifestations of the divine. It is ritually revered with prayers, offerings, *tikka* [sanctified dot] and a sacred thread.

### **Hardi as a Herb**

Turmeric (*Curcuma domestica* Valetton), is a robust perennial tropical herb of the ginger (*Zingiberaceae*) family. Also called hardi, haldi or Indian saffron, it grows to 1m, and has a short stem. The leafstalk is thin and abruptly broadens to a sheath. The plant bears 6-10 leaves, which may grow up to 1.2 feet/36 centimetres. The leaf blade is lanceolate with a projecting point, thin, and wholly green. It has large underground root stocks and consists of rhizomes resembling ginger. The rhizomes are short and round with short blunt “fingers,” ovate, oblong or pyriform. Rhizomes may be .8 to 2.4 inches/2 to 6 centimetres long, and .4 to .7 inches/1 to 1.7 centimetres thick. The rhizomes have a pungent smell and taste, and are brownish and scaly on the outside and bright orange on the inside. Turmeric fruits are inconspicuous, and some cultivated strains are nearly sterile (Rosengarten 1973). The flowers are creamy yellow, dense cone-shaped spikes, and grow alternately at the base of the stalk.

*Curcuma domestica* is a native to India (Graf 1981:985; Bailey and Bailey 1976:347). It is mentioned in early Sanskrit writings of the fourth and fifth centuries AD (Mahabir 1990). The distribution of uses of turmeric in domestic rites outside India indicates its antiquity, and an early cultural connection between native Indians in other parts of the world and South Asian Indians. Turmeric was introduced into Jamaica in 1783, where it has now become naturalized. The crop has now become widely distributed throughout the tropics, but large-scale cultivation for its rhizome as a spice is largely confined to India, southeastern Asia and the East Indies (Purseglove 1975).

Turmeric is used both externally and internally in Asia and the Caribbean for many reasons. It is used as a protective charm and auspicious item by Hindus in Trinidad and elsewhere, perhaps because of its sacred orange colour (Mahabir 1990). As a quickly-growing plant, hardi is apparently associated with fertility of the family and the earth. In Hindu marriage ceremonies, Hindu women ritualists (*naws*) grind the rhizomes and mix the powder with coconut oil. The paste is used to “lep down” [anoint] the body of the bride/groom as a cosmetic to give a golden complexion, ritual purification, and as a fertility rite (Mahabir 1990). The ritualists say: “It make[s] you look young and nice” and gets rid of pimples and “buttons.” A manufactured cream is now sold mainly to women as a skin cleanser

which claims to add “luster to the complexion.”

Hardi was an important dye for silk, cotton and wool in Southern Asia and Europe, before the discovery of aniline dyes (Purseglove 1975). It is used to dye rice-grains for decorating the mosaic *bedi* [altar] in Hindu wedding ceremonies in the Caribbean. It is also used as a colouring matter in pharmacy, confectionery and food industries. Hardi is used to give a yellow colour to *bara* in “doubles,” and *phulowie* [Indian snacks]. Hardi is added to gravy as a seasoning to cut any acidic taste. In Trinidad today, it is a common spice used in the cooking of *karhi/curhee* and *daal* [yellow split peas], and *talkarie* [curried vegetables] (Mahabir 1992).

### **Medicinal Merit of Hardi**

Known as *haldi* in Hindi, *jiang huang* in Chinese and *manjal* in Tamil, turmeric has a medicinal history that dates back to 5000 B.C. At that time, it was a key medicament for wound healing, blood cleansing and stomach ailments in India’s Ayurvedic system of medicine. It is still used extensively as a miracle cure throughout India and the world (Indian Food Forever 2008). The Ayurvedic system holds that both pepper and turmeric contain anti-viral active ingredients. Turmeric received world-wide attention on August 30, 1997 when India won a battle over the Mississippi Medical Center in the U.S for attempting to patent traditional knowledge of hardi to heal wounds.<sup>3</sup> The major constituents of turmeric are curcuminoids, the yellow colouring principles, of which curcumin constitutes 50-60% (Exotic Naturals 2001). Singapore has started to import tulsii and turmeric to treat its SARS (Severe Acute Respiratory Syndrome) patients (Varshney 2003).

Recent research shows that turmeric inhibits HIV replication and boosts the immune system. Curcumin (one of the elements of hardi), and several other compounds, have been shown to inhibit a protein secreted by HIV1-infected cells that may encourage the pathogenesis of AIDS (BHRS 1999; Brown 2000; Om Organics 2003). Dr. Hari H. P. Cohly at the University of Mississippi Medical Center, and other researchers, have done research on the responsiveness of T cells infected with HIV-III<sup>B</sup> strain. The cells were tested with turmeric (T), turmerin (Tm) and curcumin (Cu) in the absence and presence of AZT for p-24 antigen release. Turmerin in combination with AZT at 0.5 µg/ml and 0.05 µg/ml concentration showed a noticeable reduction in p-24 antigen release, but most importantly resulted in a significant increase in cell viability. Their findings provide evidence that turmerin, in combination with AZT, can provide better protection by decreasing the toxicity associated with AZT.

Turmeric-curcumin has been found to have biologically active components and related compounds called curcuminoids. These consist of antioxidant, anti-

inflammatory, antiviral, antibacterial and antifungal properties with potential activity against cancer, diabetes, arthritis, Alzheimer's disease and other chronic maladies (Stix 2007). The 1999 edition of *British Journal of Cancer* reported an experiment that found hardi was effective in the treatment of tumours. Zingiberaceae rhizomes, commonly used in Malaysian traditional medicine, were screened for anti-tumour promoter activity. Seven rhizomes were found to possess inhibitory activity towards Epstein-Barr virus (EBV) activation, one of which was *Curcuma domestica* (Vimala *et al.* 1999). New tests suggest that curcumin blocks the activation of genes that trigger cancer. In addition, curcumin's anti-inflammatory activity reduces arthritic swelling and progressive brain damage in animals (*USA Weekend* 2002). Research by Dr. Kamala Krishnaswamy of the National Institute of Nutrition in India also confirms that the consumption of turmeric may not only prevent cancer, but also heart diseases (*The Times of India* 2003).

Hindu/Indian women in Trinidad and the Indian Diaspora use hardi (called "saffron") mainly to treat other women internally and externally. *For three days and seven times*, a ritualist directs young girls to anoint turmeric oil on the body of the Hindu bride and groom to purify, cleanse and lighten the colour of the skin. They use the ointment to rub the abdomen of women after childbirth to make the skin firm. They also make a drink (*karha*) to cleanse the womb from "clad" [clotted] blood after childbirth. *Karha is made by boiling and fire-parching* ("chowkaying") the rhizome in a pot, with ghee, to which milk and sugar are added. It is also given to female animals immediately after delivery "to clean out the inside."

Karha is commonly used by women to ease menstrual pain. These elderly women grind the rhizome with harjor (*Hylocereus lemairei*) and apply it hot (with grated onion) as a poultice for bruises. Some of these elderly women still use a mortar and pestle to pound pieces of the rhizomes. Others use a *sil* and *lorha* [grinding stone] to crush the "fingers" after they are washed and skin-peeled. The more common method is to use a hand mill for grinding, or electrical blender. The women also use the fingers to make a medicine to heal (internal) blows/lashes and sprains in the body. Indian grand/mothers also boil, pound (with ginger), and drink (with sugar and milk) a hot concoction for colds and fevers. They also prescribe that the leaves be tied around the head for severe headaches (Mahabir 1990).

### **Ritualists as Conservationists**

Religious practitioners all over the world use a traditional method for conservation of bio-resources, described by scientists as "religious resource conservation points"

(Sharma, Rikhari and Palni 1999). Practitioners plant consecrated trees in sacred groves over generations to protect the species from destruction and extinction. Hindu ritualists in Trinidad plant trees near their *jhandi* [sacred flagstaffs] as *in situ* germplasm preservation/collection centres, to conserve natural resources and sustain their individual and communal needs. Plants like the tulsi and bael are given the status of a deity. Conservation through religion is a common practice in Hindu temple grounds. Protected plants at these worship points also serve as seed banks for further propagation of the species.

Traditional wisdom shows that spiritual resources hold the key to conservation of medicinal plants. Hindu women ritualists (*naws*) in Trinidad use tumeric as an ointment to anoint the body of brides/grooms during Hindu wedding ceremony. They also use it for a variety of spiritual and medicinal reasons. The rhizomes are a scarce commodity in the market, and *naws*, therefore, conserve the plant by propagating it in their gardens and backyards for individual and communal requirements. Their religious values have made them ecologically conscious of the need to conserve this sacred herb.

Women ritualists usually propagate the plant by setting fresh “green” pieces of rhizomes, with buds (“chooking the head”) 3 inches/7.5 centimetres deep, at 1-foot/30 centimetre intervals in their gardens. Patches of the plant are grown as a garden crop sometimes in flowerpots, and often in admixture with other flowering and medicinal plants. It thrives best in friable and fertile soil exposed to the sun. Unlike ginger, it grows well in sandy soil. In the 1960s in Trinidad, it was planted in abundance in the damp, low-lying rice and sugar cane fields. Hardi is best planted in the rainy season (June to December). Leaves spring up above the ground in about four weeks. During growth, all adjacent weeds are cleared. The women harvest the rhizomes when the stems begin to fade about ten months after planting. <sup>4</sup> The “green fingers” are carefully dug, washed and prepared, by drying in the sun for about seven days. The dried rhizomes become “hard, like pieces of sticks,” and are preserved in pans and paper for later use.

There is the danger that once some plants become known for their healing properties, they would be harvested indiscriminately (without permits) from wild populations. They would be processed and then sold locally and internationally as traditional medicine. This unregulated form of exploitation can reduce the density and distribution of the plants. In some parts of the world, over-harvesting and loss of traditional medical knowledge in local communities have led to degradation of medicinal plants (Phillipson 1997).

## Conclusion

A pharmaceutical enterprise based on medicinal plants offers great potential for sustained economic growth in developing countries. It should be ensured that local workers themselves are directly involved in managing the use of botanical resources. They must be guaranteed direct economic returns on account of their traditional knowledge. The economic returns would be an important incentive for further conservation.

My thesis in this paper is to argue that religious values can serve to support environmental movements. It echoes the arguments in an article entitled, "Satyagraha for Conservation: Awakening the Spirit of Hinduism," by O. P. Dwivedi (cited in Stewart 1999). He argues that activists must reawaken religious values if the world is going to reduce the current level of environmental degradation. He suggests that religious beliefs can serve as a crucial foundation in helping to create a self-conscious moral society, which would put conservation and respect for God's creation first, and relegate individualism, materialism, and our modern desire to dominate nature, in a subordinate place.

Many government conservation movements try to find ways to give villagers "community empowerment," to enable them to protect vegetative reserves. But these efforts tend to fail because of paternalistic attitudes that many people in the Third World resent. Writing in *International Wildlife*, conservationist Paul Spencer Wachtel (1993) states:

I find it both ironic and hopeful that sacred groves, representing some of the most successful Asian "conservation programs," have in many cases already cut out the middleman - in this case the government. Sacred groves, or "life reserves," as one villager described them, survive today without benefit of government gazettement, nature wardens, education centers and sometimes even without government goodwill.

There is the need to reawaken religious values to prevent an imminent ecological damnation. The spiritual nature of the environmental crises has to be appreciated for human consciousness to change.

There seems to be hope at home in the adoption of religious philosophy, as the basis for a programme for ecological conservation. For the commemoration of World Environment Day on June 5, 2003 an inter-faith service was held in Trinidad, in which leaders of the Hindu, Islamic, Christian and Bahai denominations participated. The spokesman for the Islamic faith said: "We are responsible for looking after the eco-system that supports our earthly existence." He added that

this very serious task must be dealt with effectively, if “we and the future generations are to enjoy the benefits so generously provided by the Creator.” The next day, devotees of the Orisha faith observed the fourth annual Rain Festival in Santa Cruz. It included a Dance for Shango “that told of the dry season with its bush fires,” and “a longing for rain, renewal and rebirth” (Hilton 2003). The ceremony was held in the wake of the driest season in Trinidad for over five decades, during which bush and forest fires raged for months on end.

## NOTES

- <sup>1</sup> The Director of the National Emergency Management Agency (NEMA) predicted that there would be widespread flooding in the country because the “hills were badly burnt this dry season” (Newsday 2003).
- <sup>2</sup> Traditional medicine (TM) refers to the knowledge, skills and practices based on theories, beliefs and experiences indigenous to different cultures, used in the maintenance of health and in the prevention, diagnosis, improvement or treatment of physical and mental illness. Traditional medicine covers a wide variety of therapies and practices, which vary from country to country and region to region. In some countries, it is referred to as “alternative” or “complementary” medicine (CAM).
- <sup>3</sup> Turmeric has been at the forefront of intellectual property cases. Various companies and research organizations have repeatedly attempted to patent the spice for their own use and benefit. However, the Indian government remains firm in its effort to prevent the acquisition of exclusive rights by any company for the use of turmeric (Slack 2004).
- <sup>4</sup> The yield per acre may range from 10,000 to 20,000 pounds of raw turmeric (Rosengarten 1973).

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2009 "Traditional Medicine." Cited July 2, 2009. Available from the Internet: [http://www.who.int/topics/traditional\\_medicine/en/](http://www.who.int/topics/traditional_medicine/en/) Western Media and Adolescent Development in Guyana: Television Consumption and Adolescents' Cultural Preferences



# Western Media and Adolescent Development in Guyana: Television Consumption and Adolescents' Cultural Preferences

By  
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Key words: *Television, Guyana, cultural shifts, media preferences, globalization, Caribbean, Third World, media effects, cultural preservation, cultural imperialism, cultural dependence, adolescents.*

## Abstract

Given the proliferation of in-home television in Guyana during the 1980's and onwards, this study evaluates the relationship between western television consumption and the cultural choices of adolescents in Guyana. Specifically, it compares indigenous and foreign cultural preferences in the light of the diffusion of Western television programming. Of particular interest were adolescents' food and music choices, as well as their cultural knowledge. Findings indicate significant biases toward foreign foods and music genres, and not so significantly, foreign cultural knowledge. These differences are more consistently related to weekend television viewing habits, and only in a limited way, to weekday practices. The effects of weekend viewing habits were not attenuated with the addition of structural predictors and other control variables. The implications of the findings for adolescent development and well-being in Guyana are discussed.

## Introduction

The dominance of print media in the Caribbean, beginning with the publication of the Jamaican Daily Gleaner in 1834, ended in the mid 1970s and 1980s with the rapid expansion of electronic formats. The region's geographic proximity to the United States allows easy access to US satellite transmissions and ready technology exchange. The result of this easy access is significant penetration of the Caribbean by foreign media with concomitant dependence (Brown, 1995). Regardless of varying dates that media were introduced to the various islands, there is common consensus that the new technologies have altered the Caribbean's

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media landscape (Pertierra & Horst, 1999; Blank, 2003; Horst & Miller, 2006). These changes are evidenced by the dominance of Western media in the Third World countries where the ability and resources for local production of media content are limited.

Guyana is a good example of a Third World country dominated by foreign media, and where unlike several other societies, the control of media content is less regulated. Children are therefore, more readily exposed to attitudes and opinions of others portrayed in these media. This country is of particular interest, since the present adolescent cohort is the first that is growing up with ready access to diverse media types, especially in-home television. With increased and easier access to predominantly western media, understanding the influence on the developmental trajectories of Guyanese children, and more specifically their cultural preferences, is of special significance. Despite the known relationship between media consumption and socio-cultural behaviours of children, little empirical research of this nature exists on children in Guyana. External literature does an excellent job of describing the effects of mass media on adolescents in Western societies, and a study in the Guyanese context is an excellent addition to the literature.

In sum, the study examines the relationship between mass media and cultural orientations in Guyana, and describes and analyzes resultant effects on Guyanese children. Central to this effort is the need to understand how consumption of largely western oriented media content affects the preservation of indigenous culture, and in turn, a sense of indigenous identity. This effort is supported by large-scale quantitative data that are rare for this population. These data provide valuable information on the relationship between mass media and adolescents' cultural preferences of foods and music genres. We also investigate cultural knowledge, food preferences, and choice of music genres.

## **Background and Review of Literature**

The existing literature on media effects is voluminous, and our review is of necessity circumscribed by our concern for media's ability to sway personal preferences, as well as its negative and positive influence on Third World societies. Media are known to affect public opinion, and produce strong social impact on society, beliefs, behaviours, and cultural preferences. This review is preceded by a highlighting of the globalization context which is an essential, but sometimes polarized framework for the discussion of media influences. Second, it examines previous but limited media effects of research done internationally and in the Caribbean, to highlight media's impact on adolescents' cultural preferences. The review of the Caribbean literature is specific to media effects on adolescents' preferences for music genres, food franchises, and acquisition of cultural knowledge.



## **Globalization and Indigenous Cultures**

Globalization is described as one of the unquestionable realities of the 21<sup>st</sup> century, and has been variously defined by scholars (Wallerstein, 1987; Gibson-Graham, 1996; Carnoy, 1999; Friedman, 2005). Blackmore (2000) defines globalization as “Increased economic, cultural, environmental, and social interdependencies and new transnational financial and political formations arising out of the mobility of capital, labor, and information, with both homogenizing and differentiating tendencies” (p.133). Though this and other definitions tend to focus on the economic aspects of globalization, some critics have argued for its multidimensionality (Kellner, 2000; McCarthy & Dimitrades, 2000; Hoppers, 2000).

Kerby (n.d.) for example, proposed four primary dimensions of globalization: economic, technological, political, and cultural. Though the importance of each element is recognized, the cultural element is of interest to this study. This cultural aspect of globalization, Kerby (n.d) believes, is what contributes to homogenous mass culture, in which the western culture along with its language is at one extremity, and the other cultures are at the other. Further, the cultural aspect of globalization involves issues of cultural identity, construction of reality, and the production and consumption of media (Kerby, n.d). Richards & French (2000) suggest that globalization is hierarchic, and the transfer of ideas and culture proceeds from the developed to the undeveloped world with pressure toward a homogenized culture, which more often than not, modifies indigenous standards.

The homogenizing of culture and increasing consumerism is labeled by Ritzer (2000) as the “McDonaldization” of societies - a special form of globalization. McDonaldization affects numerous industries, inclusive of music, and the ways in which “news” and even press releases are constructed. While several positive benefits derive from globalization, there are several negative outcomes. Increased labour market competition between core (developed countries) and periphery (Third World) nations is one such negative result. This competition often results in an imbalance in the power structure that often affects indigenous cultural choices (Irogbe, 2005).

The Caribbean has a long history of such dominance primarily by American and European nations, in economic, political, and cultural control. In most instances, this dominance has gone unchallenged by indigenous cultures. Accordingly, it is usually argued that globalization did not affect Caribbean countries as harshly, since cultural and other dominance from outside forces have been the rule. Moreover, some authors suggest that Caribbean countries did not have to make radical adjustments to cater to globalization, due to centuries of capital influences (Robothan, 1998; Harris, 2002). Other authors have recognized the existence of an indigenous culture, and have argued that while some benefits accrued, globalization

of mass media has negatively impacted Caribbean culture (Brown, 1995, Rabess, n.d.). Regardless, there is no denying the fact that values, customs and cultural practices are indigenous to the region, and the influence of the massive intrusion of foreign media forms on such are of interest in this study.

## **International Media Research**

### **Media Consumption**

In this study, *media consumption* refers to exposure to varying types of media. In some cases, consumption is measured as the number of hours spent using media, the medium used, and the frequency of using media, as in the case of Roberts, Foehr, and Rideout (2005) who asked adolescents to estimate the amount of time (in minutes and hours) they had spent using varying media the previous day. Examination of television consumption is of interest, since several social theorists have argued that such consumption is significant to identity formation (Storey, 1999; Kellner, 1995; Bly, 1996). Though mixed findings exist about the position television viewing occupies in adolescents' lives (Roberts, Foehr, & Rideout, 2005; Morgan & Shanahan, 1995), and while other media sources have become popular, several research findings suggest that television remains the preferred medium for most children and adolescents (Comstock & Paik, 1991; Roberts, Christenson, & Gentile, 2004; Jackson, Low, Gee, & Butler, 2007). Prior studies also delineate television's role as an educator (Ward & Rivadeneyra, 1999; Roberts, 1980).

## **Factors Associated with Consumption**

### **Demographic Factors**

While research findings are mixed on the influence of demographic and household/structural factors on media consumption, evidence suggests a number of consistent correlates. Among the predictors is race/ethnicity, which is relevant in Guyana and Trinidad where demographic realities warrant it, and such interest is buttressed by research findings elsewhere. Racial variations in media consumption are documented in studies from the USA (Tangney & Feshbach, 1988; Roberts, Foehr & Rideout, 2005; Roberts et al 1999; Roberts & Foehr, 2004; Albarran & Umphrey 1993; Greenberg, 1993; and Ward & Rivadeneyra, 1999). Essentially, these studies suggest that black children generally report more television viewing compared to white children. Roberts et. al. (2005) found that overall African American children reported on average, 1.2 hours more media usage than Caucasian kids, while Hispanic children fell in the middle. They suggest that while all three racial groups are equally likely to watch TV daily, overall, African American kids watch television for longer periods, and racial variation in media usage is often linked to other outcomes such as school performance and behavioural problems.

Other studies have also used school grades (Morgan & Shanahan, 1995), and age and form level (Passig & Levin, 2000; La Ferle, Edwards, & Lee, 2000; Roberts, Christenson, & Gentle, 2004; Rideout, Vanderwater, & Wartella, 2003) to explain the variations in media consumption. These studies generally conclude that while children reportedly spend several hours weekly consuming various media, television was the medium mostly used, and in some cases, this consumption was unsupervised. Roberts, Christenson, & Gentile (2004) account that eighth and ninth graders watched 25 hours of television, listened to music 21 hours, played video games 9 hours, and read for fun 3 hours weekly. Similar findings are reported by Rideout, Vanderwater & Wartella (2003) who also assert that children below the age of eight spend several hours either consuming media alone, or with siblings and/or parents. The variation in media consumption is frequently associated with identity formation, and thus of interest in this effort.

Gender also differentiates media consumption, but the overall literature point to mixed results (Pasig & Levin, 2000; La Ferle, Edwards & Lee, 2000; Wartilla, 2003; Morgan & Shanahan, 1995; Marshall, 2009; Roberts, Foehr, & Rideout, 2005; Cheng, Brenner, Wright, Sachs, Moyer, & Rao, 2004; La Ferle, Edwards, & Lee, 2000; Lenhart, Rainie, & Lewis, 2001; Kline, Brown, Dykers, Childers, Oliveri & Porter, 1993). Passig & Levin (2000), for example, found dissimilar use surfaced among very young children. La Ferle, Edwards, & Lee (2000), in their survey of 14-18-year olds, found that though boys and girls tracked information from the Internet, boys tended to pursue fun, games and music, and shopped on line. In contrast, girls were more likely to do research for academic purposes, and followed fashion. Further studies confirm these findings, but add that while girls do play games, these tend to be games with less violent and competitive themes (Wartilla, 2003). Woodward & Gridina (2000) report similar variation of usage, though an assessment of overall internet and computer use revealed no gender differences.

Adolescents' level of religiosity is also used to assess the impact of media consumption on their cultural preferences (Marshall, 2009; Wallace and Foreman, 1998). Though not surprising, Marshall (2009), and Wallace & Foreman (1998) found reduced consumption of media by adolescents who described themselves as "more religious". Marshall (2009) concluded substantively that adolescents who were religious were more likely to have other activities that would occupy some of their time on weekends, and thus leave less time for media consumption. Our quest in this study is whether religiosity would have any influence on the outcomes of interest, since commitment to religious beliefs and practices are often filters of cultural preferences and interests.

## **Structural Factors**

Family structure (often variously defined) and household size are structural factors that have reportedly influenced adolescents' media consumption. Some studies (Marshall 2009; Roberts et al. 1999; Brown, Childers, Bauman, and Koch, 1990) suggest that family structure (type and size) often impact the quantity of media consumed, content, the messages derived, and adolescents' social preferences. Other authors propose similar views about the relationship between belonging to families in which both parents are present, versus belonging to single-parent or step-parent families, and media consumption (Nathanson 1999; Barkin, et al. 2006; Marshall 2009).

## **Media Effects**

While an examination of the context and content of media consumption provides some framework for understanding the types of media adolescents might be using, media "effects" research is more dedicated to providing information about specific results. Media effects research is timely, especially as Kellner (1995) observes that media consumption may produce a "media culture" among adolescents. Though not exhaustive, some of these effects relate to adolescents' food (Coon & Tucker, 2002; Story, Neumark-Sztainer, & French, 2002), and music (Klein et al., 1993) preferences. We examine these two effects in the next several paragraphs.

## **Food Choices**

Several studies have confirmed the influence of television programmes and accompanying commercials on children's behaviour (Story & Faulkner, 1990; Kaufman, 1980), including their food choices, attitudes towards specific brands, purchasing behaviours, and resultant food preferences and eating behaviours (Story & French, 2004). Other authors further claim that often, food advertisements influence food choices (Kotz & Story, 1994; Gamble & Cotunga, 1999; Coon & Tucker, 2002; Story, Neumark-Sztainer, & French, 2002). Generally, research indicates that media messages endorse unhealthy foods more than they do wholesome foods (Scammon & Christopher, 1981; Kaufman, 1980), and children who are exposed to such messages choose and consume advertised foods much more often than children who do not view food advertisements (Coon & Tucker, 2002; Crockett & Sims, 1995). Poor eating habits and unhealthy conceptions about food and the principles of nutrition are known to increase with enhanced levels of exposure to food advertisement (Signorieli & Lears, 1992).

Our study specifically investigates the relationship between media consumption and food choices, but in the context of indigenous versus foreign franchise preferences. While we do not investigate all the known relationships as described

above, much can be inferred from preferential shifts in food types. Cultural shifts to the fast food industry speak to changing patterns of food consumption. In Guyana, fast food consumption was traditionally considered a “treat”, and the shift to routine dietary practices with the attendant health implications is of interest. While we make no claims of knowledge of the relative nutritional value of foreign and local franchises, which is our emphasis in this study, the overall shifts to advertised “benefits” or media dependence as a basis of food choices are the larger concerns. We therefore test whether media exposure is related to preference for foreign food franchises over local ones.

### **Music Choices**

Some research show strong associations between media consumption of heavy metal, rap music, and other music videos and risky behaviours among adolescents (Klein et al., 1993; Calfin, Carrol & Schmidt, 1993; Greeson & Williams, 1987). Klein et al. (1993), in their study of factors that contribute to adolescents’ risky behaviours, established strong associations between media consumption (listening to the radio, watching music videos and movies on television) and risky behaviours, including having sex. Heavy metal music and music videos were strong predictors of risky behaviours among adolescents, especially white boys and girls; while television movies and rap music were predictors of risky behaviours for black girls (Ibid pp. 25-27).

We do not explicitly deal with the content of music and its effects in this study. Rather, we are concerned with preferences of music genres as an indication of cultural shifts and orientations. Nonetheless, such preferences are implicitly an indication of the nature of media exposure, which ultimately has implications for outcomes as indicated above. More importantly for our purposes, we are concerned with identifying whether media exposure differentiates the music choices of the adolescents in the study.

The influence of globalization on societies, media consumption, and media effects were provided from the preceding review of literature and from an international perspective. While international media research is abundant, Caribbean media research is noted to be relatively underdeveloped (Lent, 1981), meager, limited in focus, lacking elegant research methods, theoretically focused, and uncritical (Skinner, 2001).

## **Caribbean Media Research**

### **Themes in Caribbean Media Research**

Two prominent themes present in several studies extant in the Caribbean and relevant to this present study are cultural domination, and the media effects on

cultural identity hypothesis. According to Brown (1995), cultural domination “is the controlling of habits of mind, shaping values in life, cultivating unsustainable levels of consumerism - hijacking the region’s media by the ‘invading of intellectual space’” (pp. 56-67). In part, this study examines the dominance of extant culture over Caribbean adolescents. Previous research in the region suggests a number of contextual, structural and socio-demographic factors as possible explanatory or mediating factors. These include the extent of media consumption of course, but also social category, consumer knowledge, age, frequency of travel, socio-economic status, media access and availability of information technologies (Neuendorf, Botta, & Skinner, 1999; Joseph & He, 1997), media context, socio-economic status of parents, race, gender, and household size (Marshall, 2009).

Caribbean research further suggests that Western media exposure results in the replacement or distortion of some Caribbean family oriented values, and the introduction of less desirable ones (Cuthbert & Hoover, 1990; Phekoo et al., 1996). In general, researchers contend that traditional values and cultural disruptions often result from the importance attributed to imported media, such that media effects on cultural identity remain a concern in Caribbean media research. We elaborate on these two issues in reverse order.

### **Media Effects and Cultural Identity**

The effects of media on cultural identity constitute a prominent theme in Caribbean media research. In some cases, studies have examined the erosion of traditional values and the inappropriateness of foreign images to black Caribbean culture and values (Cuthbert & Hoover, 1990); the shortage of programming showcasing local culture, and the dominance of foreign programmes (Surlin, 1990). In other cases, spotlight was on showing that Caribbean viewers had virtually no exposure to programming about themselves or their culture. Cuthbert & Hoover (1990) examined perceptions of VCR users in Grenada and Barbados. Their findings highlighted the erosion of local culture that resulted from government’s permission of foreign cultural dominance. In a study of Guyanese adolescents’ media consumption, Marshall (2009) concluded that electronic media significantly predicted adolescents’ attitudes towards non-traditional social values, compared to the other media forms assessed.

Overwhelmingly, research findings from the Caribbean suggest that the more time adolescents spent viewing television (particularly the viewing of U.S. produced entertainment programming), and the more favourable their attitudes were toward television entertainment content and television advertising, the lower were their cultural identity and cultural consciousness. These findings have implications for this present study, and are testable with the data we describe



later. Other studies on the influence of American television and the preference for American television entertainment programming on Caribbean adolescents reveal other themes.

### **Cultural Dependency**

Cultural dependency is often viewed in Caribbean based media research as another factor accounting for social preferences. Dependency is often evidenced by the inclination to prefer foreign food franchises and music genres, and to possess greater knowledge of foreign information than local information. Brown (1995) tested whether prolonged exposure to foreign media resulted in negative attitudes towards local culture, and positive ones towards foreign culture. In her Jamaican study, socio-economic status was found to be related to levels of dependency. The researcher concluded that the middle and upper lower classes demonstrated higher cultural loyalty, confidence, and commitment to nationalism, when compared to upper classes. Brown (1995) explained that high media use among the latter, because of access associated with the ability to afford multiple media forms, explicate the differences.

Additional studies (Lashley 1995; Phekoo et al., 1996; Cuthbert & Hoover, 1990; Blank, 2003) of Caribbean societies report similar findings. More specifically, Blank (2003) attributes the perceived shift in expectations and values of the younger generation in Dominica, as it relates to careers and lifestyle choices, and the perceived negative shift in young people's behaviour, dress and attitudes, to what is described as the "Americanization" of Dominica due to media exposure. The author claims that cable television negatively reorients the perception of farming, which is the predominant activity of the Island. Further, Blank (2003) states that the same changes characterize Dominica's adolescents, who currently emphasize material goods and make unaffordable lifestyle choices, given the Island's economy.

Though not comprehensive, the review of both international and Caribbean media research highlights the role of media (particularly television) in the lives of adolescents. Buttressed by these research findings, this study investigates similar television influences in Guyana. We recognize that the extent of our analysis is constrained by the nature of our data and the availability of the critical variables. In our delimited analysis therefore, we test the relationships that exist among adolescents' consumption of television and their preferences for food franchises, music genres, and cultural facts as outcome variables and use structural factors (household size and type), and background characteristics (race, gender, form level, and perceived religiosity) as controls.

## Methodology

### Sampling

The data for this study come from a two-stage random probability sample of adolescents from 14 high schools located in the coastal region of Guyana. The coastal region is home to more than 90 per cent of Guyana's population. At the first stage, schools were clustered by types (restricted to A & B graded high schools in outlying coastal and urban areas), and the number of schools was selected proportionally based on the overall enrolments within each cluster. All 14 schools sampled are used in this study. At the second stage, schools were selected using the *probability proportionate to size procedures*. Subsequent to obtaining permission from the relevant review boards, government, and school authorities, data were collected via surveys by a trained team supervised by the principal investigator. The final sample comprised 1492 students from Forms 4 and 5 (US Grades 11-12).

### Outcome Measures

We were interested in three outcome measures. First, *Food Preferences* was a measure of the adolescents' preference of local or foreign food franchises as a place to buy food. Respondents were presented with seven pairs of fast food or restaurant outlets. In each pair, there was one foreign franchise and one locally owned restaurant or franchise, and adolescents were asked to choose the one they preferred. Among the foreign franchises were Kentucky Fried Chicken, Popeye's, and Pizza Hut. Local franchises included NP Chicken, Demico Qik Serve, and Salt and Pepper. We summed the local and foreign selections separately to create two different variables: *Foreign Food Preference* [FFP] and *Local Food Preference* [LFP]. We used these totals to calculate a score that represents the extent to which the preference for foreign franchises exceeds that for local food franchises: *Foreign Food Excess* [FFE]. Our procedures are represented by the simple formula  $(\Sigma F - \Sigma L)$ , which for the multivariate analyses, is modified by adding a constant  $[C + (\Sigma F - \Sigma L)]$  to develop a distribution of positive scores.

*Music Preferences* was a similar measure of adolescents' preference for local or foreign musical genres. In this case, three music genres, one of which was Caribbean (for example, Soca, Pop, and Rock; Steel Band/Pan, Blues and Classical) were presented, and adolescents were asked to select their first preference. This exercise was repeated six (6) times, and each time, a local genre was included to allow each genre a chance to be selected. The variables were constituted as a count of the number of regional and foreign genres chosen, as in the case of the *Food Preferences* variable [*Foreign Music Preference* (FMP); *Local Music Preference* (LMP)] and then residualized to create the *Foreign Music Excess* (FME) variable.



Finally, *Cultural Knowledge* was measured by asking adolescents to complete a multiple choice matching test with 23 questions. Questions included identification of sport personalities, political leaders, famous singers, and national holidays and events. There were 14 local items and 9 foreign ones, and using the same procedures described above, three variables were constructed: *Foreign Cultural Knowledge* (FCK), *Local Cultural Knowledge* (LCK), and *Foreign Knowledge Excess* (FKE) representing quantitatively better knowledge of foreign facts. The scores here were adjusted for the imbalance in the number of questions that were local as compared to foreign.

In sum, the outcome variables of interest here are the raw scores for the number of local and foreign food franchise preferences, the raw scores for the number of local and foreign music preferences, and the total number of local and foreign facts answered correctly. For each of the three pairs of variables, a composite variable representing what we term the “foreign” excess preferences was computed, using procedures described earlier.

### Independent Variables

This study uses ten (10) independent variables. These we divided into three categories: television consumption, demographic factors, and household/structural factors. We measured *Television Consumption* in hours, using two questions that measured adolescents’ television consumption on weekdays and weekends. Respondents were asked: Think about all the programmes you watch on television each weekday (Monday to Friday). About how many hours of television do you watch on those days? This question was repeated for weekends (Saturday or Sunday). We used the numeric answers provided.

Adolescents’ demographic factors include *Race*: coded as three dummy categories (Afro-Guyanese, Indo-Guyanese, and Mixed/Other Guyanese). [For the regression analysis, we used Indo-Guyanese as our reference group]. *Gender*: coded male (0) and female (1), and *Form Level*, coded fourth (0) and fifth (1). Our final demographic variable is *Religiosity*. We used three measures to assess adolescents’ subjective appraisal of how religious they considered themselves. First, *Church Attendance*: adolescents responded to a question about the frequency of their attendance at religious service other than for funerals or weddings. Responses were coded **never** (0) to **nearly every day** (4). Our second measure of adolescents’ religiosity was their frequency of watching religious programmes on television (*ReligiousProg*). Answer categories ranged from **never** (0) to **nearly every day** (4). The third measure was their self-perceived *Level of Religiosity*, ranging from “Don’t Believe in Religion” (0) to “Very religious” (4). For the multivariate analysis, because of the skew towards high levels of religiosity, we created a dummy variable

to indicate *high* (very and somewhat religious) and *low levels of religiosity* (all others).

The structural factors are *Household Type*, coded *nuclear families* (1) and *other family types* (0); and *Household Size*, for which we used the numeric answer provided by respondents in our sample.

## Findings

### Univariate Analysis

In Table 1, we present the relevant sample characteristics for this paper. The percentage (62.0%) of female students responding to the survey is consistent with the generally higher number of enrolled females in secondary schools in Guyana. More Indo-Guyanese (36.1%) were sampled than Afro-Guyanese (32%) and Mixed/Other Guyanese (31.9%), again reflective of the racial distributions of the schools' population. The mean and median ages of the sample were 16.2 and 16.0 respectively. Slightly more than half of the respondents (50.6%) were in the fifth form, and the median number of televisions owned was 2. Respondents reported that on average they accessed 15 television channels, and viewed 6.1 hours of television weekdays (median 4.0 hours) and 7.6 hours on weekends (median 6.0 hours).

**Table 1**  
**Sample Characteristics (Continuous and Categorical Variables)**

<b>Categorical Variables</b>	<b>%</b>	<b>Continuous Variables</b>	<b>Mean/ Median</b>
<b><u>Race</u></b>		<b><u>Age</u></b>	
Afro-Guyanese	32.0	Mean	16.2
Indo-Guyanese	36.1	Median	16.0
Mixed-Other	31.9	<b><u>TVs in Home</u></b>	
		Mean	1.9
		Median	2.0
<b><u>Gender</u></b>		<b><u>Number of Channels Accessed</u></b>	
Females	62.0	Mean	15.0
		Median	10.0
<b><u>Form Level</u></b>		<b><u>Number of Hours Viewing TV</u></b>	
Fourth	49.4	<b><u>Weekdays</u></b>	
Fifth	50.6	Mean	6.1
		Median	4.0
		<b><u>Weekends</u></b>	
		Mean	7.6
		Median	6.0

The shifting preferences for foreign food franchises are very evident from the results in Table 2. Note especially, that 26.2% of the adolescents chose no local franchises, as compared to 11.3% who chose the same for foreign franchise: a rate of 2.3 times less. For those choosing two or less of either franchise, the per cent of those who chose foreign was 44%, as against 54.8 for local. Nonetheless, four franchises were the most likely choice for both foreign (31.8%) and local (27.3) food outlets.

The distributions for music preference do not provide as distinct differences as those for food preferences. For example, those who did not choose any of the foreign or local genres varied only 2.5%. However, when we consider those who chose between zero and at least two of the local or foreign musical forms, the differences are slightly over 10%: foreign 59.2% and local 69.6%. As expected, at the extreme, the percentage of adolescents who chose 5 or 6 local genres was 6.2%, as against 13.1% who chose 5 or 6 of the foreign music forms. Clearly, despite the universal acceptance and popularity of Caribbean music, the preferences of adolescents in the region are tilting in favour of the non-indigenous forms of music.

Table 2

## Percent Distribution of Preferences for Local and Foreign Food Franchises and Music Genres

Number of Choices	% Local Preferences		% Foreign Preferences	
	Food (LFP)	Music (LMP)	Food (FFP)	Music (FMP)
0	26.2	27.3	11.3	24.8
1	15.7	21.5	17.0	18.5
2	12.9	20.8	15.7	15.9
3	17.7	15.7	14.4	14.2
4	27.3	8.5	31.8	13.3
5	0.0	5.5	3.4	9.2
6	0.1	0.7	4.0	3.9
7	0.0	0.0	2.4	0.1

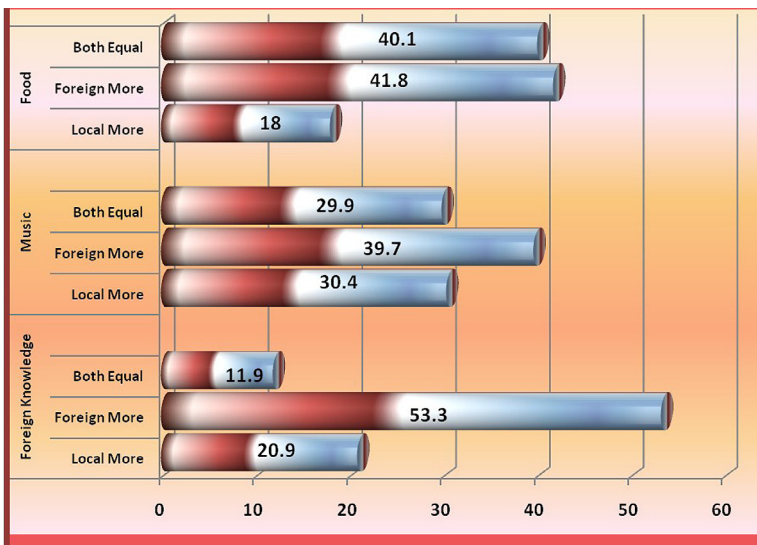
In Table 3, the differences in adolescents' knowledge of local and foreign facts are presented. We use the percentile rankings of the adolescents' performance on correctly identifying the local and foreign facts on which they were tested. The results provide some interesting patterns. Note that adolescents are fairly evenly distributed in the upper and lowest percentiles of the distribution, particularly for the foreign knowledge questions. However, it is clear that to a large extent adolescents scored better on the foreign items overall. The data indicate that on the local test questions, those who scored in the lowest 25th percentile were almost ten per cent higher than those who scored similarly on the foreign test questions. However, when the median split is considered, the difference is less dramatic, and in fact, reversed. Whereas 48.4% of the adolescents scored at or below the median on the foreign test questions, 44% performed similarly on the local test. Nonetheless, the overall picture is that there is higher representation of adolescents at both the highest and lowest ends of the performance scales for the local items than for the foreign.

**Table 3**  
**Percentile Ranks of Correct Responses on Cultural Knowledge Questions**

Percentiles	Percent within Percentiles	
	Local	Foreign
Lowest - 25 <sup>th</sup>	33.1	23.3
26 <sup>th</sup> – 50 <sup>th</sup>	10.9	25.1
51 <sup>th</sup> - 75 <sup>th</sup>	25.5	27.3
Above 75 <sup>th</sup>	30.4	24.3

In Figure 1, we take a different look at the data. It is clear that for each of the outcome variables of interest, adolescents expressed preferences for both the foreign and local issues under consideration, and had some knowledge of both local and foreign facts. Our concern in Figure 1 is the assessment of the extent to which foreign preferences and knowledge exceed that of local. Stated differently, in what direction are adolescent preferences tilting? Local or foreign? And, to what extent do adolescents express equal preferences? Accordingly, we use the frequency distributions for the residualized variables described earlier to summarize local, foreign, and equal preferences.

**Figure 1**  
**Percent Foreign Food Franchise, Music Genre, and Cultural Knowledges**



It is clear from Figure 1 that in each case, the exclusive local preferences were much lower than foreign ones, and sometimes substantially so. In terms of food franchises, foreign franchises were preferred 2.3 times more than local ones. The per cent of those who prefer foreign food franchises (41.8%) is fairly similar to those who prefer both foreign and local equally (40.1%). The per cent of those who preferred foreign music more was about 9% higher than those whose preference was restricted to local genres. Adolescents performed almost 2.6 times better on the foreign cultural tests than on the local questions. Only about 12% performed equally well on both tests. Thus, while the distributions of raw scores look closer when collapsed into percentile rankings, the patterns of preferences are much more distinctly foreign when we look at the residual differences in preference scores.

In Table 4, we formally test for differences utilizing paired sample T-tests for each of the three outcomes of interest. The essential question is whether the observed preferences are statistically different. Clearly, as the results indicate, for all three of the outcomes (foreign foods, music, and cultural knowledge), the differences between means are large enough to indicate statistical significance. In the case of cultural knowledge, which represents the average per cent of correct answers, the mean for Local Cultural Knowledge is just over 27% higher than Foreign Cultural Knowledge.

**Table 4: Means Differences for Local and Foreign Food Franchises, Musical Genres, and Cultural Knowledge (Paired T-Test)**

Paired Samples	Mean	N	t
Local food franchises	2.05	1482	-14.70*
Foreign food franchises	2.76		
Local music preferences	1.76	1482	-6.57*
Foreign music preferences	2.17		
Local cultural knowledge	31.98	1482	-47.479*
Foreign cultural knowledge	59.18		

\* p < .05

### Multivariate Analyses

The final set of analyses employ linear regression models to assess the factors that potentially explain the preferences for foreign foods, music genres, and knowledge of foreign information. Our primary hypothesis is that these are explainable by the TV consumption, which in Guyana is saturated by foreign content. Based

on our literature review, however, we assess TV consumption net of all the other independent variables we consider relevant and available for the analyses to follow. We ask essentially two questions: 1) To what extent does TV consumption net of other factors explain the variation in the foreign preferences of interest in this study? 2) To what extent do the same variables predict the extent to which foreign preferences exceed the preferences for local foods, music, and greater knowledge of foreign facts utilized in this study?

### Baseline Models

We first present two “baseline” models indicating the impact of television viewing habits on weekdays and on weekends, on the foreign food and music choices, and on cultural knowledge of Guyanese adolescents. As indicated in Table 5, the patterns are rather inconsistent. First, the average hours of television viewing on weekdays (beta=.088) significantly explain the excess preference for foreign food franchises, but not the preference for foreign foods per se. The reverse is true for weekend television viewing habits: the increasing hours of TV viewing by adolescents on weekends (beta=.141) do influence their food choices, but do not explain the extent to which adolescents would prefer foreign food franchises above local ones. Secondly, increase in the average levels of TV viewing during weekdays (beta=-.144) is significantly related to a decreased preference for foreign music. On the other hand, however, increased hours of TV viewing on weekends (beta=.090) significantly explains the excess preference for foreign music genres. Finally, weekday and weekend TV viewing habits have reverse effects on cultural knowledge. Weekday TV viewing is associated with a diminished knowledge of foreign cultural facts, but weekend habits are related to increased knowledge of foreign cultural facts. Neither viewing habits explain the excess knowledge of those facts.

**Table 5**  
*Baseline Standardized Regression Estimates for Predictors of Foreign Preferences*

Baseline Model	Food Franchises				Music Genres				Percent Knowledge			
	Foreign Preferences		Residualized Food Preference		Foreign Preferences		Residualized Music Preference		Percent Foreign Knowledge		Residualized Knowledge	
	Beta	Std. Error	Beta	Std. Error	Beta	Std. Error	Beta	Std. Error	Beta	Std. Error	Beta	Std. Error
<u>Television Consumption</u>												
Weekdays	-.088	.021	.088*	.021	.144*	.024	-.078	.030	-.108*	.382	.052	.026
Weekends	.141*	.019	-.008	.019	.060	.022	.090*	.029	.108*	.360	.033	.025
R <sup>2</sup>	.010*		.007		.020*		.008		.012*		.005	

\*  $P \leq .05$

## Full Models

In the next two tables (Tables 6 and 7), we present full models for both the *foreign preferences* outcomes and the *residualized* dependent variables. In general, while there are some interesting patterns, the models do not explain much of the variation in the outcome variables. At best, the predictors as specified, explain roughly 7% of the variability in the choice of music genres, and at worst, 1% of the explained variance in cultural knowledge for the residualized variable. Certainly then, there are other factors not considered in these analyses that explain the outcomes of interest in this paper. Nonetheless, we proceed to highlight some interesting outcomes from the regression analyses undertaken.

In the multivariate models, the weekend TV viewing effects, while slightly attenuated from the baseline effect, remain significant with the additional predictors in the models. As evident in Table 6, weekend TV viewing habits are significantly associated with preferences for foreign food franchises, foreign music genres, and cultural knowledge. Increasing levels of TV viewing on weekends are likely to increase the preference for foreign food franchises, foreign music genres, and better knowledge of foreign cultural facts. Note however, that weekday TV is associated with a decreased level of knowledge of foreign cultural knowledge and music genres, but not for the choice of foreign food franchises.

Overall, the relationship between weekend TV viewing habits remains robust with the addition of other predictors in regard to all of the outcomes of interest. The effects of weekday TV viewing are assuaged slightly, and do not explain preferences for foreign foods. Adolescents from nuclear households chose foreign music genres significantly more frequently than those from other types of households, but the effects of this variable on the other outcome variables are non-significant. Interestingly, higher levels of exposure to religious TV broadcasts are significantly associated with lower preference for foreign food franchises and foreign music, but have no effect on cultural knowledge. Finally, as household size increases, the preference for foreign food outlets also increases. Understandingly, adolescents in larger households significantly report greater preference for foreign food franchises, but household size has no significant effect on the other outcomes.



**Table 6: Standardized Regression Estimates for Predictors of Foreign Preferences**

Model	Food Franchises		Music Genres		Knowledge	
	Beta	Std. Error	Beta	Std. Error	Beta	Std. Error
<b>1. TELEVISION CONSUMPTION</b>						
Weekdays	-.052	.019	-.139*	.022	-.095*	.376
Weekends	.112*	.018	.102*	.021	.085*	.357
<b>2. DEMOGRAPHIC FACTORS</b>						
<b><u>Gender</u></b>						
Female	.080	.143	-.024	.163	.026	.196
Male (Reference Category)	-	-	-	-	-	-
<b><u>Form level</u></b>						
Fourth (Reference Category)	-	-	-	-	-	-
Fifth	.018	.133	-.057	.152	.050	.182
<b><u>Race</u></b>						
Afro-Guyanese	.065	.144	-.040	.165	-.016	.212
Other races (Reference Category)	-	-	-	-	-	-
<b><u>Religiosity</u></b>						
Perceived Level of Religiosity	-.009	.140	-.033	.161	-.032	.193
Church Attendance	.040	.060	.035	.068	-.008	.082
Watching Religious Programmes	-.086*	.054	-.168*	.062	.036	.075
<b>3. HOUSEHOLD/STRUCTURAL FACTORS</b>						
<b><u>Household Type</u></b>						
Nuclear	-.007	.136	.065*	.155	.014	.186
Other (Reference Category)	-	-	-	-	-	-
<b><u>Household size</u></b>						
	.078*	.033	.029	.038	.003	.045
R <sup>2</sup>	.035*		.064*		.048*	

\*p &lt; .05

Overall, the model we proposed was less predictive of the residualized outcomes that we were interested in. We noted gender, age (as measured by form level) and race effects, but these were inconsistent across the outcomes of interest. As indicated in Table 7, gender explains the excess preference for foreign food franchises (females prefer them more), but not the variation in the other outcomes. Afro-Guyanese, as compared to all other groups, had higher difference scores when performances on the foreign cultural facts tests and local facts tests are compared, but race does significantly explain the excess preference for the other two outcomes.

Watching religious programmes is positively associated with the excess preference for foreign food franchises, but has a negative effect on the excess preference for foreign music genres. In particular, it is noted that while weekday and weekend television habits partially explained the outcome variables in the models with the other predictors, they failed to reach significance when explaining the residualized outcome variables.

**Table 7: Standardized Regression Estimates for Predictors of Residualized Foreign Preferences (Full Model)**

Model	Food Franchises		Music Genres		Knowledge	
	Beta	Std. Error	Beta	Std. Error	Beta	Std. Error
<b>1. TELEVISION CONSUMPTION</b>						
Weekdays	.078	.354	-.067	.030	.045	.026
Weekends	.004	.019	.065	.028	.034	.025
<b>2. DEMOGRAPHIC FACTORS</b>						
<b><u>Gender</u></b>						
Female	.094*	.151	-.051	.220	.026	.196
Male (Reference Category)	-	-	-	-	-	-
<b><u>Form level</u></b>						
Fourth (Reference Category)	-	-	-	-	-	-
Fifth	.109*	.141	-.069	.205	.050	.182
<b><u>Race</u></b>						
Afro-Guyanese	.030	.153	.025	.223	.112*	.174
Other races (Reference category)	-	-	-	-	-	-
<b><u>Religiosity</u></b>						
Perceived Level of Religiosity	.016	.149	-.038	.217	-.032	.193
Church Attendance	.031	.063	.032	.092	-.008	.082
Watching Religious Programmes	.080*	.058	-.189*	.084	.036	.075
<b>3. HOUSEHOLD/STRUCTURAL FACTORS</b>						
<b><u>Household Type</u></b>						
Nuclear	-.035	.144	.065	.210	.014	.186
Other (Reference Category)	-	-	-	-	-	-
<b><u>Household size</u></b>						
	.036	.035	-.016	.051	.003	.045
R <sup>2</sup>	.043*		.065*		.008	

\* p &lt; .05

## Summary and Discussion

The primary purpose of this study was to assess the impact of television viewing habits on the cultural preferences of adolescents. Essentially, since Western media is dominant, the primary assumption was that the proliferation of such media on Guyanese television would result in increased preference for foreign foods, music genres, and better knowledge of foreign facts as compared to local ones. Using various analytic tools, we described the nature of foreign and local preferences, assessed their differences, and estimated multivariate models to explain variation in the three outcomes described earlier. In particular, we were interested in modelling the effects of television viewing habits, net of the demographic and structural variables included in the models.

Consistent with expectations, we found significantly more preferences for foreign food franchises. Surprisingly, our results also indicated higher preference rates for foreign music genres, even though such rates were not as elevated as those for the food outcome. Most revealing was the sustained difference in cultural knowledge, with significantly better performance on the foreign cultural facts, and the significant movement toward foreign food preferences. In terms of the latter, the proliferation of foreign food franchises in Guyana in recent years is potentially impacting the food preferences of Guyanese adolescents.

Given that most of these are fast food industries with aggressive advertising, without publicizing the adverse impact of these industries on adolescent health (Bowman et al, 2004; Diez & Robinson, 2005; Pereira, et al. 2005), the implications for public health awareness are apparent. It should be noted also that adolescents from larger households are more likely to prefer these franchises. This probably indicates some dependency on these outlets for their families' food needs. Both the financial and health implications of these choices for a larger and more vulnerable sector of the population are not trifling. Added to these concerns is that the food preferences are not differentiated by age, racial categories, and gender.

Our models included several indicators of religiosity. The assumption was that from the perspective of regulatory exposure, value-based judgements about viewing habits, and time constraints associated with religious involvement, the impact of television habits on cultural choices will be significantly mitigated. The data provide limited support for the assumption. Self-reported levels of religiosity, and, surprisingly, church attendance, did not differentiate adolescents' cultural choices. However, frequency of watching religious broadcasts on television did, for food and music preferences. The most obvious explanation is that frequent viewing of religious broadcasts precludes the influences of other programmes and advertisements that are more likely to affect cultural choices. While religious broadcasts are not completely culture free, they are less likely to influence the outcomes that were under investigation in this study. Further study is needed, however, to understand the notion that might influence personal and cultural outcomes.

The impact of television viewing habits on the cultural preferences and performance, our central concern, is explicable, given the results discussed earlier. Exposure to especially local cultural facts through the medium of television is less likely than the other outcomes of interest. It is therefore plausible that while TV viewing habits would influence foreign cultural preferences, they do not explain the excess preference when compared to local ones. Of further interest are the differing effects of weekdays and weekend viewing habits. The fact that the latter is more likely to promote foreign cultural preferences may speak to the more sustained and targeted influences of weekend television programming, as compared to the

diffused influences on weekdays, with less clustered hours for watching TV. Clearly, the implications are that more local cultural programming during the times of sustained TV viewing has the potential of greater influence.

Largely then, the study provides some evidence of the potential of television viewing to alter the cultural preferences of adolescents in Guyana. Within the limits of cross-sectional data, we have shown consistent biases towards foreign food franchises and music genres. Certainly, a more focused study with a broader array of known influences is necessary, but this effort is important for the contributions it makes. It provides new information for Guyana in terms of cultural shifts, and the impact of such shifts for explaining other developmental and health outcomes should be a necessary next step. It underlines the necessity of health education that focuses on television effects on health outcomes among adolescents, including obesity, juvenile diabetics, poor heart health, and other potentially negative health outcomes.

## **Conclusion**

This study suggests that a relationship exists between television consumption and adolescents' choices. Admittedly, while we focused on the role of television in influencing adolescents' preferences, we are aware that various mediums might also sway these alternatives. Consequently, we identify several important questions that remain unanswered: 1) How do different media affect Guyanese adolescents' choices? 2) How does total exposure time, calculated as a proportion of time spent, simultaneously using more than one medium relate to adolescents' choices? 3) Is there any relationship between media content and cultural choices of Guyanese adolescents? This study demonstrates that while television viewing is impacting adolescents' choices, future studies might address these questions as well as adolescents' media content, and frequency of such consumption.

Parents, guardians, teachers, health professionals, religious leaders, politicians, and others responsible for supervision and/or dissemination of information to adolescents, must develop some awareness of television programming, content, control of such content, and effects on adolescents' choices. Health and media professionals must develop partnerships with food franchises, manufacturers, and representatives in advertising to promote an awareness of the positive relationship between diet and health. These professionals should also seek to encourage clearer, accurate messages related to ethnic food values, nutrition, and health. Educators, politicians, parents and others can contribute to the awareness and appreciation of local music genres and national and Caribbean cultural knowledge.

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**II**

**Humanities**



# Structural Analysis of The Modern Calypso

By  
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## Abstract

In this descriptive investigation, calypsos have been reported by many from an etic perspective as if emic. The privation of absolute transcription renders the rhythmic value too simplistic; moreover, a clearer understanding of the culture of calypso is non-existent. The broad categories of rhythm, arrangements, dance, and song texts are examined from an emic perspective. Anthropologist James Lett of Florida Atlantic University said of Kenneth Pike: “The neologisms ‘emic’ and ‘etic,’ which were derived from an analogy with the terms “phonemic” and “phonetic,” were coined by the linguistic anthropologist Kenneth Pike (1954). Pike suggests that there are two perspectives that can be employed in the study of a society’s cultural system, just as there are two perspectives that can be used in the study of a language’s sound system. In both cases, it is possible to take the point of view of either the insider or the outsider. The emic perspective focuses on the intrinsic cultural distinctions that are meaningful to the members of a given society. The native members of a culture are better judges of the validity of an emic description, just as the native speakers of a language are the sole judges of the accuracy of a phonemic identification. However, the etic perspective, according to Pike, relies upon the extrinsic concepts and categories that have meaning for scientific observers. Scientists are the sole judges of the validity of an etic account, just as linguists are the sole judges of the accuracy of a phonetic transcription.” The creative art of calypso is a representation of the intricate and unique Trinidadian & Tobagonian culture. Implications of these findings are discussed here.

## Introduction

The term ‘calypso’ has a duality of meanings. Firstly, it is used as an ‘umbrella term’ connoting a genre that started in Trinidad and Tobago; and secondly, it refers to a strand of the umbrella genre. From this point onwards, the term ‘calypso’ will be representative of the umbrella genre, while *kaiso* signifies a lisle of the umbrella genre. Calypso, in the main, is orally transmitted but may occasionally be textually transcribed. This is so because of a commonly held belief that the use of written notation kills the real experience of the genre. The lack of notation, it is said, gives vent to flexibility and a ‘live’ experience. Without the historical and/or cultural

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understanding of Trinidad & Tobago, one may be oblivious of the dynamic meaning calypso has to its practitioners and patrons.

Since World War II, Trinidad & Tobago has been influenced by the North

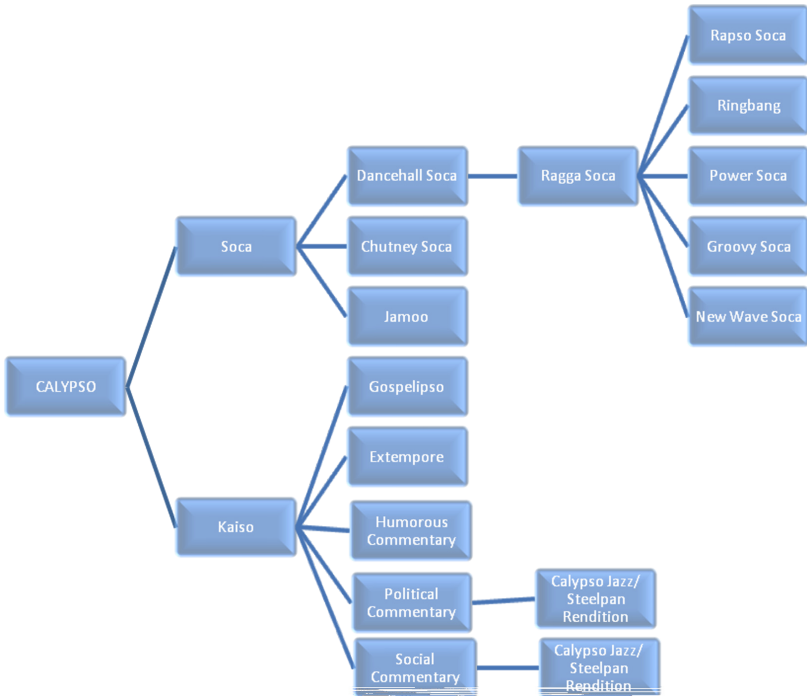


Figure 1 (Calypso Typology)

American culture. Consequently, during the last forty to fifty years, calypso underwent a metamorphosis that summarizes the cohesive complexity of its culture. The elements in calypso are varied and complex (See fig. 1). Yet, they make up a composite whole. As a result, cultural and national identity is asserted. For an understanding of this complex yet cohesive phenomenon, this essay would examine the elements through a detailed account of rhythm, arrangements, dance, and the song texts.

### Rhythm

With respect to rhythm, calypso can be divided into two sections: ballads or contemplative song text, and dance music. Like all music-making experiences in the Caribbean, and also in most of the Western world, rhythm is considered one of the most significant elements. With rhythm, one must have a particular ‘attitude’ or ‘state of mind’ - the embodiment of ‘dynamic euphoria’. Even though calypso is composed of a rhythmic fusion, many scholars (Crowley 1959, Elder 1971, Espinet and Pitts 1941, Hill 1972, Quevado 1962) have simplified its rhythmic motif (See fig. 2) – a motif mainly played by the *snare* drum and the *kick* bass.

Hood (1959) and Treitler (1974) postulate that compositions in an oral tradition result in “similar but not identical” types of pieces. Hence, my notion is, calypso as a genre results in similar but not identical types of pieces. Calypso features a compilation of rhythmic elements that is rather linear than vertical. This rhythmic configuration gives vent to fresh music, even though the rhythm seems to be duplicated into new songs. Figure 3 demonstrates the contrasting variants of calypso and how the rhythmic feel is complemented by other percussive instruments.

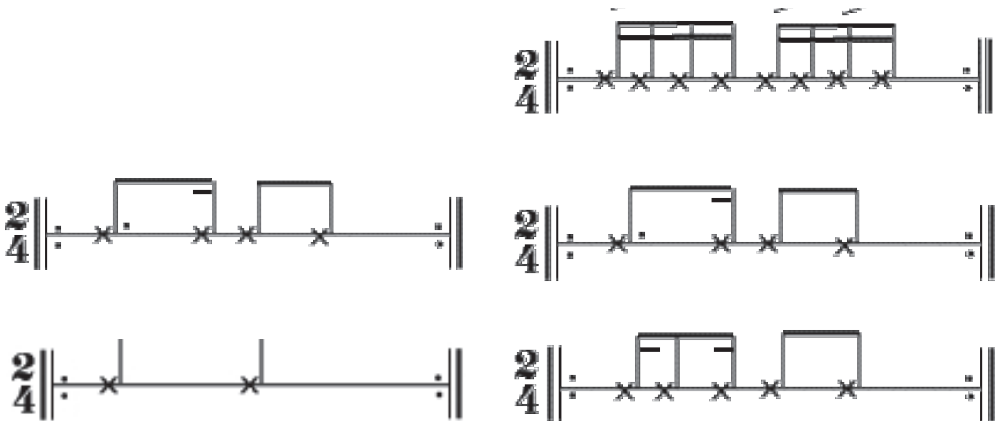


Figure 2 (Simplified Calypso Rhythm)

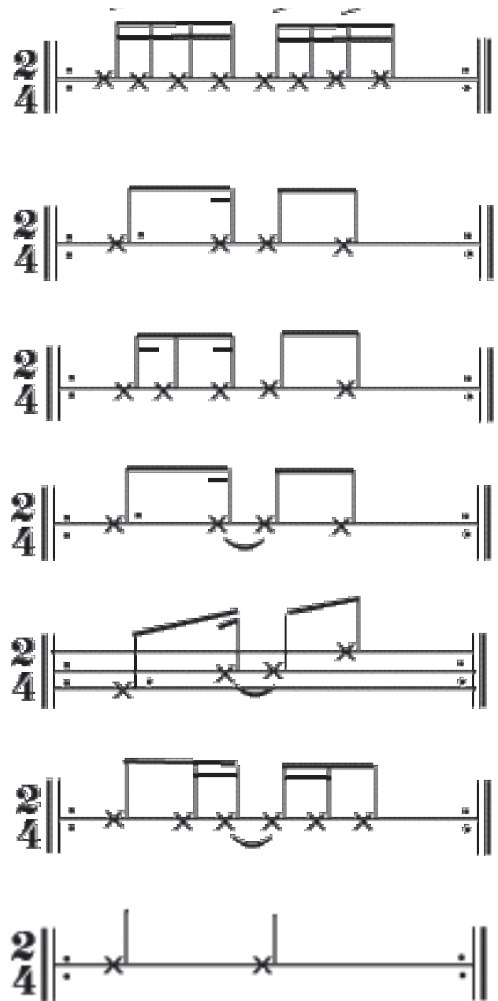


Figure 3 (More Complex Calypso Rhythm)

Calypso musicians consider elements of timbre to be essential in describing the music. The same rhythmic pattern will be perceived differently from one song to the next, in relation to the different elements in the timbre, tonality, tempo, mixing and volume. Most modern *kaiso* musicians use the electronic drum machine or drum sequencer to compose a calypso rhythm. If the lisle of calypso is *soca*, *chutney soca*, *ragga soca*, *rapso soca*, *new wave soca*, *dancehall soca*, *power soca*, *groovy soca*, *ringbang*, *chut-kai-pang*, *gospelipso*, or *jamoo*, the timbre of the snare drum is modified. Thus, the attack is more forceful on various beats, and the quarter note ostinato of the kick bass incorporates more reverb. Depending on the situation, one conga sound may be heard with its natural timbre; another may be played dampened, producing a shorter, drier, and sharper sound. The arrangement used in *rapso* is known to include sampled sounds such as handclaps etc. The sampler and electronic drum machine are part of the standard equipment used in producing sounds on albums, compact discs and tapes of various calypso variants.

One of the basic rules in *kaiso* (as I learned in steelpan tutelage) is to minimize the number of competing lines played simultaneously. As a result, additional rhythmic sound effects can be placed only where there are gaps in the arrangement. The congas could intervene on the 1/16 note beat before the 2<sup>nd</sup> and 4<sup>th</sup> beats, with an accent on the high conga as shown on the rhythmic linear chart in Figure 3. The same scenario is expressed in “Lion and Donkey (rematch)” as composed and performed by Slinger (Sparrow) Francisco. In effect, the various percussive instruments rarely play all at the same time; instead they interlock, as seen in Figure 3<sup>1</sup>. The idea is to complement each rhythmic element with the other. Consequently, a single rhythmic line in *kaiso* does not represent the whole.

The music is characteristically up-beat, with a pulsating melodic bass line and kick bass that is usually associated with Carnival music. Calypso is a hit when it creates within the listeners a feeling for physical reaction, which is seen in the form of dancing (with *soca*, *chutney soca*, *ragga soca*, *rapso soca*, *new wave soca*, *dancehall soca*, *power soca*, *groovy soca*, *ringbang*, *chut-kai-pang*, *gospelipso*, or *jamoo*), or of laughter or sing-along (if social and political, humorous, or commentary *kaiso* is played). Calypsonians are conscious of the carnival associations certain rhythmic patterns have on the listeners. They have relied heavily on these patterns to create a mood and to elicit the desired live experience.

Calypso is based on interactive rhythmic and melodic patterns rather than on vertical arrangements typical of Western art music scores. The only elements that assume continuous play from the start to the end of the piece are the melody and

<sup>1</sup> Calypso studio recordings use as much as 12 tracks just for the percussion section.

the bass lines. Even though other percussive instruments are heard throughout, they fall under the schematic rhythmic gaps. The musician composes one element at a time.

The kick bass track may be laid down first, followed by the snare drum, and then other instruments - high-hat, bottle and spoon etc. Each sound is added over and in relation to the sound created earlier. At times, certain elements overlap each other; however, care is taken to fill rhythmic gaps with different and eclectic rhythmic patterns and timbres, which eventually produce a complex rhythmic arrangement.

## Arrangements

In addition to the percussive instruments in calypso, normally a chorus of three or four singers, a brass section, two synthesizers, an electric guitar and a bass guitar are included. The singers in the chorus play an important role, as they add presence, colour and expression to the arrangement. They also stimulate the listeners to take part in the song by reproducing the traditional call-and-response pattern. Characteristically, the melody of the chorus is short, catchy, within the range of an octave, and easy to sing. In fact, it is this segment that people remember most.

The brass section in calypso plays either in unison or harmonically, but is never through-composed in the calypso. The brass section typically comprises two saxophones, four to six trumpets, and a trombone. Its sonorous sound punctuates the introduction and it often consists of the refrain in three-part or four-part harmony. At times, at his/her discretion, the calypsonian may gesture to the brass section to repeat the entire introduction, in order to capture the full attention of the patrons. The brass is fully employed not only in the introduction, but also at the end of each refrain.

Since World War II, North American music has influenced the way of life in Trinidad & Tobago with the inclusion of the harmonic arrangements of calypso. The '*phat*' chords played by the brass section in the refrain, no doubt, are evidence of the brassy sound of big-band, except in a Caribbean way. Calypso is known for its Caribbean jazz, juxtaposed with riffs throughout the piece. Usually, riffs are played between the textual phrases in unison or harmonically.

The two synthesizers play different roles: one is used as a rhythmic instrument and reproduces sampled sounds from the percussive section; the other interjects harmonic chords in syncopated rhythms. In most cases, the electric guitar with its unique timbre, strums the same rhythmic and chordal progressions as the synthesizer.

## Dance

The basic rhythmic foundation is used to circumvent new and fresh ideas by the



manipulation of timbres with studio mixing, putting them in a new context, recombined with other rhythms, and given importance. The sound of the *soca* variants shown in Figure 1, when heard in Trinidad & Tobago, produces a particular body movement - a 'carnival atmosphere' - and a dynamic and invigorating impulse that realizes the 'live experience' of the music. Richard Middleton aptly summarizes this concept by stating: "Once a set of meanings has solidified around certain arbitrary musical meanings and conventions, those meanings can be hard to shift" (1990:10).

The music is played at full volume, whether in concert or nightclubs, and in such a way that the listener feels the parts played by the bass drummer and the bass guitarist in the gut. According to various practitioners and listeners, it is the volume and the rhythm that contributes to the desired 'carnival experience'.

As most Caribbean music is inseparable from a physical reaction of some sort, a musical performance is often evaluated on the degree of movement it generates. And if it is *soca*, *rapso*, or *chutney-soca*, that reaction is dance. The jazz trumpet player Happy Lewis explains:

The public here (Trinidad) judges much of a musical performance by physical demonstrations. If a group performs with serious faces and without much physical expression, the public does not relate to what is happening. They find the music too sophisticated, the musicians pretentious. The problem is that people here have not learned to relax and enjoy themselves in concentrating on the music. They have not learned to participate that way. They have not realized that there are all kinds of ways to play fun music. Needless to say that there are some people who have understood all that, but they remain a minority. The public reacts at the call of participation. Dance here is accessible to everybody and is part of what one expects in relaxing.... Jazz, therefore, has so far remained a marginal music of true enjoyment and relaxation. Dance, physical demonstrations from the musicians and the call-and-response requiring public participation are not in jazz, and are missed by the listeners.

Music is expected to feed dance and any other kind of physical participation, be it vocal or something else. Music is expected to provide relaxation, true enjoyment.<sup>2</sup>

According to Lewis, a music that can be physically experienced through dancing is more highly regarded in the Caribbean than any other type of music, because music, body, and pleasure are closely linked. In this context, music means more

<sup>2</sup> Personal interview with on June 21, 1995 with Happy Lewis.

than sound: it is conceived as both a physical and a social experience.

During a performance, the practitioners make walking steps in time with the quarter note pulse. They may also jump up, wave the hands in the air or even push their hands up and down while their bodies accentuate the beat of the music. They may even have a dance crew on stage to initiate the dance movement in the crowd. During the 1997 Carnival, the majority of the *rapso* pieces featured words like, “follow the leader”, “jump to the left/right”, “jump and wave”, “take a jump”, etc. as demonstrated in the following medleys: ‘Follow the Leader’ by Nigel and Marvin Lewis, ‘Making Me High’ by T. Bass, ‘Ah Have It’ by Chinese Laundry, and ‘Control Your Property’ by Iwer George.

Another aspect is the choreography of the calypso genre. The success of contemplative reaction depends on the ‘word painting’ by the practitioners. They cultivate unique and flamboyant images, and their performances are carefully crafted dramas in which they act out the lyrics of their songs through appropriate dress, body movement and gesture. Sometimes props and additional actors or dancers are utilized. The audience voice approval of a calypsonian by the number of times they call him/her back on stage to deliver another verse of the selection.

Ras Shorty I (pronounced Ras Shorty-eye) introduced *soca* in the mid-70s. He formed the genre by adding more soul into the calypso, thereby producing soul-calypso, hence *soca*. By the late 70s, *soca* represented smutty calypsos, which are still in the diet today.

Normally, the traditional calypso is a piquant commentary in song, where the melody enhances the lyric. The soca-calypso reversed this trend by *stressing* musical rhythms, often at the expense of critical commentary. Its driving rhythm results in a great level of exuberance and energy. This is not to say the quality of the calypso has deteriorated, but the lyrics have now taken a *secondary* role - an evidence of the dynamic art form.

In 1994, a new calypso strand emerged. This type of calypso is reputedly derived from an East Indian wedding ritual, with some blending of the East Indian form and soca. The roots of this music lie in the *Bhojpuri* folk songs brought from India by the indentured workers who came to Guyana, Suriname and Trinidad between the 1840’s and 1917. Unlike classical and semi-classical Indian music, which is rooted in Hinduism’s sacred Vedic texts, these folksongs deal with earthly concerns: work, the changing of the seasons, and perhaps most significantly, life’s rite of passage: birth, marriage, and death.

Moreover, they are considered women’s songs. On the Friday night before a wedding, the women sequester themselves with the bride in a ‘women only’ ceremony. There, they would initiate her into the mysteries of conjugal life via innuendo-laden songs and sensual dancing, to the accompaniment of the *dholak*

(drum) and *dhantal* (iron rod). They would dress in men's clothing and engage in suggestive role-play, with the help of props such as eggplants or cucumbers. Similar rites of abandon took place during the *cathi* or sixth-day birth ceremony. Even today, the lyrics of the songs sung in ceremonies are in Hindi.

Singer Sundar Popo remembers tagging along with his mother to wedding nights as a boy. "Women sang folksongs, men sang classical," he says.<sup>3</sup> The only adult males permitted at wedding nights were the effeminate type who played the *dholak*. Sundar, with Indian-flavoured tunes like 'Nani and Nana', became one of the first East Indian artistes to cross over into calypso. He is also one of the first East Indian male performers to venture into the domain of non-classical singing, mixing Hindi lyrics with English in suggestive songs like 'Scorpion Gyu'.

Sonny Mann, a 40-year veteran of the Indian music scene, became another subscriber to this genre. He went from singing religious *bhajans* to film songs and classical songs, and finally arriving at what is ostensibly his pot of gold - chutney-soca. His 1993 tape, *The Man Himself*, sold 80,000 copies worldwide, but Sonny Mann only came to the attention of the rest of Trinidad during the 1995 general election campaign. Mann's all-Hindi chutney number, 'Lootay La', was interestingly played on the campaign trail by both the Creole-based People's National Movement (PNM) and the Indian-led (and eventually victorious) United National Congress (UNC).

The essential instruments of chutney-soca are the *dholak*, *dhantal*, *tabla*, and harmonium. Once you add to those instruments the soca rhythm, it becomes chutney-soca. True chutney is, in fact, a faster beat than chutney-soca. Sundar and Mann remember performing at weddings and someone in the crowd would call out, "Gimme a breakaway". The orchestra would speed things up and the general tone of things would get more up-tempo and 'spicier'. Hence, the name for this genre was conceived to reflect the chutney spice.

"Some of the lyrics of the chutney-soca songs are so obscene," says Sundar, "that if they knew the translation they'd ban them from the radio."<sup>4</sup> Sonny Mann's 'Lootay La' is one of the principal targets of criticism, as his song desecrates the *bhowjie* or sister-in-law, a highly respected figure in the Hindu kinship system. This dance strand in calypso with its varying elements mirrors the complex whole in the Trinidad society.

<sup>3</sup> Personal conversation with Sundar Popo in July, 1995.

<sup>4</sup> Ibid. July 1995.

## Song Texts

Once more, the indication that a calypso (especially when rendered live) is successful is based upon the reaction of the listeners. If *soca*, *rapso*, or *chutney-soca* were sung, one would expect the rhythm carefully thought out and mixed down properly to exude a dance fever from the listeners. If it does not, the practitioner would most likely be pelted with eggs, tomatoes, or one may hear the audible sound of discontent.

The ballad/drama, social and political, or humorous commentary in this genre known as the *kaiso*, may solicit a dance reaction, but in general, warrants carefully thought-out lyrics to stimulate thinking or laughter. It is the lyrics that ‘makes it happen’ in this lisle of calypsos. The calypsonians’ job is to make a graphic representation of the everyday national news, major developments and other concerns of the island. It is common for them to comment on supposed characteristics of ethnic groups or classes. The Chinese sportsmen, such as the outstanding national batsman, Rupert Tang Choon, led a cricket team against the touring Guyanese Chinese cricket team. Viking used the context of the cricket match to poke fun at Chinese names and to cite an old Caribbean joke of how the Chinese arrived at these names. He sang:

I had a read on yesterday’s papers  
 A cricket match with some Chinese players  
 I had a read on yesterday’s papers  
 A cricket match with some Chinese players  
 They say the Indian people names are funny  
 Nothing to beat the Chinese  
 As though the Chinese does get their names  
 By the beating of the steelbands in Port of Spain

**Refrain:**

For is Ling Ting, bowled and caught by Loong Tang  
 And Ming Ting were clean bowled by Poon Pang  
 And the whole Oval shout  
 When Loong Lung get Wang-Pung-Ting-Pang-Toong out.

I was in a la couray  
 Ah reading ‘bout the team yesterday  
 Ah bit me tongue on several occasions  
 To make the right pronunciations  
 You must be graduated in China  
 To pronounce the Chinese names proper

Because, as I understand,  
They get their names through the sounding of the tin pan.

At the 1997 Carnival season, McGruff took the opportunity to feature another myth of the Chinese by poking fun at the then Chief Minister of Finance, Mr. Brian Kuei-Tung, who is of Chinese origin. Previously it had been said (referring to a criminal case just completed), if the woman convicted of cutting off the phallus of her husband had committed the same offensive act on Mr. Kuei-Tung, she would have been freed. It had been voiced that she was given a year in jail for every inch that was cut off. In his calypso, McGruff not only referred to the sexual organ of the Finance Minister, but also of Brian Lara, a Creole, who he felt has a large “bat,” a reason for him to be almost infallible to the bowlers he faced.

Refrain:

So he (Brian Lara) hop on a plane back to Trinidad  
He and he fans cock-up in he promenade<sup>5</sup>  
Dey cock-up, dey cock-up  
Dey cock-up in Lara promenade  
It's then I get to know why bowlers can't out him  
If you see the size of bat Lara toting  
Dey cock-up, dey cock-up  
Dey cock-up in Lara promenade  
We love Lara bad—yes  
All dem woman glad to see man cock-up in the promenade  
We are proud and glad  
To cock-up in Lara promenade

The day ah did cut ribbon in de square  
If you see big boys how dey cock-up there  
But I noticed Kuei-Tung quite up in a corner  
And I wonder why he hiding so like a guana [iguana]  
But is Ramesh wey tell me easy [who told me easily]  
Kuei-Tung can't cock-up like Manning and Rowley<sup>6</sup>  
You see de ting is, Kuei-Tung is a Chinese (pronounced Chinee)

<sup>5</sup> A square downtown Port of Spain called Brian Lara Promenade in commemoration of B. Lara as a highly recognized international batsman.

So when he cock-up nobody can see

Through wit, humour and a hyperbolic use of English, Patois, or Trinidad parlance, the calypsonian raises issues that are in the air.

Calypsos are subdivided into three structural sections: half tone, single-tone, and double-tone (although in some cases, a combination of two may be employed). A half tone calypso has two-line verses. The first line is sung by the calypsonian and the other line sung by a chorus or the listeners. Of half tones, Epstein (1977) affirms the observation of earlier researches, that this phenomenon is characteristic of 18th century West African litany. This type of calypso is participatory - the listeners respond with their one liner at every other line sung by the calypsonian. The vocal style rests heavily upon the ostinato in the chorus.

Single-tone calypsos incorporate four lines in each verse. They may have two strophes that are identical or, one solo and one chorus. The double-tone calypso has eight lines in each verse. The first two lines in the first verse are often repeated. This style in the main was sung to the customized tune of *Sans Humanité*,<sup>7</sup> pronounced *Santi Manité* (see verse below).

**A war verse**  
by **Growling Tiger**

When I was a child at the age of five  
And my dear old grandfather was alive  
He would sit me upon his knee  
And say “boy, listen to me”  
He said “boy I will tell you your birth” [i.e. fortune]  
“and it is to rule over men on this earth”.  
So I’m sorry for the molesters who mess with this Tiger

*Sans Humamite*

The *Sans Humanité* is usually in a minor key with a play on words. If sung well with witty rhetoric and utilizing amusing anecdotes, the listeners may express their approval of the calypso by yelling *kaiso*.<sup>8</sup>

Calypsos are modified to suit venues. Inside a calypso tent, the songs chosen are more satirical, humorous, or contemplative, different than that of a dance calypso. As a general rule, obscene language is prohibited and frowned upon in calypsos

<sup>6</sup> Ramesh Maharaj, a Member of Parliament, is Attorney General; Patrick Manning is the leader of the opposition and also former **premier**. Dr. Keith Rowley is a **senator** and a member of the opposition.

<sup>7</sup> The meaning of this phrase is ‘it serves you right’ or ‘without pity’. The verse is unfinished unless the listeners sing using the non-sensible syllable La, to the tune of the verse after each verse, however illogical the words may seem.

by the authorities, yet calypsonians try their best to touch the borderline without crossing over, using witty and clever verbal song texts.

The double-entendre is not only used in calypso singing; it is a major part of the social and rhetorical structure of the Trinidadian & Tobagonian's life. Patrons of the musical genre laugh in amazement at the subtle way obscene language filters through the songs. The calypsonian misplaces the syllabic stress, thus changing the meaning of the word or text. In one of his calypsoes, calypsonian 'Crazy' (Edwin Ayoung) speaks about a man steeped in philosophical contemplation. Suddenly, nature called, so he rushed off to the lavatory. Upon sitting, he ruminates on his philosophical matter and exclaimed, "I ain't getting up until I finish it." When the natural syllabic stress on the last two words is shifted to form two different words with the use of the diphthong, the meaning of the text is changed to "fini-sh#\*."

Explainer was more daring in his calypso 'Soca Reporter'. He describes a popular female journalist, Angela Fox. Angela, the well-known reporter, according to Explainer, enthusiastically travels the earth promoting *soca*. He sang:

Mark Ward, Frank Martineau  
When they have the big time show  
The first reporter they does see is Angela  
If it have ah soca show, up in Germany  
The first reporter they go see is Angie  
Labour Day Brooklyn, she dey covering  
Only to unfold, how soca looking  
Around the world

Angela Fox, here  
Angela Fox, there  
Up in Grenada, Angela Fox there...

It is intriguing to note that at face value there is certainly no problem with this soca. So it seems when textually transcribed. However, in the calypso tent, Explainer changes her surname (the *ox* is replaced by *ucks*). Under the law, his written transcription (that is, if the calypso is published) vindicates him. Scrunter also boasts of his ability to sexually satisfy in his soca, 'I Ain't 'Fraid of Mosquito.' The "cock-set" he alludes to, is a coiled mosquito deterrent. However, his theatrical suggestions on stage make it clear that the "cock", his phallus, is always "set" for action. Just recently, pop star artiste Britney Spears was challenged by a

<sup>8</sup> This term means a topical song well done.



former attorney who is presently a news anchor at FOX Cable News to surcease the transmission of her recent song, “If You Seek Amy”, during prime time on radio or television. The anchor felt that the inherent message in the title is too negative for young children who may be privy to the media during that time of day.

Calypsonians keep the genre fresh by weaving the immediate surroundings into a song. In fact, a practitioner is considered to have ‘arrived’ in the profession if he/she displays extemporary skills. Hollis (Chalkdust) Liverpool, in a seminar on ‘The Cultural Trinidad’ at the University of the Southern Caribbean in 1996, mentioned that the art of extemporary singing is achieved by acquiring a set vocabulary of rhyming words. All that is needed are the phrases before the rhymed words, prompted by the perceived activities in the immediate environment.

Vocal ornamentation takes the form of ‘scat’ singing. It serves to enhance the melody and rhythm. Waterhouse (1974: 32-34) states that ornamentation serves as an integral aesthetic feature of music, and so is ‘scat’ singing. Whether it is Tommy Joseph’s “diga-dim, digi-doom-bai, bim-bi-lim,” or Chalkdust’s “aye-I,” or Super Blue’s “dige-bam-bam,” excitement and musical interest is produced by combining this play of words and syllabic syncopation that is without semantic meaning.

The cultural language of Trinidad is reflected in various calypsoes. Historically, calypsoes have been the voice of the people. The calypsonians themselves belong to the middle to lower echelon of society. Well informed and educated, they represent the mouthpiece for society. Their comments cover topics that are socially and politically orientated, such as David Rudder’s ‘Madman Chant’, Sparrow’s ‘Federation’, Rio’s ‘Back to Basics’, Kurt Allen’s ‘Too Bright’ or Chalkdust’s ‘Eye Problems’. It may also take the form of cultural education, as in Gypsy’s ‘Little Black Boy’, Luther’s ‘Tassa Mania’ or Sparrow’s ‘Dan is the Man’. People flock to the tents to hear the rendition of the week’s news reported through the eyes of the calypsonian with elements of *picong*, satire, or saturated with *mepris*. These calypsos would either be straight humour or disguised in fantasy.

With a creative choice of words in Standard English and the vernacular, the calypsonian plays with the meter of the words. He/she uses meter as a base and not as a trap, establishing just enough of a pattern to make us aware of its presence and to increase the attention span of the listener. “In Sparrow,” comments Gordon Rohlehr (1970: 91), “meter exists as a powerful force which the singer cannot afford to ignore, but which he needs to conquer and against which he must establish such rhythmic patterns as the sense of what he is saying demands.” What is evident in the written transcription of many calypsos from readers is the belief that the meter is



non-existent. In fact, the practitioner manipulates the meter, instead of the other way around. The manipulation of the meter is found in Sparrow's fictitious drama, "Lion and Donkey (rematch)".

**Lion and Donkey (rematch)**

Brea lion and donkey arguing  
Between the two a dem who is really king.  
Brea lion and donkey arguing  
Between the two a dem who is really king.  
Hmm Well the argument reach a high  
The committee say, "let dey fight."  
All but monkey backing Lion  
The whole animal kingdom in confusion  
Hear dey bawling

Chorus "Beat the man Lion, buss he head"<sup>10</sup>  
Soloist Hmm all dem animals gone crazy  
Chorus "Beat the man Lion, buss he head"  
Soloist Even the referee he and all against donkey (he bawling)  
Chorus "Beat the man Lion, buss he head"  
Soloist A donkey is an ass and he have no brain"  
Lion bite away donkey tail and have the poor ass in pain.

Lion know donkey ain't easy  
So he decide to fight carefully  
But the way the crowd encouraging  
He get brave and he start to swing<sup>20</sup>  
Hmm A left and a right to head, whoop  
Two upper-cut, ah say donkey dead  
Donkey tumble down on the floor  
Elephant, goat, and tiger began to roar  
Hear dey bawling

Chorus "Lick him down Lion, lick him down"  
Soloist Take your paws and rip way he belly  
Chorus "Lick him down Lion, lick him down"  
Soloist Only monkey crying for donkey  
Chorus "Lick him down Lion, lick him down"<sup>30</sup>  
Soloist This time Lion in a temper only sharing blows  
Rip away all ah donkey clothes and have the whole ass expose.

Monkey bawl, “Aye man, ring the bell”  
 Crapaud say, “For what, go to hell,”  
 “Well alright use the secret weapon  
 And teach a lesson to this damn lion”  
 Referee Mr. Unicorn say,  
 “It’s a foregone conclusion  
 Time to ring the bell already pass  
 But a miracle couldn’t save your partner ass”<sup>40</sup>

Choru “Knock him out Lion, knock him out”  
 Soloist Donkey getting tired and backing  
 Chorus “Knock him out Lion, knock him out”  
 Soloist Lion fouling, but the referee ain’t warning  
 Chorus “Knock him out Lion, knock him out”  
 Soloist Lion take a stone and really knock him down  
 Dog and all start to laugh at this big naked ass on the ground.

In a clinch Donkey kiss Lion  
 Calling him a macromère man  
 Lion get so vex he change up he style<sup>50</sup>  
 No more bobbing and weaving, he fighting wild  
 When he had Donkey at arm’s length  
 He pelt a bolo with all he strength  
 Donkey weave and that was the case  
 Lion spin, Donkey grab him around the waist  
 Hear de referee

Chorus “That is foul Donkey that is foul”  
 Soloist Donkey tell the referee, “yes ah know”  
 Chorus “That is foul Donkey that is foul”  
 Soloist “Maybe, but this is one foul (fowl) that could crow”<sup>60</sup>  
 Chorus “Break ah say Donkey, break ah say”  
 Soloist Monkey say, “Ah don’t know what is wrong with you  
 Why de hell you talking ‘bout break, break, break and it’s that he’s  
 trying to do”.

Other issues are relevant for discussion in this calypso. There are occasions when the practitioners fuse various elements from variants of calypso. For example, Sparrow did not only use the double tone form, but has amalgamated it with the half

tone in the refrain. He relates the story in the verses and includes in the refrain a choral group. During a live performance, he uses his choral group to encourage the listeners to sing along in the call-and-response refrain. With the listeners singing, “Beat the man Lion, buss he head,” “Lick him down Lion, lick him down,” “Knock him out Lion, knock him out,” “That is foul Donkey, that is foul,” and “Break ah say Donkey, break ah say” in response, he maintains their attention. Furthermore, the listeners’ and chorus’ melodic and lyrical lines are easy to catch and sing. The interval range is a 5th - well within an octave - and is introduced by the phrases, “Hear dey bawling” and “Hear de referee.” Other calypsonians may shout “Sing it,” or something of the like to stimulate interaction among the patrons.

The use of vernacular in the calypso enhances the story line. Standard English is spoken in Trinidad; however, local parlance, when juxtaposed in public addresses, serves as a means to arrest attention or drive home a point. No doubt, there are in calypso tents a milieu of academic abilities, mainly from the educated echelons of society. In a setting as this, the ‘hair is let down’, so Sparrow starts off with a name from a Nancy story, “Brea Lion.” In line 2 he continues: “two ah dem” instead of “two of them”, and in the refrain, “buss he head” instead of “burst his head”; in line 34, he uses the word “crapaud” to mean a large frog (Conraua goliath). I would like to suggest that for this type of fictitious drama in song, the many appearances of the vernacular words are validated as a means to increase humour.

His story is well thought out, and each additional line drums up suspense. Sparrow’s incision of tonal acrobatics in line 21, “whoop”, choreographs the blow given to donkey. He prepares the patrons for more drama as he places his hands on his hip and poises his face for ‘mobélange’,<sup>9</sup> verbalising “Hmm” in both lines 5 and 21. The words are animated in vocal and physical gesture.

This particular calypso has incorporated three contrasting synchronic elements, forming a composite whole. The standard percussive ostinato that is reiterated forms the foundation of the piece. As the percussive pattern remains fixed, each new verse compounds the dramatic content of the previous verse as he employs a strophic melody. Moreover, with the different structural layers, the whole remains ‘tight’. There are further similarities between the textual and the music content in this calypso (see Figure 4).

Textual content: A B A C A D E  
 Melodic scheme: A B A B A C D  
 Rhyme scheme: A B A B A C C

Fig. 4 (Structural scheme of the refrain)

<sup>9</sup> This is a Creole word used in the vernacular form meaning “gossip”.

The melodic and rhyme schematic elements show similar tendencies in the interrelationships of their lines. The textual content is not too far removed in its structural scheme, thus creating cohesion and evidently adding dramatic value. Observe the latter part of the textual content in comparison to the tendencies of the melody and rhyme. Here the rhymes of the last two lines serve as the adhesive factor in the refrain. Over this scenario, Sparrow plays around with the meanings of words. A good example of a word serving two meanings is in line 60: “Maybe, but this is one foul that could crow.” He also plays around with the word ‘ass’ conveniently throughout the calypso. This is typical of Trinidad’s local parlance. Usually, there is laughter at the end of a phrase like this.

## Conclusion

Calypso functions within the culture of the Trinidadian & Tobagonian diaspora as an alternative public sphere, and it is an indispensable ethnic vehicle of cultural expression. The live wire of this genre is dependent on participation: the call-and-response in the refrain and the carnival dance fever incited in various calypso variants. Other factors apparent in this genre include scat-singing, syllabic articulation, double entendre boasting of sexual escapades, humour, social commentary, and cleverly articulated words synonymous with obscene language. Well-placed rhythmic pulses filling in the gaps are representative of local musical values.

Calypso, a genre from Trinidad filled with artistic creativity, has had both cultural traditions and diachronic circumstance to help shape it. Rousseau (1975:266) recognizes that the effects the songs have on the listeners are not limited to the physical effects of the sounds themselves but include their cultural interpretation. Potentially contradictory relations could, in fact, easily challenge the apparent musical coherence of calypso.

Middleton (1990:16) argues that the strength with which these particular potentially contradictory relationships are held together depends not only on the amount of objective ‘fit’ between the components, but also on the strength of the articulating principle involved, which is in turn, connected with objective social factors. Calypso thrives on subjects of local relevance, and is sung in local parlance that promotes its poetic beauty. This genre, with its varied and unique song structure, summarizes the cohesive complexity of Trinidad & Tobago’s culture.

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**III**  
**Science**  
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# Living in the Next Extinction – How Can We Re-engineer the Human Body to Survive The Holocaust?

By

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Key words: *Extinction, Holocaust, anthropogenic environmental disasters, human embryonic stem cells (hES), induced pluripotent stem cells (iPS), ribonucleic acid interference (RNAi), chimera, synthetic life forms.*

## Abstract

The purpose of this paper is to stimulate academic debate and not necessarily to sway the reader to any particular theory or philosophy. Let us examine some questions that arise today in the light of observed overpopulation, dwindling resources, environmental disasters, pollution, exotic chemicals in our food chain (“gender benders”), and loss of biodiversity, all resulting in dramatic social changes. Whether we are anthropologists, practicing biologists, theologians, philosophers, atheists or Christians; whether we believe in divine creation or intelligent design, questions still exist with science, biotechnology, and religion - but have they been answered? For instance: What is the age of the earth, and, are we living in the next extinction? How and when will the world end? Can genetic engineering provide us with some answers and solutions to survive impending extinction? How can we manipulate and re-engineer ourselves to promote “healthy ageing” or create a generation of hybrids (chimeras) that can survive a “holocaust?” What lessons can be learnt from lower organisms, which can be applied to our engineering problem? Can we patent our genes? What ethical issues confront us when we embark on this journey of genetic engineering? Today, we see rogue nations with nuclear weapons and Islamic fundamentalists trying to acquire biological and nuclear weapons to eliminate Jews and Christians. Furthermore, European scientists model scenarios of our survivability from a collision with a super asteroid signalling the end of time. In this chaotic environment, we will focus on the controversial questions raised above, and will review the literature to find solutions to these questions.

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## Introduction

The range of questions that we attempt to address in this paper illustrates the multidisciplinary nature of the world today - physics, geology, astrophysics, molecular biology, genetic engineering and theology. We will explore how the world could end and how we can re-engineer the human body to survive the

impending extinction. What transformations occur to the body when the mortal becomes immortal? For your consideration, there is a popular belief that science is intrinsically at odds with religious faith. The idea can be traced back at least to the 18th century rationalist Denis Diderot, who in 1769, wrote that the study of something as simple as a chicken's egg can topple "every church or temple in the world."<sup>1</sup> Yet simpletons still believe that scientific inquiry will disprove faith unless researchers uncover physical evidence of the divine Creator.

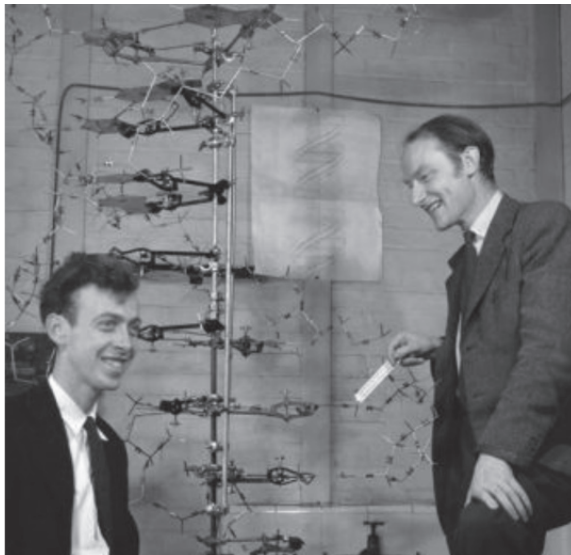


Figure 1. DNA model by Watson & Crick  
Courtesy: Cavendish Laboratory, Cambridge

We recognize that 2009 is an *annus mirabilis* celebrating the 600 years since the Bible was translated into English, the 200th anniversary of Charles Darwin's birth, and the 150th anniversary of the publication of his book, *On the Origin of Species by Means of Natural Selection*. New understanding of the processes that fascinated Darwin continues to be the focus of intense research 150 years later. Indeed, every discipline can demonstrate its own unique evolutionary path and speculate on where it may lead. This paper intends to bridge, both in time and concept, the science we practice today and the science that was initiated by Gregor Mendel<sup>2</sup> and

Charles Darwin<sup>3</sup>, followed by the revolutionary discovery of the double-helical structure of DNA (see Figure 1) by Watson and Crick<sup>4</sup>, some fifty-five years ago. Now we have made another quantum leap by taking molecular biology out of the analogue world and entering the digital age of the computer. The best example is the sequencing of the human genome – James Watson and the Cro-Magnon genomes - where we have gone from reading the “genetic code” to having the ability to write code and synthetically design organisms.

The complexity of technology and the rapid innovations appearing in the marketplace to cope with our extravagant appetites, along with the expanding population and abuses of the environment, are discussed. We are already using genetic engineering (DNA recombinant technology) to splice, recombine and transform living material into commercial goods in agriculture<sup>5</sup>, animal husbandry<sup>6-7</sup>, pharmaceuticals<sup>8</sup> and medicine<sup>9</sup>. Scientists have already modified sheep, cattle and pigs that grow faster than normal, and have transplanted genes into sheep embryos to make their wool grow faster while providing more milk. The exploits of Ian Wilmut<sup>10</sup> and his team that created “Dolly,” the first cloned mammal, in 1996, seem to pale into oblivion compared with what is being done today.

Craig Venter<sup>11</sup> together with his group at the Venter Institute, has synthesized the 582,970–base pair genome of the bacterium *Mycoplasma genitalium*. This synthetic genome, named M. genitalium JCVI-1.0, contains all the genes of wild-type *M. genitalium* G37 except the gene MG408, which was disrupted by an antibiotic marker to block pathogenicity and to allow for selection. To make things more interesting, we have now entered the “plug & play with RNA” world of technology *a la* Microsoft. For example, Win and Smolke<sup>12-15</sup> at California Institute of Technology have created an RNA-based programmable molecular computer that can control gene expression of target genes, thus regulating molecular processes in living cells. Not to be outdone, Harvard’s Shapiro<sup>16-17</sup> and his colleagues have tapped the computing power of biological molecules (DNA), giving rise to machines that can speak directly to living cells.

Given these advances in biotechnology, where do we go from here? Can genetic engineering create new life forms by manipulating our DNA vis-à-vis Venter, and not depend on random mutations that are converted into potentially useful properties according to Darwinian evolution? Are we in the same position as King David when he acquired the technology to process iron, formerly in the domain of the Hittites and Philistines some 2,000 years ago, to be able to fashion swords and give the Israelites military independence?

Our planet is in the throes of an anthropogenic extinction, for which our governments obviously cannot provide solutions. So, in order to survive, we need a scientifically literate society that can understand the major advances in science

and technology. Our plight of ignorance can be best summarized by Augustine, retired CEO of Lockheed Martin Corporation and Chairman of the U.S. National Academies Committee that produced *The Gathering Storm*<sup>18</sup> report. Augustine<sup>19</sup> in an editorial says an internet search shows that of the 535 members of the U.S. Congress, only 8 list themselves as engineers or scientists. Our leaders are not the innovators we had hoped them to be, but today, they are usually the subjects of grand jury investigations. For comparison purposes, of the 9 senior leaders in China, 8 hold scientific degrees. Augustine then poses an interesting question: How can our leaders be expected to make sound decisions in a world of increasingly complex science and technology, if the most qualified individuals in those fields remain absent from the field of play?

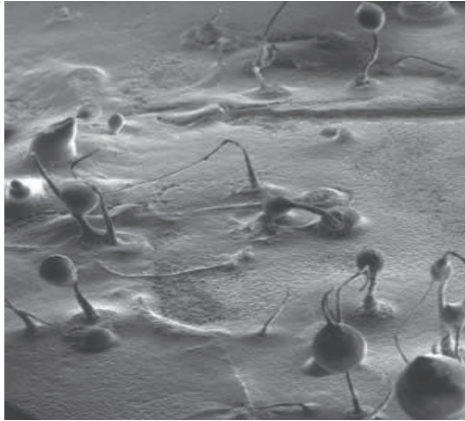
In order to 'survive' the holocaust, as described in the Book of Revelation or other atheistic scenario, it is mandatory that we network our best intellectual resources to answer these questions and provide solutions. A more proactive approach is required by Christians to meet this impending crisis rather than wringing hands and nodding heads. This paper will review the historical record in order to discuss and shed some light on these controversial questions. It looks at reward vs. benefit of patenting genes, as well as the ethics involved when we embark on this course of re-engineering the human body. Hopefully, this paper will mean different positive things to many different people and change the way we think about humanity and the inhabitants of our global village.

## 2. Environmental Stress

The root causes of our problems start with a deteriorating environment and our response to the ensuing stress. In simple terms, the environmental stress response is an evolutionarily and highly conserved physiological mechanism that protects cells and organisms from stressful changes in their environment. Environmental stress causes damage to DNA and proteins; it translates to cell and tissue injury, organ malfunction, and disease. Understanding the genes, proteins, molecular pathways and physiological mechanisms promoting adaptation to environmental stress has wide-ranging implications for biomedical engineering. Such knowledge enables better prediction and modelling of the global impact of environmental change on the health of animals, ecosystems, and humans.

As we continue to pollute and destroy the world, let us look at how lower organisms adapt to stress in their environment, and maybe gain a few insights for our own survival. Khare and Shaulsky<sup>20</sup> have shown in their paper that the soil amoeba *Dictyostelium discoideum*, belonging to the group Mycetozoa (slime molds), can live as an individual single-celled organism as long as food is plentiful. But

when threatened with starvation, tens of thousands of related and unrelated cells aggregate into a multicellular organism. The aggregate differentiates into a mass, or slug, with coordinated movement and senses. This slug then travels upwards in the soil towards light and heat and turns into a lollipop-shaped fruiting body. The fate of each cell is not equal: about 80% of the cells become viable spores that can survive drought and starvation; the remaining 20% die while forming a cellular stalk that lifts the spores high above the surface for dispersal (see Fig. 2). Shaulsky<sup>21-22</sup> asks an interesting question: Is this an example of cellular altruism? Is there a gene that programmed the cells to give up their lives for the success of the group? In the light of the destruction of our environment and social order, can we learn a lesson from this lowly amoeba?



**Figure 2. Micrograph Courtesy: Photo Researchers, Inc.**

On more familiar ground, Nigel Goldenfeld at the University of Illinois at Urbana-Champaign indicates that what is becoming clear is that microorganisms have a remarkable ability to reconstruct their genomes in the face of dire environmental stresses<sup>23</sup>. This would be similar to school children in the playground exchanging mp3 songs with their iphones (wireless). Harvard's Walsh and Palumbi<sup>24-25</sup> illustrate this phenomenon further. Table 1 shows the evolution of bacteria and their resistance to antibiotics.

**Table 1**  
**Evolution of Resistance to Antibiotics - modified from Palumbi and Walsh**

Antibiotic	Year Introduced	Resistance Observed
Sulfonamides	1930	1940
Penicillin	1943	1946
Streptomycin	1943	1959
Chloramphenicol	1947	1959
Tetracycline	1948	1953
Erythromycin	1952	1988
Vancomycin	1956	1986
Methicillin	1960	1961
Ampicillin	1961	1973
Cephalosporin	1962	1969

Antibiotics also generate evolution outside hospitals in response to environmental stress. Resistant strains are common on farms that use antibiotics in livestock production<sup>26</sup>, and have been found in soils and groundwater affected by farm effluents<sup>27</sup>. Retroviruses with RNA genomes evolve even more quickly than bacteria.<sup>28</sup> Every year, vaccinations against influenza must be reformulated, making the prediction of the following year's viral fashion one of preventative medicine's chief challenges<sup>29</sup>.

Fortunately, some researchers have begun to look to nature to solve our global problems. For example, the cayman, a relative of the alligator and native to Trinidad and Central America, exhibits miraculous healing properties. When a cayman is wounded, the healing process (torn muscles etc.) starts within 12 hours, a process that takes five days to start in humans. The remarkable thing is that while caymans live and swim in microbe-infested waters, their wounds never become infected. Mark Merchant, a researcher at McNeese State University, found that alligator leukocytes secrete small peptides. These peptides are capable of killing many of the microbes that modern antibiotics can't touch, including MRSA, a resistant strain of Methicillin resistant *Staphylococcus aureus*, thought to be responsible for 70% of the lethal infections contracted in US hospitals<sup>30-32</sup>. Like Fleming's chance discovery, many new antibiotics are the product of serendipity. A Denmark based biotechnology company was looking for an industrial enzyme to make iron-free shirts and strengthen paper. Instead, the company found a rare antibiotic peptide in *Pseudoplectania nigrella*, a black fungus that grows in European pine forests. Hans-Henrik Kristensen<sup>33</sup>, at Novozymes, analyzed the sequences of every peptide and protein secreted by the fungal cells and realized that one of them was similar to a known class of antibiotic peptides called defensins.



Understanding the environmental stress response will create novel opportunities for improving and better managing the health of humans, animals, and ecosystems suffering from impacts of environmental stress.

### 3. What is the age of the earth?

“He stood, and measured the earth: he beheld, and drove asunder the nations; and the everlasting mountains were scattered, the perpetual hills did bow: his ways are everlasting” (Habakkuk 3:6). In calculating the age of the earth from the Genesis Creation model and the Bible record of human history, the age of the earth can be calculated to a period of thousands of years. Differences occur between the Masoretic and Septuagint texts<sup>34</sup>; however, both are less than 10,000 years old. Even though Ellen G. White,<sup>35</sup> a modern-day prophetess, did not attempt to calculate the age of the earth in the way others like Bishop Ussher<sup>36-37</sup> did, some of her statements indicate her knowledge of the age of the earth. First, she said the earth is exactly 6,000 years old; second, that the earth is about 6,000 years old, and third, that the age of the earth is over 6,000 years.

Berosus, the 3rd century Babylonian scholar, placed Creation at 2.15 million BC and the Flood at 36,323 BC.<sup>38</sup> However, Plato thought the Flood occurred about 200 million years ago<sup>39</sup>. The Hindu classics describe the history of the world in terms of endless repeating grand cycles of 4.32 billion years duration, each containing 1,000 sub-cycles, 4.32 million years in length<sup>40</sup>. I-Hsing, a Chinese scholar in the 8th century, placed the beginning of the latest “Grand Period” or cycle at 97.0 million years BC<sup>41</sup>. Modern geologists and geophysicists consider the age of the Earth to be around 4.54 billion years<sup>42-44</sup>. This age has been determined by radiometric age dating of meteorite material and Moon rocks, and is consistent with the ages of the oldest-known terrestrial rocks in NW Canada and the Yilgarn Craton in Western Australia.

As a commentary on the above, creationists should not have a problem with the accuracy with which quantities of elements and isotopes are measured in an assortment of rocks. However, we would suggest that the interpretation of those measurements into ages is irrelevant to the “apparently short” creation model. While science can study matter and life as they function according to natural laws, this study cannot illumine how or when the inorganic and the organic came into existence. We are given the approximate time from the Bible (~6000 ± years) for the origin of the organic on the planet, but the age of the inorganic is indeterminable but for being prior to Creation Week. The Biblical Hebrew word for “day” in the first chapter of Genesis is Yom, which could describe one day within a complete time period, such as described by the Hindu classics. Even the English name of “Genesis” is misleading. The first chapter of Genesis starts with the Hebrew word

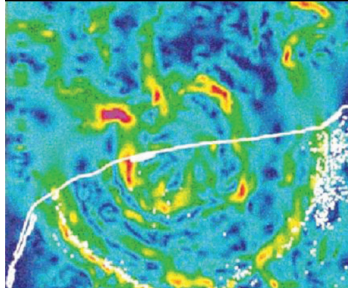


*Beresheet*, which literally means “at first” or “when something started,” but not necessarily the *absolute first time*. Because Scripture is living and active, relevant to past, present and future, it escapes easy categorization. “The grass withers and the flowers fall, but the word of our God stands forever” (Isaiah 40:8). This is certainly a point for debate, and hopefully, scholars and future technology will provide an understanding consistent with the radiometric age of the earth, as well as the Genesis creation model. In the interim, some consolation can be found for some in the following text: “Beloved, do not forget this one thing that with the Lord one day is as a thousand years, and a thousand years as one day” (2 Peter 3:8).

#### **4. Are we living in the next extinction?**

“He hath compassed the waters with bounds, until the day and night come to an end” (Job 26:10). This may be a confusing topic to some, but many Christians believe that God will be coming in their lifetime, which leads us to the question whether we are living in the next extinction? Cycles are observed in nature, red blood cells are replenished every 120 days, skin cells every 35 days, mitosis every 20 minutes, and engineers design structures to resist the cyclic 10-year or 100-year floods. So, it is conceivable that another global extinction cycle is imminent. Seventy per cent of practicing biologists believe that we are living in the next extinction<sup>45</sup>.

The Biblical account of the last extinction event, Noah’s Flood, exists in some form in almost every culture in the world today, so we will discuss the modern day concept of extinction as described in the literature through geological record. But, some simple definitions are necessary for discussion purposes. The dictionary definition of the term “extinction” is the cessation of existence of a species or group of taxa. An extinction event is a sharp decrease in the number of species in a relatively short period of time. In the 570-million-year period, of which abundant fossil remains are available, there have been five great biological crises, during which many groups of organisms died out<sup>46</sup>. James Powell<sup>47</sup>, Director of the Los Angeles County Museum of Natural History, has shown that the most recent of the great extinctions is used to define the boundary between the Cretaceous and Tertiary periods (K-T), about 65 million years ago when the dinosaurs became extinct.



**Figure 3. Gravity map of the Chicxulub Crater, Mexico, courtesy Hildebrand et al.**

In attempting to answer this question, the Alvarez<sup>48-50</sup> team (father a Nobel physicist and son a geologist), at the University of California Berkeley, found high levels of the element iridium, in a complete section of sedimentary rock that spanned the middle of the Mesozoic era into the Cenozoic era. This Gabbro formation was located in the beautiful town of Gubbio, in northern Italy. Iridium is extremely rare on Earth, but common in comets and asteroids.

The Alvarez team theorized that the iridium must have come from a collision with a giant asteroid. They calculated that the asteroid must have been at least 10 km in diameter, creating an impact crater of at least 300 km in diameter. Their theory was finally proved when evidence of the huge Chicxulub impact crater on Mexico's Yucatan Peninsula was found in 1989 by Hildebrand and Penfield<sup>51</sup> (see Fig. 3). The Alvarez team concluded that the biological effects of such an asteroid collision would result in a temporary absence of sunlight, which would effectively shut off photosynthesis and thus attack food chains at their origins. The food chain in the open ocean is based on microscopic floating plants, such as the coccolith-producing algae, which show a nearly complete extinction. The animals at successively higher levels in this food chain were also very strongly affected, with nearly total extinction of the foraminifera and complete disappearance of the belemnites, ammonites, and marine reptiles.

A second food chain is based on land plants. Among these plants, existing individuals would die, or at least stop producing new growth during an interval of darkness, but after the return of light, they would regenerate from seeds, spores, and existing root systems. However, the large herbivorous and carnivorous animals that were directly or indirectly dependent on this vegetation would become extinct. Paleobiologist Dale Russell<sup>52</sup> in his paper, states that "no terrestrial vertebrate heavier than about 25 kg is known to have survived the extinctions." Many smaller terrestrial vertebrates did survive, including the ancestral mammals, and they may have been able to do so by feeding on insects and decaying vegetation. Powell has summarized the previous mass extinctions, and has shown the approximate time and the estimated species lost (see Table 2).

**Table 2**  
**The Big 5 Mass Extinctions – after Powell**

No.	Extinction Episode	Age (10 <sup>6</sup> years) before present	Estimated Species Extinction (%)
5	Cretaceous-Tertiary	65	70
4	Triassic-Jurassic	~202	76
3	Permian-Triassic	~250	96
2	Late Devonian	367	82
1	Ordovician-Silurian	~438	85

Raup of the Museum of Natural History in Chicago, and Sepkoski<sup>53</sup>, a geophysicist at the University of Chicago, have shown that based on the fossil record, over 99% of species that ever lived are now extinct. They further show that the background rate of extinctions on Earth is about two to five taxonomic families of marine invertebrates and vertebrates every million years. In 1993, eminent Harvard biologist E.O. Wilson<sup>54</sup> estimated that Earth is currently losing something on the order of 30,000 species per year, which breaks down to the even more daunting statistic of some three species per hour. Some biologists have begun to feel that this biodiversity crisis, this “Sixth Extinction,” is even more severe and more imminent, and that we, *Homo sapiens*, are the cause.

This means we can continue on the path to our own extinction; or, preferably, we modify our behaviour toward the global ecosystem, of which we are still very much a part.

## 5. How and when will the world end?

Time is ticking, and Christians believe that the account in the Book of Revelation is the final chapter in Earth’s history. Atheists and others discount the Bible’s account, so, if we discredit the terrorist scenario (bio and/or nuclear weapons), then we are left with the obvious environmental demise scenario. The accumulation of greenhouse gasses, depletion of oxygen from deforestation, rising temperatures causing the evaporation of oceans, leaving a scorched planet, is the short story. This secular or scientific view of the end of the world describes a sick Earth in intensive care that is succumbing to a final environmental shock.

It should be no surprise, as this is a common formula for the destruction of life as we see in our hospitals – cancer, cardiovascular disease, and addiction of every kind as we refuse to treat our bodies as the temple of God. Depending on how we view our existence, we are inexorably dependent on the services provided by Earth’s natural systems. The World and Wildlife Fund report entitled, *The Living Planet Report 2008*<sup>55</sup> tells us that we are consuming resources faster than they

can be replenished, thus exposing our vulnerability to scarcity of resources such as water in many areas. Our global footprint now exceeds the world's capacity to regenerate by about 30 per cent. And if our demands on the planet continue at the same rate, by 2035, we will need the equivalent of two planets to maintain our lifestyles (see Fig. 4).

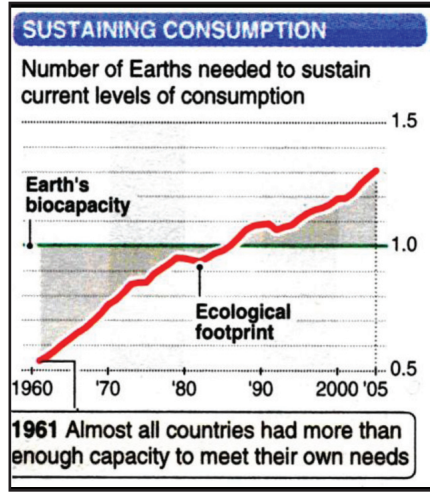


Figure 4. Sustaining Consumption. Compiled from the WWF Report 2008.

Natural disasters such as volcanoes, earthquakes, forest fires, floods and droughts can disrupt global ecosystems. Volcanic eruptions can spew fine dust particles into the upper atmosphere and lead to climate change<sup>56</sup>. During 1960-1990, earthquakes killed ~439,394 people and caused losses estimated at \$65 billion<sup>57</sup>. The magnitude 7.0 earthquake that hit Haiti on January 12, 2010 has taken the lives of 230,000 people so far, injured over 300,000, and displaced over 1 million people. Reconstruction of the damage is estimated at \$5 billion. Typhoons, hurricanes, tsunamis and cyclones have claimed ~350,299 lives, with losses estimated at U\$34 billion. Floods in developing countries are almost an annual event; and in the same period, lives lost amount to 6,592 with economic losses of US \$9 billion. In the 1980's, drought in Africa alone affected 48 million people. Wildfires also burn millions of hectares in the African savannah each year, emitting tons of particulate matter and carbon dioxide<sup>58</sup>.

Let us look at the historical record of a few prominent anthropogenic environmental disasters that have brought us to the current global situation. In December 1984 in the city of Bhopal in Madya Pradesh, India, a cloud containing 15 metric tons of methyl isocyanate spewed from the Union Carbide plant, covering an area of more than 30 square miles. The gas leak killed at least 4,000 local residents instantly and caused health problems to perhaps 500,000 people.

These health problems killed around 15,000 more victims in the years that followed. Approximately 100, 000 people still suffer from chronic disease consequential to gas exposure today<sup>59</sup>.

On April 26, 1986 the Chernobyl nuclear power plant in Ukraine exploded, killing 31 people instantly. The Ukrainian government figures show that more than 8,000 Ukrainians have died as a result of exposure to radiation (Plutonium, Cesium 137, Strontium 90) during the first cleanup operation. It is stated that the eventual death toll resulting from the nuclear explosion ranges from 30-300,000, and many unofficial sources put the toll at over 400,000<sup>60</sup>.

At the end of the 20th century, there have been oil spills all over the world, caused either by accidents or during major wars. During the first Gulf War, Saddam Hussein’s retreating troops ignited hundreds of oil wells (“Scorched Earth Policy”), requiring international firefighting teams more than eight months to extinguish. The burning crude oil released noxious gases and coated carbon particles that produced a wide range of combustion products: carbon dioxide (CO<sup>2</sup>), carbon monoxide (CO), sulphur dioxide (SO<sup>2</sup>), nitrous oxides (NO<sup>x</sup>), volatile organic compounds (VOCs), ozone (O<sup>3</sup>), various polycyclic aromatic hydrocarbons (PAHs), and acid aerosols. The most visible evidence of the fires was the particulate matter and carbonized particles (soot), which posed the greatest hazard. It is impossible to determine which of these oil spills had the most severe consequences for its environment. Table 3 presents the major oil spills in this environmental disaster.<sup>61</sup>

**Table 3**  
**Top Marine disasters<sup>62</sup> (modified)**

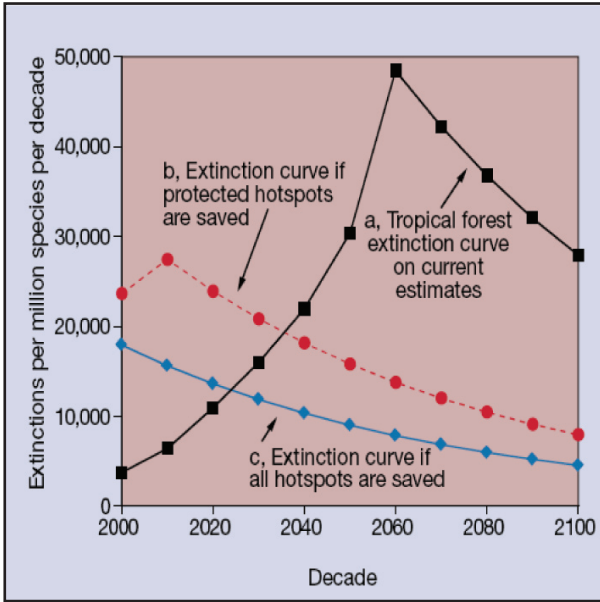
<b>Date</b>	<b>Spill/Tanker</b>	<b>Country</b>	<b>Oil Spilled (mg)</b>
1991	Gulf War	Kuwait	520
1980	Oil Well	Mexico <sup>4</sup>	140
1979	Atlantic Empress	Trinidad & Tobago	90
1994	Fergana Valley	Russia	84
1983	Nowruz Oil Field	Persian Gulf	80
1983	Castillo de Bellver	South Africa	79
1978	Amoco Cadiz	France	69
1991	ABT Summer	Angola	51

Stuart Pimm<sup>63</sup>, Doris Duke professor of Conservation Ecology at Duke University, has done extensive research around the world and explains that humanity is rapidly destroying habitats that are most species-rich. About two-thirds of all species are in the tropics, largely in the tropical humid forests. Pimm estimates that these forests originally covered 14-18 million square kilometers, of which about half of the original area remains today. Much of the rain-forest reduction is recent, and

clearing now eliminates about 1 million square kilometers every 5 to 10 years. Burning and selective logging severely damages several times the area that is cleared<sup>64</sup> (see Fig. 5).

Myers and his group at the University of Berkeley<sup>65-66</sup> have identified 25 biodiversity hotspots around the world, of which 17 are in tropical forests. These areas have already suffered disproportionate loss of primary vegetation, meaning that the many species they contain are under particular threat of extinction. Pimm and Raven explain that if all remaining habitat in hotspots are saved (curve c), then some 18% of their species will be lost. The same half-life for currently threatened species is used as in curve a. They further point out that if the hotspots are cleared in the next decade to the point where only currently protected areas are saved (curve b), then the total extinctions will be much higher than calculated. *So, do we modify our behaviour or continue on this path towards Powell's 6th extinction?*

From time immemorial, people have tempted fate by trying to predict the end of the world, and we have been inundated with false prophecies, from Assyrian clay tablets<sup>67</sup> in cuneiform to Mayan stone calendars. The Millerites led by William Miller, believed the date would be between March 1843 and March 1844<sup>68-69</sup>. Understandably, the passing of this date with no material consequence has become known as the Great Disappointment. Ellen White<sup>70</sup> prophesied on June 27, 1850, that only a few months remained before the end. She wrote: "My accompanying angel said, 'Time is almost finished. Get ready, get ready, get ready.' ...now time is almost finished...." Millerites leader George Storrs<sup>71</sup> summed it up well when he wrote: "As the event did not occur, we were deluded by a mere human influence, which we mistook for the Spirit of God."



**Figure 5**  
**Extinctions in tropical forests, 2000-2100**  
 (Courtesy Stuart L. Pimm and Peter Raven )

Three projections of how numbers of species extinctions in tropical forests may unfold from forest clearance. Curve “a” is the extinction curve on current estimates, not taking into account biodiversity hotspots. According to the relationship  $S^n/S^o = (A^o/A^n)^{0.25}$ , as habitat is reduced from an original area of  $A^o$  to  $A^n$ ,  $A^n$  will hold  $S_n$  viable species in year  $n$  from an original total of  $S_o$ . The  $S^o-S^n$  doomed species will die off with a half-life of 50 years<sup>7</sup>. With a constant rate of forest clearance, this curve takes time to peak because of the nonlinear relationship between species and area, and the time lags for species to become extinct.

It turns out that minds far greater have attempted to predict the End Days. Isaac Newton’s 300-year-old manuscripts show one of the world’s greatest scientists tried his hand at some apocalyptic algebra. In one manuscript from the early 1700s, Newton used the cryptic Book of Daniel to calculate the date for the apocalypse, reaching the conclusion that the world would end no earlier than 2060<sup>72</sup>. The search for the “God particle” or the Higgs boson particle at CERN (Conseil Européen pour la Recherche Nucléaire) in the Large Hadron Collider (Figure 6) just outside of Geneva on the border of Switzerland and France may create “the black” hole, which some scientists say may destroy the earth<sup>73-73b</sup>. The future is uncertain and the end is always near; however, others believe that *the future is certain and the end is very far away*. This is an interesting concept to debate. However, let us acknowledge a wonderful passage: “But of that day and hour knoweth no man, no, not the angels of heaven, but my Father only” (Matthew 24:36).



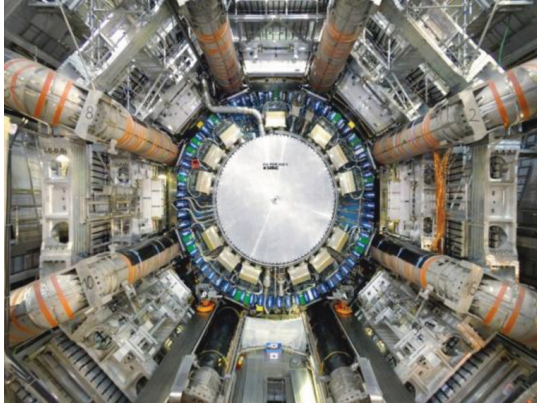


Figure 6.

View of the ATLAS detector during July 2007 (photo by Claudia Marcelloni, © CERN)

## 6. Re-engineering the human?

“They that wait upon the Lord shall renew their strength; they shall mount up with wings as eagles; they shall run, and not be weary; and they shall walk, and not faint” (Isaiah 40:31). Juan Ponce de Leon may have been influenced by this passage. And whether he actually set out to find the Fountain of Youth in 1513 is an interesting point worthy of debate. Yet, 500 years later, we still share that fascination, looking for a gene rather than a fountain of water<sup>74</sup>. On August 4, 1997, Jeanne Calment died at the age of 122 years, five months, and 14 days - the longest confirmed life-span of any modern-day human<sup>75</sup>. Why is it that humans today live to an average of about 78 years, and the common housefly, only 24 hours; yet some tortoises survive for nearly 300 years, the King Clone creosote bush in the Mojave Desert lives up to 11,700 years, while the German oak and US bristlecone pine live to be 13,000 years old<sup>76-78</sup>? The patriarch Adam lived up to 830 years, Enoch lived to 905, Noah 950, and Methuselah, 969 years. Cro-Magnon lived up to 18 years, ancient Egyptians to 25; Europeans in the 1400’s to 30, Europeans and Americans in 1800 to 37, Americans in 1900 to 48, and in 2009, to 78.

Here’s another interesting question to ponder: Why does a foetus in the first trimester have the ability to regenerate a limb if it is removed<sup>79</sup>? Why do children have the ability to grow a new fingertip if it is lost and this “regeneration” ability is lost after the age of 5<sup>80</sup>? This might be an interesting avenue to pursue to develop “robust human rejuvenation” – regenerate new organs to replace old ones without the rejection problem. Is this “regeneration” loss the result of the first catastrophe – Genesis sin? Socrates once said that all men are mortal, and for the last 2,500 years or so, he seemed to have had the last word on the subject. However, with the advent of molecular and synthetic biology, could he be wrong? But today, we may at least ask why this should be so? Why do people die? Fortunately, higher



organisms have been endowed with a molecular feature by the Creator, with maintenance and repair functions. However, small evolutionary changes in our DNA caused by deteriorating environmental conditions give rise to disease associated with ageing, which limit our life expectancy.

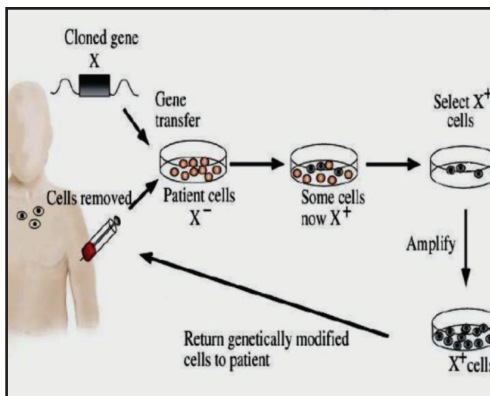
Some of the hallmarks of ageing that we experience follow Flannery's<sup>75</sup> scenario: blood vessels thicken, blood pressure rises, bone loss predominates, lungs lose breathing capacity, muscle mass disappears, glucose metabolism falters, heart function becomes less efficient, eyesight and hearing steadily worsen, cancer incidence rises, and our memories begin to fade. Leonard Hayflick of the University of California, San Francisco, revolutionized cell biology when he discovered that cultured normal human cells can only divide a finite number of times, after which they become senescent. This limited capacity for cell division is now known as the 'Hayflick limit', and it has enabled other researchers to make significant progress towards understanding the molecular mechanisms of ageing and cancer<sup>81-82</sup>. By the late 1970s, scientists had discovered the cellular mechanism governing the Hayflick limit. As cells divide, the ends of chromosomes called telomeres get shorter and shorter. Hayflick demonstrated that when the telomeres get too short, the cells then senesce. But unlike normal cells, cancer cells are not subject to the Hayflick limit - they divide indefinitely. The answer has to do with telomerase, an enzyme that lengthens telomeres. Some scientists believe that inhibiting telomerase by using RNAi mechanisms, will cause cancerous cells to die a natural death in the body.<sup>83-85</sup>

Advances in biotechnology, specifically transgenics and artificial intelligence, have led us to a place where no one has gone before: chimeras, cyborgs, artificial life forms, new species, and variations or combinations of all of the above. A chimera is a creature in Greek mythology with the head of a lion, the torso of a goat, and a tail sprouting the head of a venomous snake. The Greeks considered the chimera a monster because it violated a perceived "natural order", in which each species is a separate and unique category. So profound was this violation thought to be that thinkers over the millenniums have assumed such creatures could not possibly exist in reality. In modern day biology, a chimera is a genetically engineered creature created from the DNA of different species. What once was fiction has now become fact through the process known as DNA recombinant research.

Scientists are able to splice genes together from different species that would never be able to mate under normal, non-laboratory circumstances. This sort of mosaicism is exceedingly rare in the medical annals, though not completely unheard of. Worldwide, there are over 30 cases of this rare condition known as chimerism<sup>86</sup>. Human to human chimeras occur naturally. Mothers carry cells from past fetuses within their blood. When a double fertilization and fusion occurs, a baby could be born

with two genomes. That person is a chimera. Most chimeric people live and die never realizing their double genetic identity. Human to human chimeras can also be made. Organ transplant patients carry two genomes. Leukemia patients who receive donor blood cells become chimeric because they now carry the genetic code derived from other individuals<sup>87-88</sup>.

These conditions of declining health and longevity beg the question. How can we re-engineer the human body to survive the impending extinction? The proposed techniques that can be used in re-engineering ourselves include in-vivo and ex-vivo gene therapy and regenerative medicine. In gene therapy, genes can be transplanted to a person with a gene deletion or gene correction, to revert a specific mutation in the gene of interest; or gene augmentation to enhance expression in a gene of interest; or targeting and killing specific cells by introducing a killer gene; or gene ablation to silence gene expression. These techniques are illustrated in a general form in Figure 7.



**Figure 7. In Vivo & Ex Vivo Gene Therapy**  
Courtesy Lexorbis

Regenerative medicine utilizes stem cells, biomacromolecules and smart devices. To overcome the problem of tissue rejection following transplantation in patients, we have to generate pluripotent cells directly from the patients' own cells. Takahashi and Yamanaka<sup>89-92</sup> of Kyoto University, in a landmark paper that should lead to a Nobel Prize, have successfully reprogrammed differentiated human somatic cells into an induced pluripotent state (iPS). This breakthrough is paving the way for the creation of patient and disease-specific stem cells, to treat a host of diseases, including diabetes, Parkinson's, and spinal cord injury, and in eliminating the ethical controversy of using human embryonic stem (hES) cells. Macchiarini<sup>93</sup> along with his multinational team at the University of Barcelona was the first to have success-

fully transplanted a trachea into a patient, with end-stage airway disease, without antigenicity. Macchiarini removed cells and the major histocompatibility complex (MHC) antigens from a human donor trachea (cadaver), which was then readily colonized by epithelial cells and mesenchymal stem-cell-derived chondrocytes that had been cultured from cells taken from the recipient. This graft was then used to replace the recipient's left main bronchus. The patient was healthy after 4 months, had no anti-donor antibodies, and was not on immunosuppressive drugs.

Badylack<sup>94-98</sup> and his group at the University of Pittsburgh's McGowan Institute for Regenerative Medicine have been working on limb regeneration as well as tissue engineering (using biomacromolecules), cell-matrix interactions and cell signalling. A graphic example can be seen in Figure 8 below. Here a 66 year old diabetic patient with an ulcerated foot had been treated unsuccessfully for over a year by her doctors with the final prognosis of amputation. Figure 8b shows the results of a treatment with porcine small intestinal submucosa (SIS) for eleven weeks, with complete regeneration of tissue. To date, 1.5 million people have been treated with some sort of extracellular matrix (ECM).

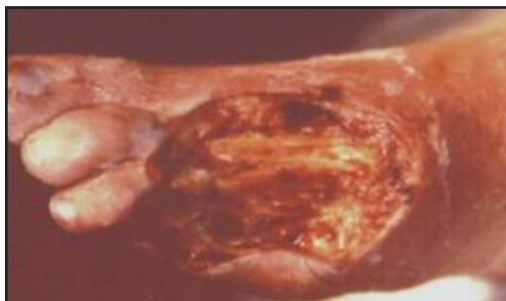


Figure 8a. 66 year old female diabetic patient with a foot ulcer



Figure 8b. 11 weeks post-sis treatment

Courtesy Badylack et. al., University of Pittsburg, McGowan Institute for Regenerative Medicine

Nanotechnology has given us a way to domesticate atoms to create smart devices to allow physicians to perform precise interventions at the cellular and molecular level. Nanorobots can be used to diagnose diseases, to rewrite DNA sequences *in vivo*, to repair brain damage, and supplement the immune system<sup>99-105</sup>. Drexler<sup>106-109</sup> and his group at MIT have shown that the existence of a range of components in nature indicates that power-driven mechanical systems can be constructed on a molecular scale.

**Table 4**  
**Comparison of macroscopic and microscopic components after Drexler<sup>108</sup>**

Technology	Function	Molecular example(s)
Struts, beams, casings	Transmit force, hold positions	Microtubules, cellulose, mineral structures
Cables	Transmit tension	Collagen
Fasteners, glue	Connect parts	Intermolecular forces
Solenoids, actuators	Move things	Conformation-changing proteins, actin/myosin
Motors	Turn shafts	Flagella motor
Drive shafts	Transmit torque	Bacterial flagella
Bearings	Support moving parts	Sigma bonds
Containers	Hold fluids	Vesicles
Pipes	Carry fluids	Various tubular structures
Pumps	Move fluids	Flagella, membrane proteins
Conveyor belts	Move components	RNA moved by fixed ribosome (partial analogue)
Clamps	Hold workpieces	Enzymatic binding sites
Tools	Modify workpieces	Metallic complexes, functional groups
Production lines	Construct devices	Enzyme systems, ribosomes
Numerical control systems	Store and read programmes	Genetic system – DNA/RNA computers

Should the laws of humanity embrace technological advances and all research for the treatment of human disease and the preservation of life? The following suggestions may be of some use, in considering “healthy ageing” or ways of ‘surviving’ the “holocaust.”

### 6.1 Increasing Lifetimes?

As previously shown, we will need another Earth by 2030’s to support our lifestyle. Therefore to travel, to colonize and develop another planet (Earth’s twin) such as Europa, Mars, Titan or other planets yet to be found by NASA’s Kepler mission launched on March 6, 2009 will require increased lifetimes. It has been known for over 70 years that calorie restriction can extend life by about 40-65%<sup>110-114</sup>. The round worm *Caenorhabditis elegans*, about 1 mm long, with a lifespan of about 9 days, is a mainstay in many laboratories doing molecular and genetic studies.



**Figure 9.**  
**The round worm *Caenorhabditis elegans***  
**Photo: courtesy NIH.**

Because many *C. elegans* genes are similar to those of humans, researchers study the functions of such genes to gain insight into human physiology. Cynthia Kenyon and Richard Weindruch at the University of California; Chalfie and Taub at Columbia University; Garey Ruvkun at Harvard Medical School, Nicholas Bishop and Leonard Guarente of Massachusetts Institute of Technology, Valter Longo at USC, Los Angeles, and Andrew Dillin, of Salk Institute for Biological Studies, are leading the field in unlocking the genes responsible for longevity in *C. elegans*. Several mutations, for example, *age-1*, *daf-2*, *hsf-1*, *sir2*, catalase gene and *clk-1*, have been described that can increase the worm's life-span (see Fig. 10).

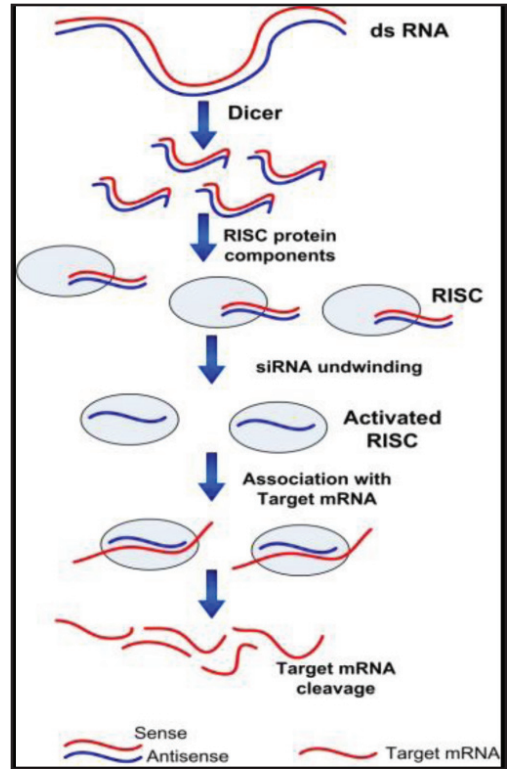
Among other things, Kenyon's<sup>115-118</sup> group has found that the transcription factor *hsf-1* in *C. elegans*, which regulates the heat-shock response, also influences ageing. Bishop and Guarente<sup>122</sup> report the discovery of a brain centre in roundworms that seems to answer the "how it works" part of the puzzle. The researchers found that a gene called *skn-1b* seems essential. People have forms of this gene, which is thought to play a role in skin formation and remove damaging chemicals from the bloodstream later in life. In roundworms, the gene seems to manifest in the brain through two neurons, or brain cells, called the ASI. They also found that at least 15 hormones, including the insulin released in response to eating, are released in cascades by the *skn-1b* gene. They believe the hormone signal may be what extends the life of the roundworms.

So, what is the meaning of all of this? From an engineering perspective, increasing lifetimes is necessary for space travel. Still, this does not solve other problems brought on by space travel - weightlessness that affects bone loss and various organ functions. In the short-term, for us pill-popping humans, the goal is to create a drug over the next few years that mimics the hormonal cascade, or fools a mammalian brain centre into facilitating longevity two or three times our average lifespan. Alternatively, the genes mentioned above can be inserted into developing human embryos using RNAi mechanisms to extend current lifetimes.

The cellular process of RNA interference (RNAi) is instrumental in facilitating our proposed designs and had previously been completely overlooked, until Andrew Fire, an embryologist at Stanford University, and Craig Melo, a cell biologist at the University of Massachusetts Cancer Center<sup>123-126</sup>, galvanized the field of molecular biology by elucidating this mechanism (see Fig. 10). This defining moment earned them the Nobel Prize in 2006 for their work.

Long double-stranded RNAs (dsRNAs; typically ~200 nt) can be used to silence the expression of target genes in a variety of organisms and cell types (e.g., worms, fruit flies, and plants). Upon introduction, the long dsRNAs enter a cellular pathway that is commonly referred to as the RNA interference (RNAi) pathway. First, the dsRNAs get processed into 20-25 nucleotide (nt) small interfering RNAs (siRNAs) by an RNase III-like enzyme called Dicer (initiation step). Then, the siRNAs assemble into endoribonuclease-containing complexes known as RNA-induced silencing complexes (RISCs), unwinding in the process. The siRNA strands subsequently guide the RISCs to complementary RNA molecules, where they cleave and destroy the cognate RNA (effector step). Cleavage of cognate RNA takes place near the middle of the region bound by the siRNA strand.

In mammalian cells, introduction of long dsRNA (>30 nt) initiates a potent antiviral response, exemplified by nonspecific inhibition of protein synthesis and RNA degradation. The mammalian antiviral response can be bypassed, however, by the introduction or expression of siRNAs.



**Figure 10**

**The Mechanism of RNA Interference (RNAi)**

Courtesy: Applied Biosystems, California.

Cambridge University Scientific Officer and administrator of the Methuselah Prize, Aubrey de Grey, has argued that the cellular and biochemical causes of senescence are sufficiently well-understood to justify research on curing the ills of old age through genetic engineering; and feels that given the appropriate biological engineering, human life spans could reach 500 years to 1,000 years<sup>127-128</sup>. In our problem solving exercise, we discuss some innovative fixes in redesigning the human body.

## 6.2 High Cholesterol

Cardiovascular disease resulting in plaque build-up and associated organ dysfunction appears more commonplace in our population and needs addressing in our redesign. Olshansky, at the School of Public Health, University of Illinois, and Butler, president of the International Longevity Center in New York City, and Carnes, at the Center on Aging at the University of Chicago, have devoted a lifetime of



research<sup>129-134</sup> in “building a body to last.” They propose to coat the entire vascular system with a Teflon-like surface. Polytetrafluoroethylene is inert, has no net charge, and has the lowest coefficient of friction of any known solid. Another more elegant solution within our grasp would be to put in place a regulatory system to control the apolipoprotein B gene (APOB) using RNAi mechanisms. This would ensure optimum levels of high density lipids (HDL) and low density lipids (LDL)<sup>135-136</sup>.

Aside from pharmacologic interventions and cardiac xenotransplantation as performed by Leonard Bailey of Loma Linda University in 1984, more elegant solutions and less traumatic procedures today use various stem cells, including embryonic stem cells, to repair damaged cardiac tissue. This procedure has shown that transplanted stem cells release growth factors and other molecules that promote blood vessel formation (angiogenesis), or stimulate “resident” cardiac stem cells to repair damage<sup>136-139</sup>. Because embryonic stem cells are pluripotent, they can potentially give rise to the variety of cell types that are instrumental in regenerating damaged myocardium, including cardiomyocytes, endothelial cells, and smooth muscle cells. However, human somatic cells can be programmed to a pluripotent state vis-à-vis Takahashi and Yamanaka, thereby eliminating the ethical issues.

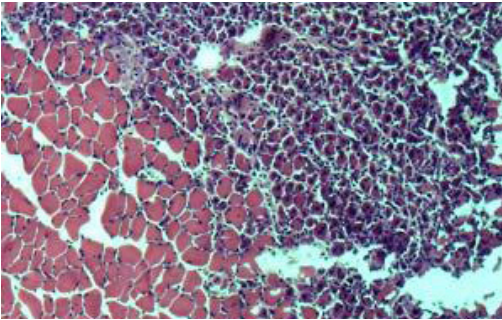
### **6.3 Antioxidants and Vitamin C.**

Oxidation reactions in mammals can produce free radicals, which start chain reactions that damage DNA, proteins and lipids in cells. As a result, we maintain complex systems of different antioxidants such as glutathione, vitamin C and E, as well as enzymes such as Coenzyme Q<sup>10</sup> (CoQ<sup>10</sup>), catalase and dismutase. For example, the GULO (L-gulonolactone oxidase) gene is responsible for the synthesis of ascorbic acid - vitamin C. Linus Pauling, a two time Nobel Prize winner, has shown that Vitamin C is required for the synthesis of collagen, an important structural component of blood vessels, tendons, ligaments, and bone. Vitamin C also plays an important role in the synthesis of the neurotransmitter, norepinephrine. Neurotransmitters are critical to brain function, and are known to affect mood. In addition, vitamin C is required for the synthesis of carnitine, a small molecule that is essential for the transport of fat to the mitochondria, for conversion to energy<sup>141</sup>. Recent research also suggests that vitamin C is involved in the metabolism of cholesterol to bile acids, which may have implications for blood cholesterol levels and the incidence of gallstones<sup>142</sup>. Humans, along with fruit bats, hamsters, and many old world monkeys, have a nonfunctioning GULO gene, and so it would seem appropriate to reactivate this mechanism in our design<sup>143</sup>.

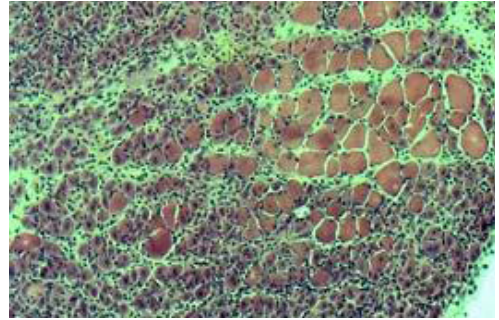
### **6.4 Muscle Repair**

Particularly troublesome to us is that muscle cells in the body stop replicating past

the stage of growth and development<sup>144-145</sup>. Furthermore, as we age, muscle repair slows noticeably, and in Duchenne Muscular Dystrophy and other degenerative muscle diseases, normal repair functions can't cope with disease progression. Loss of muscle mass results in a decrease in basal metabolism and in muscular strength, which can lower physical activity levels, resulting in diminished postural reflex, a loss of balance, and an increased risk for falls. Irina Conboy and her group at the University of California, Berkeley, have shown that old muscle produces excessive transforming growth factor TGF- $\beta$  but not myostatin. This phenomenon induces unusually high levels of TGF- $\beta$ /pSmad3 in resident satellite cells and interferes with their regenerative capacity<sup>146a</sup>. Attenuation of TGF- $\beta$ /pSmad3 in old, injured muscle restores regeneration to satellite cells in vivo (see Fig. 11). This genetic fix will serve us well as we “age” in a healthy manner.



On the right side of this muscle tissue from a young mouse are healthy, new cells created to replace damaged tissue. This ability to regenerate new cells diminishes with age.



Conboy manipulated the biochemical response of adult stem cells in the tissue, and the muscle from an old mouse was able to repair itself from damage almost as well as muscle from young mice.

**Figure 11**

(Photos courtesy of Morgan Carlson and Irina Conboy, UC Berkeley)

## 6.5 Teeth Replacement

Unlike other vertebrates, mammals can replace only their milk teeth. During mammalian evolution this regenerative capacity was lost<sup>146b</sup>. The deterioration and loss of teeth that comes with old age affects more than smiles. For instance, gum disease has been associated with increased risk for heart disease and might quicken the pace of ageing. Poor nutrition after tooth loss could also cause problems. Holm-Pedersen of the University of Copenhagen has been presenting data on a 600-member ageing cohort in Denmark, which shows a statistically significant association between tooth loss and the onset of disability, although the link is not



necessarily causative. Olshansky proposes that stronger, more resilient enamel might stave off decay, while Carnes suggests that a more elegant fix would entail a third set of teeth erupting at the age of 55. This would be an ingenious fix if we ignore the pain some of us experienced with the eruption of our molars.

Current research demonstrates several possible innovative approaches in renewing teeth and getting away from the “drill and fill” practice. The first solution involves activation of the Wnt pathway, which is responsible for embryonic tooth buds in mice<sup>146c</sup>. Activation of this molecular trigger provoked the growth of teeth with normal tooth enamel, roots and internal dentin. The re-grown teeth in mammals are just a silenced trait, but the mammalian genome still possesses the genes involved, only that they are inhibited. The second solution was inspired by the Kennedy space programme to send a man to the moon, with its myriad of problems and solutions that no one discipline could solve.

A tooth regeneration team devised an ambitious plan that sought to use stem cell biology, engineering, and computational biology to replicate the developmental programme for odontogenesis. They proposed a laboratory-grown tooth rudiment that would be capable of executing the complete programme for odontogenesis when transplanted to a suitable host, recreating all of the dental tissues, periodontal ligament, cementum, and alveolar bone associated with the canonical tooth. This plan is still a few years off and is designed to bring regenerative medicine fully into the dental surgery suite<sup>146d</sup>.

Finally, Takashi Tsuji and colleagues at Tokyo University started with the two cell types that develop into a tooth: mesenchymal and epithelial cells. They first grew each cell type separately to get larger quantities of cells, and then injected them into a drop of collagen, a substance that glues cells together in an organism. The cells developed into a budding tooth with high efficiency, and when transplanted into the cavity of an extracted tooth in a mouse, they developed normally and showed the same composition and structure as normal teeth<sup>146e</sup>.

## 6.6 Eye considerations

More than a quarter of the population 75 years and older report vision impairment even with corrective lenses. Cataracts and other damage caused by ageing and a lifetime of exposure to incidental ultraviolet radiation account for more than half of all blindness. To overcome the “lake of fire,” Olshansky et al note that the tiny pink lumps in the inner corners of human eyes are the vestiges of a nictitating membrane - a third eyelid still functional in sharks, birds, and even some mammals. They suggest that a similar sideways sweeping membrane, if translucent and able to block harmful UV or gamma rays, could provide additional protection when needed and be retracted in the dark.

Retinal prostheses is a reality today as surgeons at the University of Southern California, and engineers at University of Illinois at Urbana-Champaign, Northwestern University and the University of California, Santa Cruz are inserting microchips as well as artificial retinas in patients with retinitis pigmentosa, macular degeneration and diabetic retinopathy. Interesting work by Mark Kleinman and his group at the University of Kentucky have demonstrated macular regeneration in mouse models using small interfering RNA (siRNA)<sup>146f</sup>. Jiro Abe<sup>146g</sup> and his group at the Aoyama Gakuin University in Japan have been working with an interesting compound called Hexaarylbiimidazole (HABI).

HABI changes colour in response to UV light. It is normally colourless, but when exposed to UV light, it turns blue. Inserting this compound via RNAi mechanisms into the lens of the eye would provide the protection from UV light that we will need. These findings are possible solutions to diseases that affect millions of people, especially the elderly, and would represent invaluable additions to our collection of redesign fixes.

### 6.7 Other design considerations on the horizon

In this section, we discuss the work of leading scientists that may provide novel fixes in humans that may ultimately cure diseases and lead to “healthy ageing.” Olshansky et al. have pointed out the fragility of the neurons in the human brain and have suggested the development of more dense and robust neurons to defeat Alzheimer’s, Parkinson’s disease etc. Many of these frontotemporal dementias are closely associated with filamentous aggregates, such as those containing amyloid, tau, and synuclein. These aggregates quickly gum the normal physiology of neurons and often become cytotoxic. The Scottish and Italian team at the Universities of Edinburgh and Milan, led by Steve Pollard and Austin Smith<sup>147</sup> has grown human brain cells in the laboratory. This “brain in a bottle” will assist in developing drugs to combat diseases like Huntington’s, Parkinson’s or Alzheimer’s, and eventually enable doctors to repair damage to the brain.

Unlike the US, the British have given the green light to their scientists to conduct human embryonic stem cell (hES) and human-animal embryos research, under the regulation of the Human Fertilization and Embryology Authority. The process developed by the Edinburgh team has already been patented, and an Edinburgh-based company is set to develop commercial applications for the research.

Fred Gage<sup>148</sup> and his team at the Salk Institute for Biological Sciences in La Jolla, California have injected human embryonic stem cells into the brains of foetal mice inside the womb. The research offers the first proof that human embryonic stem cells can become functional human brain cells inside another living animal, reaching out to make connections with surrounding brain cells. How was this

interesting work done? The team painstakingly conducted surgeries to partially remove 14-day-old mouse foetuses from the womb, being careful not to disrupt the placenta that provides maternal nourishment. After injecting the human stem cells into the lateral ventricles, they then returned the embryos for their last week of development.

The human cells, taken from days-old human embryos by a San Diego company, CyThera Inc., had been engineered to emit a green fluorescence which helped them stand out against the mouse cells when the animals' brains were later analyzed under the microscope. Gage indicates that one possible application would be to place healthy human cells in the brains of mice that have versions of human neuronal diseases, such as Alzheimer's, Lou Gehrig's or Parkinson's, and see how the neurons fare. That experiment might reveal whether those diseases have their roots elsewhere and subsequently affect neurons, or whether they emerge directly from diseased neurons, in which case the human cells would remain unaffected.

Following Gage's experiment, Brian Cummings<sup>149</sup> and his colleagues at the University of California, Irvine, collaborated with Gage and have successfully regenerated damaged spinal cord tissue and improved mobility in mice using adult human neural stem cells. They injected adult human neural stem cells into mice that had limited mobility due to spinal cord injuries. The transplanted stem cells differentiated into new oligodendrocyte cells that restored myelin around damaged mouse axons and formed synaptic connections with mouse neurons.

Mice that received human neural stem cells nine days after spinal cord injury showed improvements in walking, compared to mice that received either no cells or a control transplant of human fibroblast cells, which cannot differentiate into nervous system cells. The cells survived, and the mice showed improved walking ability for at least sixteen weeks. At that point, the transplanted human cells were destroyed using diphtheria toxin which is only toxic to the human cells and not to mouse cells. The improvements in walking disappeared, indicating that the human neural stem cells were the vital catalysts. This is promising research and supports the need to study multiple stem cell types for the possibility of curing human neurological injury and disease.

Richard Chien<sup>150</sup> and his team at Harvard Stem Cell Institute have demonstrated cardiogenesis of endothelial, cardiac and smooth muscle cells by using embryonic stem cells. They amplified a cellular hierarchy of *isl1*<sup>+</sup> cardiovascular progenitors, which resemble the developmental precursors in the embryonic heart. The transcriptional signature of *isl1*<sup>+</sup>/*Nkx2.5*<sup>+</sup>/*flk1*<sup>+</sup> defines a multipotent cardiovascular progenitor, which can give rise to cells of all three lineages. These studies document a developmental paradigm for cardiogenesis, where muscle and endothelial lineage

diversification arises from a single cell-level decision of a multipotent *isl1*<sup>+</sup> cardiovascular progenitor cell. Badylak<sup>151</sup> and colleagues at the University of Pittsburg are using a different approach in trying to regenerate myocardium tissue by using a tissue-engineered cardiac patch derived from extracellular matrix – porcine small intestine submucosa (SIS) rich in growth stimulating factors.

The last novel suggestion comes from the Stephens kangaroo rat, *Dipodomys stephensi*, an endangered species whose habitat is in the hills around Loma Linda University and the Gavilan Hills in Riverside, California. The rat derives its name from its bipedal form because they hop like kangaroos. This nocturnal mammal provides us with some interesting biological features that are worthwhile mentioning for incorporation into our re-design fixes. As we continue to pollute and deplete our resources, clean life-sustaining water becomes critically important to our survival. A feature of this kangaroo rat is its efficient kidneys. The kangaroo rat has a longer loop of Henle in the nephrons which permit a greater magnitude of countercurrent multiplication, and thus a larger medullary vertical osmotic gradient. Consequently, these rodents can produce urine that is concentrated up to an osmolarity of almost 6,000 mosm/liter, which is five times more concentrated than maximally concentrated human urine at 1,200 mosm/liter.

Because of the aforementioned tremendous concentration ability, kangaroo rats never have to drink water<sup>152</sup>. The water produced metabolically within their cells during oxidation of foodstuff [food + O<sub>2</sub> → CO<sub>2</sub> + H<sub>2</sub>O + energy] is sufficient for their body. Furthermore, kangaroo rats cannot lose water by perspiring, because they have no sweat glands and can recover 90% of the losses by using metabolic water, gaining the remaining 10% from the small amount of water in their diet. Kangaroo rats lose water mainly by evaporation during gas exchange, and gain water mainly from cellular metabolism. This rodent represents a good model for improving kidney function and water conservation in humans. Similarly, marsupials in Australia [stripe-faced dunnart *Sminthopsis macroura*] concentrate urine greater than 10 times that of humans. They exhibit daily torpor in response to extremes of heat or cold, thereby reducing their energy use by 90%<sup>153</sup>. So, when we plunder our environmental resources and destroy habitat, let's think about some of these mammals that hold the future of our species in their genomes.

We have provided some insights into ways that lifetimes can be extended. Furthermore, the use of gene therapy and embryonic stem cells or induced pluripotent stem cells (iPS) from differentiated somatic cells may cure or reverse damage in debilitating diseases such as diabetes, Alzheimer's, Parkinson's and multiple sclerosis. It may facilitate "healthy ageing." According to de Grey, we can achieve "robust human rejuvenation," and we have hopefully paved the way for interesting debate. We suggest that we all may find a quantum of solace in the words of the psalmist:

“I will praise thee; for I am fearfully and wonderfully made...” (Psalm 139:14).

### **7. Can we patent our genes?**

The success of the Manhattan Project demonstrated the importance of university research to national defense. However, before 1980, there was no law regarding ownership of inventions made by universities that received federal funding. Perhaps the most important clause of the Bayh-Dole Act of 1980 is that which deals with the presumption of title. Bayh-Dole permits a university, small business, or non-profit institution to elect to pursue ownership of an invention in preference to the government. As we develop techniques to re-engineer our bodies and promote “healthy ageing,” there is always an economic incentive for investigators who develop such innovative technology. Universities typically share income from patents as follows: 50% to the inventor, 17.5% to the department, 7.5% to the college or school, and 25% to the university. This leads to an interesting question: Can we patent the most precious gift that God has given us?

The source of law that governs patent grants in the US is the Patents and Trademark Office. In Europe there are several sources. They are the European Patent Convention 154 (“EPC”), Directive 98/44/EC of the European Parliament, and the Council of the European Union on the Legal Protection of Biotechnological Inventions<sup>155</sup> (“Biotech Directive”). The most fundamental objection to biotechnology patents of genes is that because genes exist in nature, they can be discovered but not invented<sup>156</sup>. Consequently, because US law says that discoveries are not patentable, genes cannot be patented.

Physicist and activist, Shiva<sup>157</sup> indicates that the cultural knowledge and biological diversity of non-Western societies are being plundered by Western powers by means of obtaining patents on “life forms”, and by patenting their indigenous knowledge. Rifkin<sup>158</sup> of the Foundation on Economic Trends estimates that “within less than ten years, all one hundred thousand or so genes that comprise the genetic legacy of our species will be patented, making them the exclusive intellectual property of global pharmaceutical, chemical, agribusiness, and biotech companies.” Although Rifkin’s timing is a little off, we are definitely heading in that direction.

As early as 1841, the first known patent for a living organism was granted in Finland on baker’s yeast, and Louis Pasteur obtained a U.S. patent for purified yeast<sup>159</sup> in 1873. However, the landmark case for patenting genes in the US is *Diamond v. Chakrabarty*<sup>160</sup> in 1980. Chakrabarty was denied a patent by Diamond, the US Commissioner of Trademarks and Patents. In summary, Chakrabarty, a microbiologist, filed a patent application asserting claims related to his invention of “a bacterium from the genus *Pseudomonas* providing a hydrocarbon degradative pathway.” This human-made, genetically engineered bacterium is capable of breaking down

multiple components of crude oil. Because of this property, which is possessed by no naturally occurring bacteria, Chakrabarty believed that his invention would have significant value for the treatment of oil spills.

The patent examiner rejected claims for patenting the bacteria. His decision rested on two grounds: (1) that micro-organisms are “products of nature,” and (2) that as living things, they are not patentable subject matter under the US Patent Act (Title 35 U. S. C. §101§§1 et seq.). Chakrabarty appealed to the Supreme Court and won in a 5-4 decision. Justice Berger essentially rewrote section 101 extending the patent system to cover living material <447 U.S. 322> even though Congress plainly has legislated in the belief that section 101 does not encompass living organisms. Justice Berger held that a live, human-made microorganism is patentable subject matter under statute providing for issuance of patent to a person who invents or discovers “any” new or useful “manufacture” or “composition of matter.”

Of course, genes are not made by the hand of man, but in the eyes of the court and the U.S. Patent and Trademark Office, the key aspect that allows for the patenting of genes is that the sequencing process takes something out of nature, isolates it, and purifies it. In that new “isolated” and “purified” state, the gene is no longer a completely natural material, but a product of man and therefore patentable. Presently there are thousands of patents issued for human genes. To clarify, we must be careful to distinguish between the patenting of human genes and the patenting of Expressed Sequence Tags (EST) - a fragment of a gene obtained through sequencing – which is what these patents are about. Enter Craig Venter who intends to patent an entirely synthetic free-living organism<sup>161</sup>. The patent published by the U.S. Patent and Trademark Office on 31st May 2007, describes a minimal set of protein-coding genes, which provides the information required for replication of a free-living organism in a rich bacterial culture medium. Venter hopes to use the artificial life form, which he says, does not yet exist (presumably to be named *Mycoplasma venterium laboratorium*), as a carrier for genes that would enable the bacteria to produce hydrogen or ethanol to produce cheap energy. Protesters<sup>162-163</sup> claim that Venter wants his company to become the Microsoft of synthetic biology, dominating the industry (www.etcgroup.org).

Where do we go from here? In condemning biotechnology, Britain’s Prince Charles said, “I happen to believe that this kind of genetic modification takes mankind into realms that belong to God, and to God alone.” Lee Silver<sup>164</sup> at Princeton University in his article entitled “The God Effect,” articulates that Europe and the US are suffering from research restrictions as Asian countries see a golden opportunity. The Chinese government has persuaded many Western-educated expatriate scientists to return to a homeland where research on human embryos is lavishly funded at dozens of laboratories. Separately in 2003, a Chinese company became the first in



the world to win approval for a commercial application of human gene therapy for a cancer treatment. Government funding helped South Korean scientists to recently clone human embryos for the first time. Singapore is completing a \$288 million biotech complex called Biopolis, which will house 2,000 university, government and industry researchers.

Debates on gene patenting have led to additional points of controversy. If DNA does have a special nature, given its role in determining identity, does patenting DNA sequences violate that nature in such a way that patenting should be limited or even prohibited? Religious critics have raised the argument that patenting entails a way of valuing genetic material, which is inappropriate: DNA is not the kind of thing that should be owned; it should not be controlled by biotechnology companies in the ways patenting enables; and it should not be commoditized<sup>165-166</sup>.

The International Olympic Committee has concerns that athletes will soon employ genetic engineering to give new meaning to their motto: *Citius, Altius, Fortius* (Swifter, Higher, Stronger)<sup>167</sup>. Biologist Stuart Newman and biotech critic Jeremy Rifkin applied for a patent for a “humanzee,” part human and part chimpanzee, in a calculated move designed to reignite debate about the morality of patenting life forms and engineering human beings<sup>168</sup>. The U.S. Patent and Trademark Office denied the patent, acknowledging that, although it has permitted the extensive patenting of biotech-engineered life forms and human DNA, the 13th Amendment of the U.S. Constitution forbids the ownership of humans, and they considered this application to be too close to the patenting of human beings<sup>169</sup>. Since the United States Supreme Court, Congress or Patent Office have never defined what a human being is, the debate still continues about whether or not the Patent Office as an executive arm of the United States government has the power to define “human being.”

## 8. Ethical considerations

We have learnt from the medical profession, probably the first code of ethics, the ancient Hippocratic Oath, which stipulates that physicians and scientists must today, even more crucially than in the past, “first do no harm.” Other practical codes worthy of mention include the Oath of Maimonides, the 12th-century physician-philosopher, the Oath of Amatus, the 15th-century Jewish physician; and in India, the oath prescribed by Susruta from traditional rituals, which originated well before the 1st century A.D. Respect for human life is the leitmotif of the Universal Declaration of Human Rights, approved by the General Assembly of the United Nations in 1948. This document states, in part, that “all human beings are born free and equal in dignity and rights;” that “everyone is entitled to all the rights and freedoms set forth in this Declaration, without distinction of any kind, such as race, color, sex,

language, religion, political or other opinion, national or social origin, property, birth or other status,” and that “everyone has the right to life, liberty and security of person<sup>170</sup>.” Ethics brings deep values and beliefs into play, which means we may not always agree with each other. However, we need to establish a “code of ethics” and then use it as a basis for engaging in an ongoing debate - “ethics is an ongoing process, not an isolated event<sup>171</sup>.”

It could be argued that the quintessential moment in history occurred some 90 years ago with the debate between J.B.S. Haldane<sup>172</sup>, an eminent biologist, and Bertrand Russell<sup>173</sup>, the philosopher, on the potential of scientific knowledge to generate new forms of social order. Russell’s interesting response counterpoises the metaphor of Icarus, who, having acquired the power of flight, was destroyed by his rashness when he flew too close to the sun. So what are the ethical problems in conducting medical or scientific research to achieve our goals? There are obviously many to consider, but here we list a few. (1) We must have consultation with the public or affected patients; (2) informed consent for the particular research intervention and the protection of confidentiality; (3) eliminate the double-standard of care - research forbidden on the wealthy would be carried out on the poor;<sup>174-175</sup> (4) respect for the sanctity of human life, (5) increasing, pain and suffering without result, (6) post-treatment follow-up and finally, (7) balancing costs and benefits in social and economic terms<sup>176-177</sup>, which in itself, is repugnant to the values of ethic. Do we need ethics training?

Consider the following:

The European Union Directive 86/609/EEC (2008) provides protection for certain animals used for experimental and other scientific purposes, and was adopted to harmonize practices in the area of animal experimentation in the EU. The directive further stipulates standards for the care and treatment of these animals. Reminiscent of this was the first official act of Hitler after he assumed power. He issued an edict rendering animal experimentation illegal. As a commentary on this action, the world now knows that the Nazis during WWII used human beings without their consent as experimental subjects, and without giving them the consideration that animals are given in scientific laboratories and veterinary hospitals.

Unscrupulous companies test drugs in developing countries, whose inhabitants are impoverished, poorly educated, deprived of medical services, and unfamiliar with research<sup>178</sup>. Furthermore, research on abandoned, institutionalized children where there is no clear guardian acting in their best interests are selected for reasons of convenience, rather than scientific necessity<sup>179</sup>. Quinn’s<sup>180</sup> HIV study in rural Uganda had institutional review board approval. Here Quinn, of Johns Hopkins University, observed HIV-positive persons but did not offer treatment. In addition, it is unclear whether these persons’ sexual partners were informed about their risk.



What exactly was the review board thinking?

Mentally incompetent persons have on occasion been used as subjects in medical experiments designed to elucidate the cause and the treatment of mental disorders. They have also occasionally been used as subjects in nutritional experiments and the study of the action of drugs, which only indirectly might be related to the cause of mental disorders. From time to time, prisoner volunteers have been used as subjects in medical experiments in the United States and abroad. Colonel Richard Strong, later professor of tropical medicine at Harvard University, was apparently the first in the United States to use prisoners for medical experiments. With the permission of the Governor General of the Philippines, Col. Strong in 1904 used prisoners condemned to death who had volunteered to serve as subjects in experiments on the plague<sup>181</sup>. Later, Strong and B. C. Crowell<sup>182</sup> used prisoners, under similar conditions in the Philippines, as subjects in experiments on beriberi. The only reward given to the prisoners during the course of the experiments consisted of gifts of tobacco.

The landmark study in medical ethics was the Tuskegee Study of Untreated Syphilis (TSUS) recently described by Bates and Harris<sup>183</sup>. This was one of the most horrible scandals in American medicine in the 20th century. For a period of forty years, from 1932 to 1972, doctors and public officials watched 400 black men in Alabama die in a “scientific” experiment, based on unethical methods that could produce no new information about syphilis, but perhaps revealed more about the pathology of racism than it did about the pathology of syphilis. How could this episode, requiring the collaboration of doctors, county and state health departments ever have occurred?

Essentially, it was argued, “primitive” peoples could not be assimilated into a complex, white civilization. Scientists speculated that in the struggle for survival, the black person in America was doomed. Particularly prone to disease, vice, and crime, black Americans could not be helped by education or philanthropy. White<sup>184</sup> reported that articles about TSUS were published throughout the life of the experiment, including prominent outlets, such as the *Journal of the American Medical Association*, *Archives of Internal Medicine*, and *Journal of Chronic Disease*. These publications indicated that the biomedical community accepted TSUS<sup>185</sup>.

As soon as we think that we have learnt a lesson from our recent past, history repeats itself. Contrary to the 1972 Biological and Toxin Weapons Convention, which prevents development of bio-weapons, the virus section of Fort Detrick's Center for Biological Warfare Research developed cancer-causing viruses under a project funded by the U.S. Navy. In 1975, retrovirologists isolated a virus to which no immunity exists, and later named it Human T-cell Leukemia Virus

(HTLV)<sup>186</sup>. In 1986, Gonda and Gallo<sup>187</sup> at the National Cancer Institute and others at Johns Hopkins University revealed that the HTLV and the VISNA virus (fatal sheep virus) are similar.

These studies trigger speculation that AIDS or HTLV may have been introduced into the gay community using the hepatitis B vaccine as a carrier for the HIV virus. In 1994, Nicolson<sup>188</sup> at the MD Anderson Cancer Center in Houston, using a technique called “gene tracking,” discovered that many returning Desert Storm veterans are infected with an altered strain of *Mycoplasma incognitus*, a microbe commonly used in the production of biological weapons. Incorporated into its molecular structure is 40 per cent of the HIV protein coat, indicating that it had been man-made. This is a direct contravention of the 1972 Geneva Convention on bio-weapons.

More recently, in 2002, a team of researchers at the State University of New York led by Eckard Wimmer<sup>189</sup> assembled a DNA template for the RNA poliovirus, using an Internet-available nucleotide sequence and mail order synthetic oligonucleotides. To the chagrin of the scientific community, they used a routine laboratory procedure and converted the DNA into RNA, and produced an infectious, neurovirulent poliovirus capable of paralyzing and killing mice. The potential impact that synthetic genomics might have on bioterrorism are too numerous to mention. However, the acquisition of viral agents from smallpox (virola) virus (a large double-stranded DNA virus), Ebola and Marburg hemorrhagic fever filoviruses, negative-strand RNA viruses, and Foot-and-mouth disease virus (a small positive-strand RNA virus) illustrates the point. This is potentially the bio threat that we face from terrorists.

Erik Parens<sup>190</sup> et al., at the Hastings Center, acknowledge the new field of bioethics with the advent of the Genome Project, followed closely by nano-ethics, and pose the question: “Now that synthetic biology is the hot new star, do we need synthetic bio-ethics?” Given the convergence of scientific investigations, some ethical questions are certainly more pressing in some arenas than in others. For example, concerns about privacy might be more pressing in genetics than in synthetic biology, and concerns about civil liberties might be more pressing in neuroscience than in genetics. But the questions themselves are virtually identical to the ethical questions that have arisen in the past.

One of the goals of the human genome project is to develop genetic linkage maps of the human genome (~100,000 genes), which will then allow researchers to pull out individual genes and sequence them. From the start, James Watson, the first director of the Genome Project, and others, realized that the information garnered from the project could be misused - in denying health insurance, for instance. Little did they realize that they may have now opened Pandora’s Box

to the development and use of genetic weapons that can target specific ethnic groups. This project is currently being conducted under the auspices of the U.S. Energy Department, which also oversees America's nuclear weapon arsenal.

*Consider the following hypothetical cases. What would be your decision?*

A Muslim patient is in the care of Community Hospital and is in need of a heart transplant. Scientists at USC have taken stem cells from the patient and have introduced them into the embryo of a developing pig. The pig grows a normal human heart as an internal appendage, which can be removed and transplanted into the patient. Since this heart grown in the pig is identical to the patient's tissue, there are no antigenicity problems. What questions would an ethics review board consider? How do we satisfy the condition of "informed consent" with the patient, considering his religious beliefs? Do we inform the patient that his new heart will come from a pig? Can we get signed consent from the patient?

Up to 15 million people in six countries in Southern Africa are currently facing famine. Aid agencies desperately need assistance to source and deliver food. The US has donated 1,000,000 tons of genetically modified (GM) corn. The president of a recipient country has retained USC as scientific advisor to his country to address the question of accepting this food aid. Should the people starve to death, or should they be given a "poison" that could have long-term effects. There is a large consensus, especially in Europe, that, genetically modified food may be harmful to health; that GM grains may cause resistance to antibiotics, and that they may lead to the emergence of new food toxins, or to allergies in people with poor health. When we consider the average health of people in Sub-Saharan Africa, we find the majority to be in "poor" health. So, what are the consequences? Are Zambians to be used as guinea pigs for corporate America? How would the USC ethics review board rule on this question?

The genomes of the Neanderthal<sup>191</sup> man and the Woolly Mammoth<sup>192</sup> have been recovered. USC scientists propose an experiment whereby in the case of the mammoth, the DNA of an elephant's cell can be synthetically modified, to be the replica genome of a mammoth. The final-stage egg could then be brought to term in a surrogate elephant who will deliver a mammoth. The same synthetic procedure used for the mammoth would be technically possible with Neanderthals, with a modern-day human or chimpanzee acting as the delivering host for the Neanderthal baby. How would the USC ethics review board rule on these proposed experiments?

At the time of this writing, there are at least five (5) companies<sup>193-197</sup> offering personal genome-scanning services. They include offering information regarding susceptibility to disease such as prostate cancer or type 2-diabetes, and to non-

diseases such as bitter-taste perception or nicotine dependence. An analysis of the above-mentioned companies' web sites, including informed consent forms, reveals that their policies differ regarding the testing of minors. Your genetic information is extremely sensitive. In fact, it may be the most sensitive information there is. And as new discoveries are made, and more is learned about what your genes say about you, this information is likely to become evermore sensitive over time. Performing these tests on children means ignoring the sensitive nature of the information generated. Moreover, it undermines the claim that "... the only people who should be able to see your genetic information are you and those with whom you choose to share it." If individuals are tested as children, they are not able to choose whether they want to share the information with their parents. Finally, the concern that genetic information might lead to misuse by third parties also applies in this context.

As Christians, when we explore these troubling ethical questions, we suggest that our approach must be one of reverence, humility, and deliberation, mindful at all times of our human frailties. What constitutes "normal" or "whole" or "able-bodied" life? We are not superior to those with "disabilities." Rather, we should look at them, like us, as reflections of the *imago dei*, and celebrate the words, "marvelous are thy works; and that my soul knoweth right well" (Psalm 139:14).

## Conclusion

We have travelled a long and tortuous road in our quest for knowledge, to examine troubling questions pressed upon us by dramatic changes in our environment, which ultimately reflect a breakdown in our social behaviour. Our review of literature illustrates the magnitude of the environmental problem that may bring about our "extinction" more forcibly than it can provide solutions to our impending demise. It is painfully apparent that in order to survive this "holocaust", we need a scientifically literate society that can understand the major advances in science and technology. The question of the age of the earth and of a short Creation Model has been addressed to some degree, but hopefully, future technology will illumine this controversy to the satisfaction of all.

To escape the "end of time" on Earth, we need to extend our lifetimes to enable us to explore and colonize other planets. This is necessary, as the literature has shown that our destruction of the environment combined with the rate of consumption of our resources will require another planet to sustain our lifestyles. There is a general belief by some that the colonization of another planet is an achievable goal within our lifetime. It has been shown that technology and lowly life forms are providing some solutions to improving the quality of our life, to enhance "robust human rejuvenation" and increase our life-span.

Today, we are still amazed by simple life forms; *Deinococcus radiodurans* has been given the title “world’s toughest bacterium” by the Guinness Book of World Records. Able to withstand extreme heat, cold dehydration, vacuum and excessive radiation, this bacterium carries four copies of its genome in each cell, and is able to repair damaged DNA within 12 -24 hours<sup>23, 198-199</sup>. Microsoft may have taken a page from this bacterium’s genome with its “*rescue disk*” for its operating system. Can we engineer the same for ourselves? Have we learnt any lessons from the soil amoeba *Dictyostelium discoideum*? What sacrifices are we willing to make for the survival of our children, family and fellowman?

The human re-design concepts, as suggested by various scientists, are within our grasp; however, energetic debate will show if these modifications will allow us to survive the “lake of fire.” Harvesting human embryonic stem cells for research purposes to enable our designs, was forbidden in the US under the Bush administration, as the destruction of the human embryo was said to be tantamount to homicide. Would we consider the proposition that a human embryo should achieve legal status when it becomes conscious and aware with an integrated brain and central nervous system, and can respond to its natural environment within its mother way before it is born? It could be argued that the Bush decision was contradictory to the Supreme Court decision in *Roe v. Wade*, and further inflamed Mr. Bush’s position, where the law allows abortion clinics and the dispensing of contraceptives for women, yet forbids experimentation on multiple 2-day old blastocysts the size of a grain of sand.

The UK law allows a mother to keep her excess embryos (from in-vitro fertilization), donate them to other infertile parents, or donate them for research. Ironically, we are happy to disconnect life support systems from patients at the end of their life to harvest organs for transplantation or for research. On March 9, 2009 President Obama signed an executive order reversing the US view of stem cell research and lifting funding restrictions. While stem cell research proceeds in the UK as well as the Far East, religious views however, are not so easily defined. For example, we violate the Sabbath to preserve human life, but no such violation is allowed to preserve an embryo. We put forward a simple question: “Should the laws of humanity embrace technological advances and all research for the treatment of human disease and the preservation of life?”

Is Shiva correct when she says that the cultural knowledge and biological diversity of non-Western societies are being plundered by Western powers through the patenting of “life forms?” Will Craig Venter be the next “Bill Gates” of synthetic biology? When we consider the AIDS pandemic and the possibility that it was caused by a man-made virus that was released in Sub-Saharan Africa, we question man’s “humanity” to his fellowman. Will developed countries continue to take

advantage of underdeveloped countries whose inhabitants are impoverished and poorly educated? The ubiquitous nature of racism and our history of handling “undesirables,” as well as dealing with peoples of different racial stock, virtually assures us that the more powerful countries are continuing to look into new and better ways of killing whole populations.

Finally, consider this wonderful thought: an RNAi intervention or a pill that can reduce your risk to everything that is undesirable about growing old. This may sound like fantasy, but such interventions have already been shown in this paper to work in animal models. Toffler<sup>200</sup>, the bestselling author of *Future Shock*, has his own doubts when he says the clock is ticking for a “biological Hiroshima.” Prudence indicates that this same technology, like Icarus in Greek mythology, can be weaponized and turned against us to ensure our ultimate destruction.

Concerning the future of genetic engineering, Princeton’s Lee Silver, ever the optimist, talks about inserting animal genes into plants to produce beef or *chicken a la Monsanto*. Since chicken meat is muscle tissue with a particular protein composition and a particular structure, it is conceivable to create a novel plant that grows appendages indistinguishable in molecular composition and structure from chicken muscles. Imagine picking a chicken breast or leg from a tree in your garden - a wonderful idea. But it may have no appeal to vegetarians. Silver further explains the advantages of genetically engineered vegetative meat, in that it eliminates an inefficient animal intermediate, and requires far less energy, land, and other resources that would be required to feed the 9 billion people expected by 2050.

“With God, all things are possible” (Matthew 19:26). However, in the event that we fail to create our “utopian society,” and our engineering designs do not save us, will we be ready? Can we be “accounted worthy to escape all these things that shall come to pass, and to stand before the Son of man” (Luke 21:36).

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# **Book Reviews**



# Book Review 1

Gowrie, G. (2009). *Current Issues in Sociology and Education*. Third Edition. Trinidad: Eniath's Printing Co. Ltd. pages 321. Reviewed by Susan Chand.

This is the third edition of *Current Issues in Sociology and Education*, by George Gowrie (PhD), an accomplished educationist, curriculum development officer, school supervisor, and professional development specialist in primary, secondary and tertiary levels in Trinidad and Tobago. The current edition provides prospective teachers with necessary pedagogical base to improve their ongoing professional practice in schools.

The book is a collection of twenty scholarly articles based on extensive literature reviews. It takes the readers to early theories in sociology and education, and brings them up-to-date with current issues relating to Trinidad and Tobago, the Caribbean, and the wider world. The articles are categorized under six different sections.

The first section deals with leadership and management in schools. The author, in the first article of this section, alludes to 'effective' principal leadership based on literature review of past three decades. Studies recognized that principals in 'open' climate schools exhibited high 'supportive' and 'collegial' characteristics. In the context of Trinidad and Tobago, the author observed that many school principals are preoccupied with technical efficiency, and the enforcement of bureaucratic rules and regulations. This reflects a rigid and highly centralized system that gives little room for the principal's discretion, initiative and flexibility in decision-making. Furthermore, findings also indicate that the pool of successful experienced teachers is the main source of the present school administrators. Thus, the author suggests that empowering teachers with leadership skills will facilitate students' learning, as well as professionalism in administration.

In the second article, the author asserts that sound decision-making is crucial to the survival of an organization, and that the main consideration that underscores good decision-making is the organization's emphasis on problem-solving approach. Based on literature and research studies, the author suggests working definitions of decision-making and organizations, and highlights common models of decision-making in an organization. He points out that one must be cognizant of the cultural/historical development of organizations in Trinidad and Tobago while considering good decision-making and healthy organizational environment.

The third article, 'Effective Classroom Management: A Guide to Beginning Teachers', is an interesting paper on preparing beginning teachers to make a difference and in developing their understanding of the teaching profession. The

article focuses on the characteristics of a good teacher, and two basic approaches to classroom management, namely, **teacher-centred** and **student-centred**. The author asserts that becoming a teacher is more than a career choice, and that it is a calling that has its genesis in one's childhood experiences.

Section Two is on 'Educational Research.' It contains two articles: the first one provides some hints on social research for students, and the second one is entitled 'Action Research: Key to the Transformation of our Schools.' The first article is written with a view to providing guidelines to students in social science research. The author has given seven stages of research process, and posits that while knowledge of research is important, writing skills are equally essential. In the next article, he states that **Action Research** is at the heart of a two-fold process of reform, namely, 'restructuring' and 'reculturing' of the education system. He maintains that **action research** can help facilitate and create a professional work environment, so that teachers can work collaboratively to be more reflective and critical. Secondly, he says collaborative action research can lead to the process of reculturing; that is, forging professional interaction between primary and secondary school teachers.

In the context of Trinidad and Tobago, the Secondary Education Modernization Programme Coordinating Unit (SEMDCU), the Ministry of Education, the University of the West Indies (St. Augustine), and the University of Trinidad and Tobago have embarked on numerous school-wide action research projects to help school personnel gain focus and develop effective management and leadership skills. The author has identified 'live' experiences of the students and performance tests as powerful techniques in action research.

Section Three is on 'School Climate, Health and Culture.' It is a series of five articles based on the author's research studies and workshops, conducted in selected schools in Trinidad. The first article is a study that investigated selected dimensions of teachers' and principals' behaviour, and their relation to openness (or) of primary school climate in a selected district of Trinidad. The author used Open Climate Descriptive Questionnaire-Rutgers Elementary (OCDQ-RE) model for this study. He aptly concludes from the findings that while the OCDQ-RE model provided a useful framework, it did not appear to be truly reflective of the teachers' perceptions of school climate in the local settings.

Four-celled typology (open, engaged, disengaged and closed) on school climate did not cater for unique situations that existed in the local context. The next article is written to provide useful tips to guide teachers and principals to shape positive culture in the class and school. The author believes that this article is in line with the Education Policy Paper (1993 – 2003) of the Ministry of Education, Trinidad and Tobago, which underscores the significance of culture in the school systems.



The third article brings out a critical issue faced by the school systems in Trinidad and Tobago; that is, the transition of primary school children to secondary schools. It is based on a series of on-site intensive workshops for primary and secondary school teachers.

The findings suggest that such workshops will aid teachers to prepare students for the smooth transitions from primary to secondary levels, within the cultural milieu in which the schools exist. The fourth article presents important findings from the author's doctoral thesis on the teachers' quality of work life (QWL) in selected primary schools in Trinidad and Tobago. While there has been no known school study done on Trinidad and Tobago using the 'quality of work life' framework, this has been a ground breaking study in that area.

The author has made references to a number of unpublished studies done by the university students at the post-graduate level, in Trinidad, relating to school studies. His study has identified six quality work life variables that were perceived by the teachers in the selected primary schools as most important: social integration in the work place; extrinsic characteristics, working conditions; student-related issues, collegial relationships, and intrinsic characteristics. The implications of this research can be used as a point of reference in guiding school policies on promoting teachers' work life quality in schools. The final article in this section is based on a recent collaborative research that examined the state of health of a sample of primary schools in a district in Trinidad and Tobago.

The findings from this study are in agreement with the Ministry of Education of Trinidad and Tobago in the White Paper (1993 – 2003) and Strategic Plan (2002 – 2006). The state of health in the primary schools has been described by the Ministry as 'organizational pathologies' with poor motivation of teachers, student indiscipline, low levels of academic achievement, and teacher and student violence and absenteeism, all of which adversely affect positive learning and teaching. However, the study conducted by the author reveals that the government-assisted schools appear to exhibit healthier characteristics than the government schools in the sample.

Section Four has two articles relating to Educational Foundations that are specifically addressed to the students of sociology and education. The first article gives an overview of some of the sociological ideas of the founding fathers like Durkheim, Marx and Weber, followed by micro sociologists like Mead, Garfinkel and Schulz, and post-modern theorists like Foucault and Lyotard. The second article presents the view on the teacher as a teacher of philosophy, based on major philosophies drawn from the disciplines of sociology and education.

Articles in Section Five pertain to Curriculum and Instruction. These provide teachers with useful teaching strategies and evaluation techniques that are crucial

for the effective delivery of the curriculum, key issues in teaching social studies, and important ingredients of effective skills of asking questions. The author also presents a paradigm shift from 'traditional academic curriculum' to the curriculum that emphasizes 'inclusive' approach. Furthermore, one of the articles deals extensively on an overview of eight Multiple Intelligences propounded by Howard Gardner.

The concluding section includes articles on thought provoking issues like parental involvement in schools, male marginality, and management of student discipline. In Trinidad and Tobago, the National Parent Teacher Association (NPTA) is closely working with the parents and teachers to improve student learning. The author emphasizes that the examples of 'best practices' in parent involvement in some of the schools in Trinidad and Tobago, reflect a developing and nurturing 'culture of collaboration' between the home and school. Furthermore, he points out that the issue of male marginality has been the most controversial one, not only in Trinidad and Tobago, but in the Caribbean and the wider world.

The author maintains that many eminent Caribbean sociologists have linked the marginal position of men to the existence and predominance of the matrifocal family, and the colonial legacy of the plantation system. In recent times, it has been observed that more males are dropping out of schools, or do not choose to move on to higher education, thereby paving the way for more and more females in the tertiary educational systems, and subsequently in occupying higher ranking positions in the job markets. The author observes that in many quarters, male marginality in the workplace is directly related to male under-achievement in schools.

However, he is of the opinion that male marginality should be re-examined and viewed in the light of differential treatment and socialization of males and females in the early years of their lives. In the last article, the author cites the work of the renowned Trinidad-based sociologist and criminologist, Professor Emeritus Ramesh Deosaran: "Benchmarking Violence and Delinquency in Secondary Schools: Towards a Culture of Peace and Civility" (2004). This study has identified main types and causes of delinquent student behaviour in a junior secondary school, and has developed a discipline model as a guide for teachers. Such studies are highly commendable. They are aimed at managing student discipline, thereby reducing delinquency and violence in schools, and channelling young minds to positive learning experiences.

Dr. Gowrie has provided a wide spectrum of current issues relevant to teachers for the improvement of their pedagogical practices, and to students of sociology and education, and the wider community. They all have an important role to play in nurturing a child in a learning environment, and in creating a better future for him/her.



## Book Review 2

**The *Mind of Christ (Proceedings of Conference: 2008-2009)*, published by University of the Southern Caribbean Press, USC, Maracas Road, Maracas, St Joseph, 2010. 120 pages. Reviewed by Aleksandar S. Santrac.**

This volume is the product of multiple approaches to the subject of the Mind of Christ by different authors. Within the context of the possibility of starting a curriculum in Christian psychology, from exegetical, biblical, theological, psychological, and historical perspective, contributors searched for the meaning, understanding and application of the idea of the Mind of Christ. It seems apparent that the second conference in 2009 was built on the elaboration of some problems concerning the previous understanding of the concept presented in 2008. It achieved a deeper spiritual and theological understanding of the Mind of Christ.

From the exegetical perspective of Bertram Melbourne, we learn that the Mind of Christ is properly understood only in the light of the virtue of humility. Boxter Kharbteng's evaluation of Ellen White's writings brings us to the conclusion that we ought to have a balanced mind with humility and simplicity, which is in disagreement with some current trends (applying the principle to the XXI century academic milieu). From the articles of Martin Hanna, we find out that in order to integrate theology with psychology, we need to affirm theological perspective as normative, if we want to stay faithful to the biblical world-view. We also receive his input of definitions of academic freedom, presented as extremely valuable in teaching Christian psychology. Lael Ceasar focussed on the understanding of the Mind of Christ in the Old Testament, with an emphasis on student devotion at the University, as a part of the battle for the implementation of the principles of the Mind of Christ.

All of these contributions successfully set a stage for a balanced understanding of the possibility of integrating Christian psychology with university curriculum. Nonetheless, some of the articles and presentations do not fully reflect the theme of the Conference. They are not in unison in support of or against experimenting Christian psychology. Some charts and footnotes should be transformed into appendix or endnotes to make reading easier.

Finally, let me stress several issues that might be significant in the discussion on the amalgamation of psychology and Christian world-view. First, the science of psychology and the Bible have different assumptions. If we want to make biblical world-view a normative principle for the integration of the Bible and psychology, we have to be aware that we can only use the nominal concepts of psychology

within the assumptions of biblical world-view. This was the approach even of the biblical authors who, in their desire for successful contextualization, searched for the nominal concepts of mythological, historical, cultural, sociological, ethical, and philosophical world-views in order to make the message of God understandable.

Second, I would like to build my case on the use of the illustration of Dr Kharbteng about *loser* and *winner* (p. 98). There is a conflict between a world-view based on Christ's values and secular values. In the search for the assimilation of psychology into biblical world-view, there will always be a loser or winner. Unity and cooperation between two different sets of concepts in the organic sense, is impossible.

Instead of integration of two different world-views, I propose the "illumination by science and *dialogue*". There are some scientific results that might be very helpful in the understanding of the Mind of Christ (biblical world-view), and we should not disregard them. However, their role is only to present the Christian as a responsible agent that uses reason to attain truth. *Fides quaerens intellectum* (faith seeks understanding). The integration itself, nevertheless, is possible only through dialogue that should be based on the assessments and comparisons of two different sets of complex networks of the understanding of reality. Psychological and biblical world-views should be compared via content and presuppositions. The results may be instructive and illuminating, but they would never jeopardize and sacrifice the pillars of the Christian faith.





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