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Journal of Research Reports
2009-2010 • Volume 15



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WICHITA STATE
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McNair

SCHOLARS PROGRAM

Journal of Research Reports
2009-2010 • Volume 15



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From the Director

present volume 15 of the Journal of Research Reports, "Education Destination." The articles featured in this journal represent the work of Program participants from the 2009 – 2010 – grant year. As one reads through these articles, it is clear that the breadth of research interests is as diverse as the students served, and the quality is outstanding as well. My staff and I could not be more pleased with the efforts that went into producing this meaningful and scholarly body of work.

The Program could not achieve such great accomplishments without the support of the University faculty, staff and administrators who have mentored students over the past year. These mentors have not only guided the McNair & EPSCoR Scholars in completing their research manuscripts, but they have inspired them to work hard and produce scholarly material. Each mentor is to be applauded for the efforts in making undergraduate research a reality for the students in this Program.

As we continue in our fourth grant cycle, we send our gratitude to the University Administration and the U. S. Department of Education for their support over these past 15 years. We look forward to continuing our relationship for many years to come.

Within this journal we showcase the works of twelve (12) students from the campus of Wichita State University. Ten (10) of these students are McNair Scholars and two (2) students conducted research through the National Science Foundation (NSF) EPSCoR Summer Research Program. There are two (2) full manuscripts and ten (10) summaries presented.

A special word of thanks is directed to our research coordinator, **Ms. Rebecca Rawls**. With her dedication and support for the students, she was able to encourage them to go that extra mile and make sure their documents were publication ready. Appreciation is also given to our assistant director/counselor, **Ms. Shukura Bakari-Cozart** and the senior administrative assistant, **Ms. Vicki Alfred**, who without their support and persistence in making sure that things are done correctly and in a timely manner, none of this would be possible. These individuals are invaluable and irreplaceable. Dedication and commitment are rare qualities, and I feel fortunate to have found staff members who hold these qualities in such reverence.

Finally, I would like to congratulate the students for going beyond the classroom and putting their critical thinking skills into practice. Their efforts will not go unnoticed and will prove to be something they can be proud of for many years to come. We are proud of our students and their accomplishments. This is a well-deserved acknowledgement for their hard work. These students are our future educators as they continue on this journey to reach their destination of obtaining doctorate degrees. Thank you for the opportunity to serve as your director.

LaWanda Holt-Fields, *Director*

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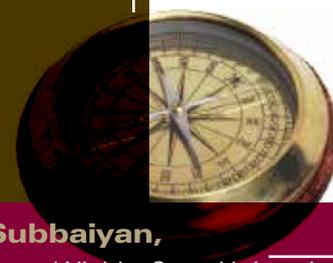
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RESEARCH PAPERS



SUPRAMOLECULAR MAGNESIUM PHTHALOCYANINE – FULLERENE DYADS: STUDIES TOWARDS LIGHT ENERGY HARVESTING



Rachel Jacobs, *McNair Scholar*, Eranda Maligaspe, Navaneetha K. Subbaiyan, Melvin E. Zandler, and Francis D'Souza, Ph.D., *Department of Chemistry, Wichita State University*

Abstract

Photosynthesis, the process of converting light energy into chemical energy, involves two major steps, viz. absorption and transportation of light energy of appropriate wavelength by the antenna light harvesting molecules to the reaction center and photoinduced electron transfer (PET) to generate charge separated entities by using the electronic excitation energy. In the reaction center, the excitation energy is converted into chemical energy in the form of trans-membrane charge separation via a multistep electron-transfer reaction.

Mimicking the photosynthetic functions by using synthetic model compounds is important to further our understanding of the process of bioenergetics. Research in this area also holds promise for technological advances in solar energy conversion and building molecular optoelectronics, such as photonic wires and switches.

In the present study, self-assembled donor-acceptor photosynthetic reaction center model systems are built using magnesium phthalocyanine and magnesium naphthalocyanine as electron donors and an imidazole-appended fulleropyrrolidine as electron acceptor. The study focuses on the synthesis of the donors and their characterization, donor-acceptor assembly formation, and photochemical studies revealing the occurrence of photoinduced electron transfer from the donor to the acceptor. The Benesi-Hildebrand plot constructed from the absorbance data revealed a straight line with a binding constant of $\sim 10^3$ – 10^4 magnitude M^{-1} indicating fairly stable complex formation for both dyad systems. The cyclic voltammetric technique was employed to evaluate the redox behavior of the self-assembled dyads. Finally, photoelectrochemical cells have been constructed to demonstrate direct conversion of light energy into electricity.

Introduction

Developing renewable resources for energy to decrease our reliance on fossil fuels has been an ongoing challenge for scientists.¹ One possible source of renewable energy could be in the development of photosynthetic dyes for solar cells, which have the ability to absorb energy from sunlight and convert it into electrochemical energy.^{2,3} Dye sensitized solar cells, which use photosynthetic dyes to convert solar energy to electrical energy, are a cost effective alternative to the silicon solar cells that are in use today.⁴

In order to better understand how to design efficient dyes, scientists have studied photosynthetic bacteria, as well as the complexity of photosynthesis in plants.⁵ The cascade of photosynthesis occurs with photon excitation of light harvesting proteins II and the energy transfer of light harvesting

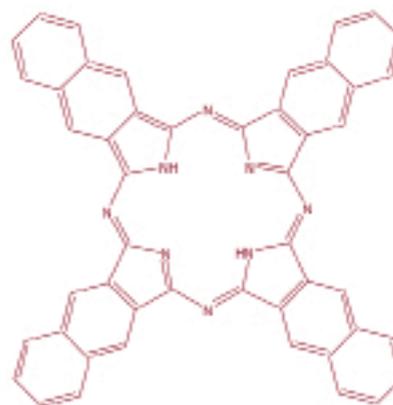
proteins II to light harvesting proteins I to the reaction center.⁶ Plants utilize a complex system of converting light into energy by means of photosystem I, which contains two reaction centers and photosystem. Charge separation in plants occurs in tightly coiled thylakoid membranes of chloroplasts bound to antenna proteins.^{7,8} Photosynthetic dyes are designed to mimic the properties of chlorophyll, an electron donor, and quinone, an electron acceptor.

Phthalocyanines and naphthalocyanines have been compounds of interest as chromophores in the development of supramolecular systems for artificial photosynthesis.^{7,9,10} Some key characteristics in why these compounds are utilized in research are the following: they are structural analogues of chlorophyll and porphyrins; they have strong light absorption in the visible region of the electromagnetic spectrum; they have excellent emission behavior; they have tunable redox properties; they are stable in a variety of solutions and harsh temperatures; and they are available in a large number of structural variations. Figure I shows the structure of phthalocyanine and naphthalocyanine. In order to achieve artificial photosynthesis, the following key factors must be achieved: (i) the light must be captured by antenna molecules and/or sensitizers, leading to "excited states;" (ii) the absorption of the light must result in the transfer of an electron to the acceptor entity; (iii) the electron transfer must be directional; and (iv) the lifetimes of the excited states must be long enough for electron transfer to take place. These concepts are based on the complex processes plants and photosynthetic organisms must accomplish in natural photosynthesis.^{1,8}

Fullerenes have often been used as electron acceptors in supramolecular systems because of several unique characteristics: their low reduction potentials,¹¹ their large three-dimensional structure,^{11,12} and their photochemical and electrochemical properties, which contribute to their ability to act as good electron acceptors.¹³ Fullerenes have also been shown to be exceptional electron acceptors in both ground and excited states, which causes their photoexcited states to be quenched effectively by a large assortment of electron donors.¹⁴ Fullerenes containing amino



Phthalocyanine

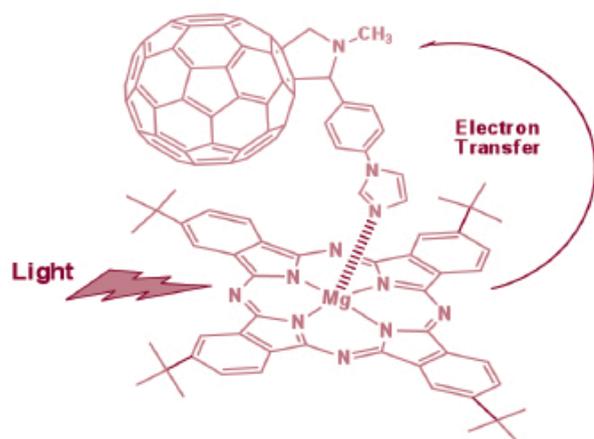


Naphthalocyanine

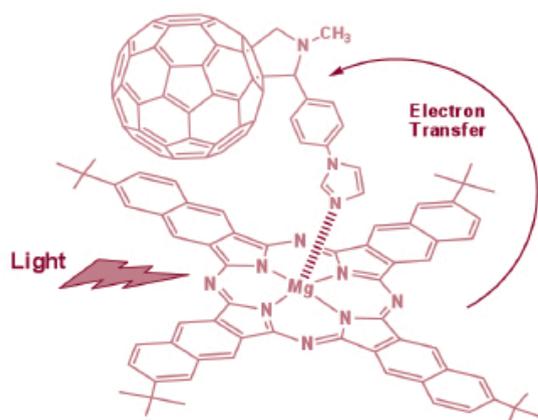
Figure I. The following is the structure of phthalocyanine and naphthalocyanine, respectively.

groups have been experimentally shown that "the sensitivity of observed photophysical properties to solvent polarity are due to photoinduced intramolecular electron transfers."¹⁴ This is an important property in the use of dye sensitized solar cells, which rely on the transfer of electrons from a photosynthetic dye to its electrodes.

An artificial photosynthetic system requires an antenna reaction center in which the system contains an electron donor as well as an electron acceptor when excited by light energy. In the present study, self-assembled donor-acceptor photosynthetic reaction center model systems are built using magnesium phthalocyanine, MgPc, and magnesium naphthalocyanine, MgNc, as electron donors and an imidazole-appended fulleropyrrolidine as the electron acceptor. The self-assembly method via a metal-ligand axial



Scheme 1. Magnesium phthalocyanine - fullerene donor-acceptor dyad. The arrows show the occurrence of photoinduced electron transfer.



Scheme 2. Magnesium naphthalocyanine - fullerene donor-acceptor dyad. The arrows show the occurrence of photoinduced electron transfer.

coordination has been a successful approach in the development and study of electron transfer in donor-acceptor dyads.¹⁵ The following schemes show the structures MgPc and MgNc. Upon light excitation, electron transfer should occur from MgPc to C₆₀Im and similar results should occur for MgNc to C₆₀Im.

Experimental Section

Chemicals. Toluene and o-dichlorobenzene in sure sealed bottles were purchased from Aldrich Chemicals (Milwaukee, WI). The synthesis, as well as the purification of MgPc, MgNc,

and C₆₀Im was carried out according to literature procedures with small modifications.

Instrumentation. The steady state UV-Vis and fluorescence were measured with a Shimadzu Model 1600 UV-Vis and SpeFluorolog-tau spectrometers. The ESI mass spectra analysis of the products was performed using a Fennigan LCQ-Decca mass spectrometer. The ¹H NMR studies were carried out on a Varion 300 MHz spectrometer. Tetramethylsilane (TMS) was used as an internal standard. Photoelectrochemistry was performed using a solar simulator (New Port Oriel) under AM 1.5 (100 mW/cm²) conditions with modified TiO₂ electrode and Pt deposited FTO as working and counter electrode respectively. The electrolyte consisted of 0.5 M TBAI and 0.05 M I₂ in O-Dichloro Benzene (ODB). Photoaction spectrum was recorded automatically using computer controlled monochromator (Cornerstone 260) with the same setup.

Preparation of Magnesium tetra-tert-butylphthalocyanine (MgPc). A sample of tetra-tert-butylphthalonitrile, DBU, urea and MgCl₂ were dissolved in dry pentanol in a round-bottom flask. The solution was rapidly heated to 120°C and was magnetically stirred for 7 hours under an argon atmosphere. The solution was allowed to cool to room temperature. The crude product was evaporated and put under vacuum. The crude product was purified using a silica gel column and eluted with methylene chloride and chloroform. UV-Vis (CHCl₃) 682.1, 616, 653.

Preparation of Magnesium tetra-tert-butyl-naphthalocyanine (MgNc). A sample of tetra-tert-butyl-naphthalonitrile, DBU, urea, and MgCl₂ were dissolved in dry pentanol in a round-bottom flask. The solution was rapidly heated to 120°C and was magnetically stirred for 7 hours under an argon atmosphere. The solution was allowed to cool to room temperature. The crude product was evaporated and put under vacuum. The crude product was purified using a silica gel column and eluted with methylene chloride and chloroform. UV-Vis (CHCl₃) 771, 773, 690, 730.

Preparation of Fullerene Imidazole (C₆₀Im). A sample of 150 mg of C₆₀, 13mg of Sarcosine, and 13mg of 4-imidazole benzaldehyde acid were dissolved in dry toluene in a

round-bottom flask. The solution was refluxed and magnetically stirred for 24 hours. The solution was evaporated and put under the vacuum for 12 hours. A small amount of toluene was added to the round-bottom flask and the crude solution was sonicated for 5 minutes until the entire crude product was dissolved. The crude product was added to a silica gel column and the product eluted with a ratio of 3:2 toluene/ethyl acetate. The brown product was evaporated and put under vacuum.

Results and Discussion

Optical Absorption Studies

Figure 2 shows the optical absorption spectra of MgPc upon addition of C_{60} in *o*-DCB. Upon addition of C_{60} to a solution of MgPc, the Soret band revealed an increased intensity while the Q-band located at 682 nm was red shifted by 1-2 nm. These spectral features are characteristic of a pent-coordinated species. The isobestic points located at 626 and 607 nm indicate the existence of only one equilibrium process in the solution. Similarly, the binding of C_{60} to MgNc was characterized by diminished intensity of Q-band located 773 nm with 2-3 nm red shifts. Isobestic points were also observed at 679 nm, indicating existence of only one equilibrium process in solution.

The Benesi-Hildebrand plot constructed from the absorbance data revealed a straight line

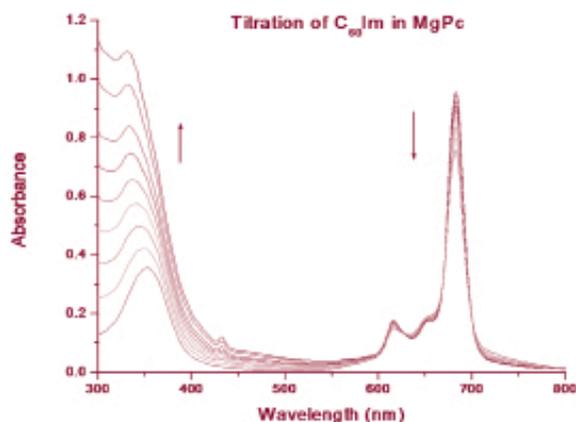


Figure 2. Ultraviolet/Visible spectra during the titration of MgPc on the addition of C_{60} Im in *o*-dichlorobenzene, a noncoordinating solvent.

with a binding constant, K , value of $8.82 \times 10^3 M^{-1}$ for MgPc- C_{60} complex. Similarly, the calculated K value for MgNc- C_{60} Im is $1.96 \times 10^4 M^{-1}$. These K values suggest a stable complex formation between MgNc and C_{60} Im.

Steady state fluorescence studies showed over 90% quenching in both cases of MgPc upon the addition of C_{60} Im and MgNc upon the addition of C_{60} Im, suggesting the occurrence of photo-induced electron transfer from donors, MgPc, MgNc to the acceptor, C_{60} Im.

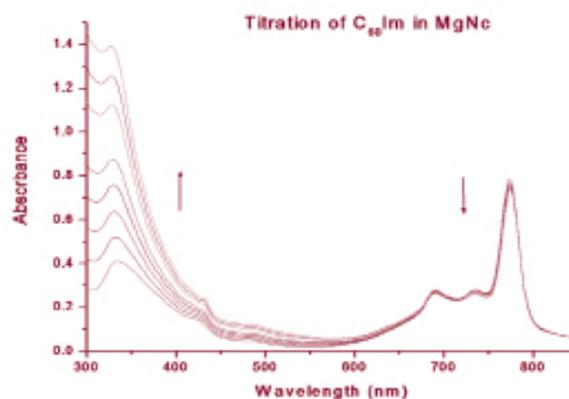


Figure 3. Ultraviolet/Visible spectra during the titration of MgNc on the addition of C_{60} Im in *o*-dichlorobenzene, a noncoordinating solvent.

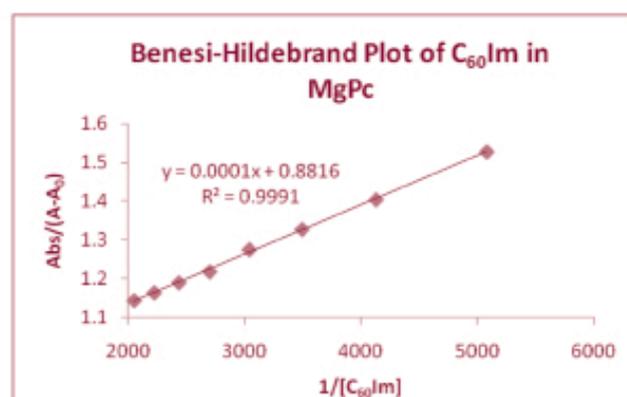


Figure 4. Benesi-Hildebrand plot of magnesium tetra-*tert*-butylphthalocyanine coordinated with C_{60} Im. The binding constant was determined to be $8.82 \times 10^3 M^{-1}$.

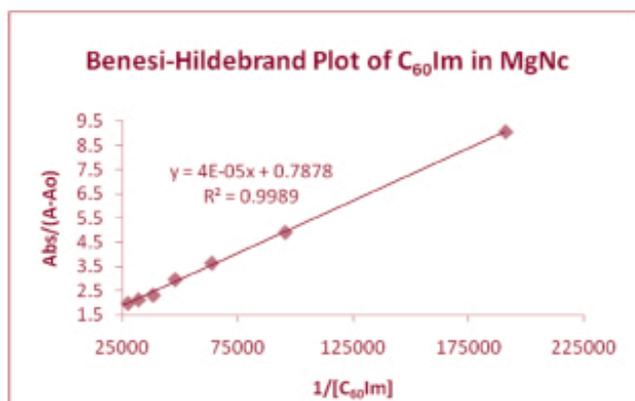


Figure 5. Benesi-Hildebrand plot of magnesium tetra-*tert*-butylphthalocyanine coordinated with $C_{60}Im$. The binding constant was determined to be $1.96 \cdot 10^4 M^{-1}$.

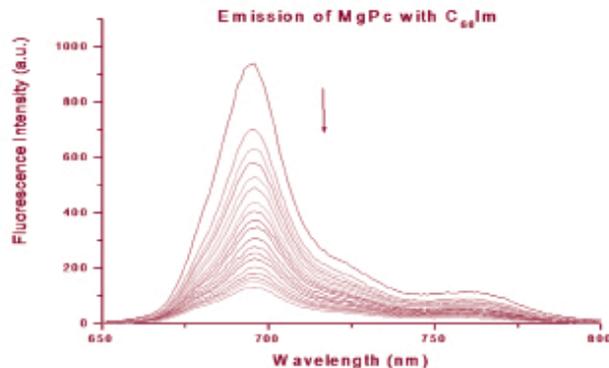


Figure 6. Fluorescence intensities of MgPc in the increasing addition of $C_{60}Im$ in *o*-dichlorobenzene.

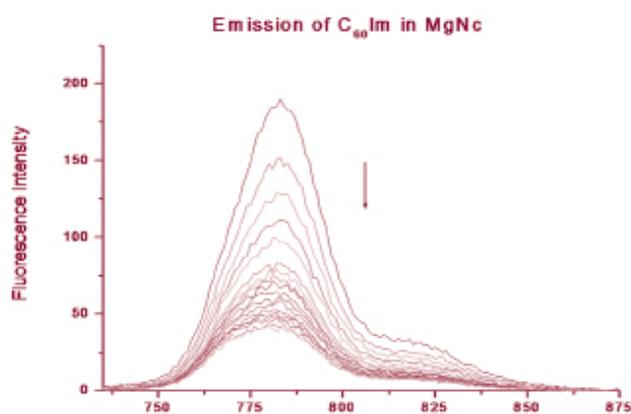


Figure 7. Fluorescence intensities of MgNc upon the increasing addition of $C_{60}Im$ in *o*-dichlorobenzene.

Cyclic Voltammetric Studies

Determination of redox potentials of the newly built donor-acceptor conjugates is important to understand the energetics of electron transfer reactions and ground state interactions. The cyclic voltammetry technique was employed to evaluate the redox behavior of each donor-acceptor hybrid system. The addition of $C_{60}Im$ to MgPc revealed anodic shifts to the first oxidation process of MgPc, attributing complex formation using axial coordination.

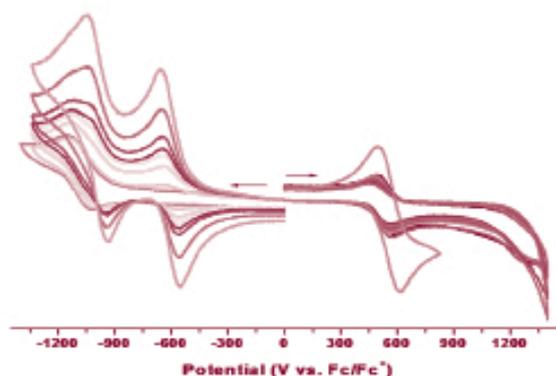


Figure 8. Cyclic voltammogram of the MgPc upon increasing addition of $C_{60}Im$ (0.2, 0.6, 0.8, 1.0, 1.5 and 2.0 eq.) in *o*-dichlorobenzene, 0.1 M (TBA) ClO_4^- . Scan rate = 100 mV/s.

From fluorescence and electrochemical studies the free energy change for electron transfer, ΔG_{ET} , was calculated using the following equation:¹⁶

$$\Delta G_{ET} = E_{1/2}(MgPc^+/MgPc) - E_{1/2}(C_{60}Im/C_{60}Im^{\cdot-}) - \Delta E_{o-o} + \Delta G_s$$

The first part of this equation $E_{1/2}(MgPc^+/MgPc)$ represents the first one-electron oxidation potential of MgPc, whereas $E_{1/2}(C_{60}Im/C_{60}Im^{\cdot-})$ represents the first one-electron reduction potential of $C_{60}Im$. Lastly, ΔE_{o-o} signifies the energy of the *o-o* transition energy gap between the lowest excited state and the ground state of MgPc ($^1MgPc^*$), and ΔG_s is the static Coulomb energy of *o*-dichlorobenzene, which was calculated according to the following equation:¹⁶

$$\Delta G_s = e^2/4 \pi \epsilon \pi \epsilon_o \epsilon_s R_{cc}$$

Computational Studies

Computational studies were performed by using DFT/B3LYP to visualize the molecular geometry and electronic structure of those dyad systems. The optimized energy structures displayed the HOMO, which was located on MgPc and MgNc entities, while the LUMO was located on the fullerene entity. This orbital distribution suggested MgPc/MgNc act as electron donors and fullerene acts as an electron acceptor. The location of HOMO only on the MgPc and MgNc entities and LUMO located only on the fullerene entity also suggest that there is “weak or no charge transfer interactions occurring in the ground state.”¹⁶ Refer to Figure 9 for diagrams on HOMO and LUMO on the MgPc-C₆₀Im dyad.

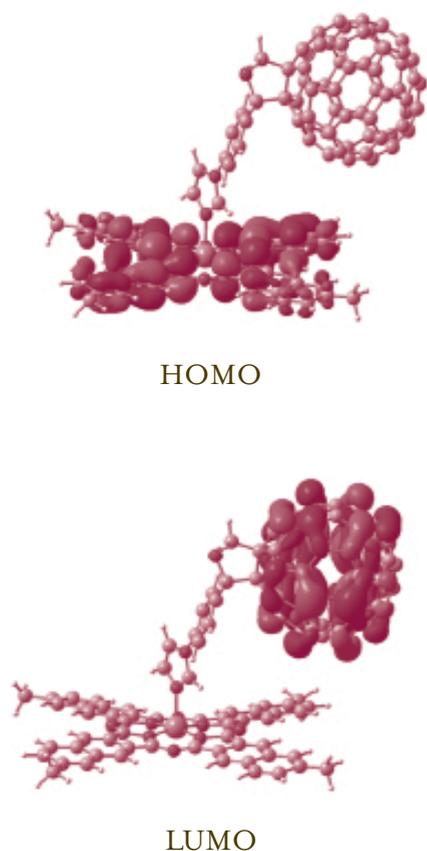


Figure 9. DFT/B3LYP(*) optimized structure of MgPc. HOMO is located on MgPc and LUMO located on fullerene.

Photoelectrochemical Studies

Modification of Nanocrystalline TiO₂ via metal-ligand axial coordination using MgPc and MgNpc

Scientists have been engaged in research on solar cells based on biomimetic principles to produce an alternative renewable energy source. Here, the design and construction of electron transporting nanostructured architectures are pivotal for enhancing both charge separation efficiency to improve the photocurrent response. In the present study, we report the photochemical behavior of sensitizers such as MgPc and MgNc on semiconducting thin TiO₂ film-coated F-doped tin oxide (FTO) electrode surfaces.

The deposition of sensitizer on the semiconducting surface markedly improves the current-voltage (*I-V*) performance of the photoelectrochemical cell through an electron transfer mechanism. Figure 10 displays anodic photocurrent responses of the TiO₂/FTO/MgPc films. The photocurrent responses are prompt, steady, and reproducible during repeated on/off cycles of the visible light illumination.

To evaluate the response of MgPc sensitizer on semiconducting surface toward photocurrent generation, photocurrent action spectrum is compared against the absorption spectrum. The

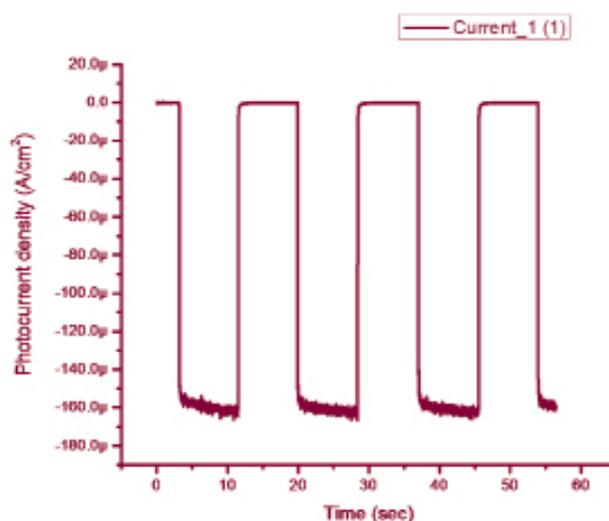


Figure 10. Current switching (*I-t*) of a FTO/TiO₂/MgPc electrode under AM1.5 condition.

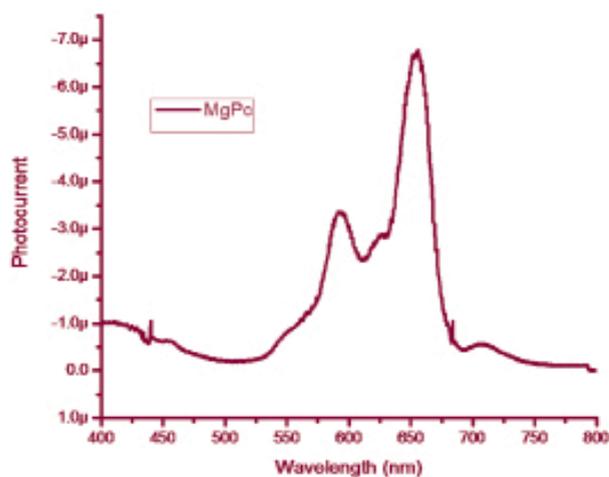


Figure 11. The photocurrent action spectrum FTO/ TiO₂/MgPc.

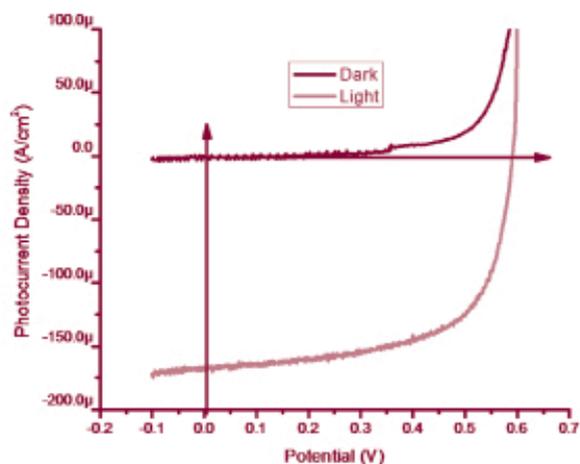


Figure 12. The I-V characteristics of TiO₂/ITO/MgPc.

photocurrent action spectra of the TiO₂/FTO/MgPc devices are shown in Figure 11. The overall responses of the above device parallel the broad absorption features, suggesting the involvement

of MgPc moiety in the photocurrent generation. Figure 12 shows typical I-V plots for sensitizers bound to modified TiO₂. The short circuit current (I_{SC}) generated for MgPc modified electrodes was 0.175 mA/cm² and open circuit potential (V_{oc}) is 0.55 V.

Summary

It was verified that magnesium phthalocyanine, MgPc, and magnesium naphthalocyanine, MgNc underwent axial coordination in supramolecular donor-accepter dyads linking imidazole-appended fulleropyrrolidine, C₆₀Im, as an electron acceptor. Both MgPc and MgNc formed 1:1 dyads with C₆₀Im, which was established from optical absorption and emission and electrochemical methods. The binding constant, K, for MgPc-C₆₀Im was found to be $8.82 \times 10^3 \text{ M}^{-1}$, whereas, for MgNc-C₆₀Im the binding constant was determined to be $8.82 \times 10^3 \text{ M}^{-1}$. The free energy change calculated for MgPc-C₆₀Im was -0.82 eV, obtained from fluorescence and electrochemical studies, which revealed that electron transfer in the dyad was exothermic. The geometric, as well as the electronic structure of the self-assembled dyads, probed using DFT/B3LYP(*) method, implied that the charge separated state is C₆₀Im^{-•}: MgPc^{+•} and C₆₀Im^{-•}: MgNc^{+•}. The action spectrum of photodensity versus time for a dye sensitized solar cell, DSSC, with electrophoretically deposited MgPc on an FTO electrode revealed reproducible results, suggesting high stability of MgPc on the electrode surface. Under an AM 1.5 simulated light, the current density was as high as 200 μA/cm² with a open circuit potential of 600 mV. As a result, MgPc DSSC successfully generated electricity, and similar results are expected for MgNc.

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TRADE IN SERVICES: ENGINEERING AND THE BRIC COUNTRIES



Tayoni Scott, *McNair Scholar*

Clyde D. Stoltenberg, *J.D. Department of International Business & Management, Wichita State University*

Consider the following scenario: I am a global engineer. Therefore, I can consult, as well as fly to another country and conduct business. When a fellow engineer phones from Brazil, China, or another foreign country, I can dispense advice on how to solve a problem. If need be, I will travel to his or her home office. However, according to customs, ethics, and laws, I do have to charge for these services. How am I to charge someone for advice given over the phone, especially when he or she is in another country? Do I charge him or her the same as if I were there? Do I need to charge him or her at all? What if the advice is a brand new idea, which I invented? Do I need to patent the idea before advising it to another engineer?

These questions are answered based on three documents that harmonize the trading of goods, services, and intellectual properties: the General Agreement on Tariffs and Trade (GATT), the General Agreement on Trade in Services (GATS), and the Agreement on Trade-Related Intellectual Property Rights (TRIPs). These documents also raise questions concerning ethical trade: Does one stay within the boundaries of these agreements? What kind of problems do these documents present, if any? Do any of these documents actually protect knowledge, or only products that are seen?

This research will examine these questions, through the eyes of global engineering, but within the specific context of the BRIC countries (Brazil, Russia, India, and China). My hypothesis states that the competitiveness of U.S. engineering firms, in BRIC markets, should be enhanced as a result of the GATT/WTO framework. Analysis on this issue must start with an explanation of the framework, rules, and processes that the GATT has put in place.

THE WTO

The World Trade Organization (WTO) is an organization that supervises, regulates, and liberalizes international trade. It also provides a framework for negotiating and formalizing trade agreements. In addition, the WTO presents itself as a problem-solver, disciplinarian, and enforcer of regulations with respect to participating countries which are bound by WTO agreements, which are approved by representatives of each government involved ("About the WTO"). This organization was officially established on July 6, 1994. Many countries assembled to edit several trade issues and concluded with numerous documents and the establishment of the WTO, but its history began long before then.

The first GATT was established in 1948, following World War II, and many countries convened to set up a few multilateral institutions dedicated to international economic cooperation. There were many disagreements, but eventually the World Bank and the International Monetary Fund were established. Even though these organizations did help with international economic cooperation, they

did not necessarily help establish regulations for trade. Eventually, negotiations began to form the International Trade Organization (ITO). Conceptually, it would be a United Nations (UN) “specialized agency” that would directly deal with trade-related issues, including employment, investment, restrictive business practices, and commodity agreements.

However, the ITO treaty was neither approved by the United States, nor several other countries, and therefore did not come into complete existence. Because of this, the GATT became the only multilateral agreement to govern international trade from 1948 to 1995. It was on January 1, 1995, that the WTO officially commenced under the Marrakech Agreement. This agreement established the WTO when it was signed in Marrakech, Morocco, in 1994; the later assembling of the conference was due to the enforcement of this agreement. Since its inception, the WTO has provided a “unifying institutional umbrella for the [three] different agreements:” the GATT 1994, GATS, and TRIPs Agreements (Collins and Bosworth, 1-2).

The GATT 1994 and GATT 1948 History

The *General Agreement on Tariffs and Trade in 1994* (typically abbreviated as GATT 1994) is a “multilateral agreement governing the international trade of goods or merchandise” (Peng 209). This agreement was originally created in 1948, but the problems it was designed to resolve date back to the mercantile wars of the 1930s. The United States responded to the Great Depression by unilaterally raising its import duties to reduce competition for U.S. firms from foreign producers. Our trading partners responded in kind by raising their tariffs. These conflicts worsened the Great Depression and eventually contributed to World War II. After the war, peace treaties were signed, but there were still problems with international trade, hence the GATT agreement and European regional integration.¹ The GATT provided a framework for multilateral reduction of tariffs to enhance global trade. The GATT and European regional

integration proved to be such a great success that almost fifty years later, these agreements would set the framework for the World Trade Organization (WTO) and the European Union (EU). The Uruguay Round of 1994, the 8th GATT conference held in Punta del Este, Uruguay, helped further define this document, as well as create other agreements and the WTO.

The basic principles of the GATT 1994 are Most-Favored-Nation treatment (MFN), National treatment, Market Access, Definition of Trade, Schedules of Commitments, and Dispute Settlement Procedures. First, *Most-Favored-Nation treatment*, or *MFN*, means the country which is the recipient of this treatment should, nominally, receive equal trade advantages as the most-favored nation by the country granting such treatment (advantages could include low tariffs or high import quotas). Second, *National treatment* essentially means treating foreigners and locals equally. In terms of trade, imports and locally produced goods should be treated equitably, at least after the foreign goods have entered the market.

Two additional principles accompanied the addition of trade in services to the GATT/WTO framework: *Market Access* and *Dispute Settlement Procedures*. *Market Access* for goods refers to what WTO members have agreed upon as the conditions and tariff/non-tariff measures that are imposed upon trade in services. Next, *Definition of Trade* is the specific service that is being traded according to the “modes of supply.” *Schedules of Commitments* are each WTO member’s commitments to open market access to foreign services according to the GATT. Specifically, these are the boundaries to which other countries must adhere. The specific boundaries include how a service can be obtained or given according to the “modes of supply.” The last principle, *Dispute Settlement Procedures*, discusses how a trade-related conflict between nations is resolved. The WTO is the authority in these situations and can assign penalties and compensation to the parties involved.

The first two principles, MFN and National treatment, were part of the original GATT of 1948, and only applied to goods and not services. These principles are further discussed as a comparison/contrast with that of the

General Agreement on Trade in Services (GATS) (see Table I, *Basic Principles of GATT and GATS*). The basic principles are what WTO members have to abide by when it comes to policies that discriminate against foreign goods. The recurring rounds, or conferences, that have taken place in the past six decades have outlined rules and regulations to gradually bring tariffs to an all-time low and also discipline those participating nations that choose to use non-tariff measures. Even though the GATT 1994 helped birth the WTO, EU, and other agreements, it alone would not protect tariff items outside of goods and merchandise. Thus, the GATS and TRIPS were created.

The GATS

The *General Agreement on Trade in Services* (GATS) is similar to the GATT 1994 in that the objective was to liberalize access to markets (Hoekman 85). They both share a basic principle outline (see Table I), are deeply rooted with the subject of tariffs, and one exists because of the other, sharing a commonality of trade and the WTO. However, the GATS takes these similarities to another level. The GATS deals with services, whereas the GATT 1994 only covers the subject of goods. This is a result of policymakers ignoring trade in services up until the 1980s. Because of innovations in information technology (IT), increasing specialization and product differentiation, as well as government policies like deregulation and liberalization, trade in services grew faster than trade in merchandise throughout the 1980s. During this time, global services trade stood at about \$1 trillion, or 21.1% of global trade (merchandise plus services). Because of this, both industrialized and developing countries have seen the relative importance of trade in services increase. However, many of these services are *not* tradable and therefore must contract foreign markets through foreign direct investment (FDI).²

The architecture of the GATS is explained with “two sets of obligations: (1) a set of general concepts, principles, and rules that create obligations that apply to all measures affecting trade in services; and (2) specific negotiated obligations that constitute commitments that apply to those

service sectors and sub-sectors that are listed in a member country’s schedule” (Hoekman 86). These two obligations are the horizontal and sector specific section, which will be discussed later in this essay. The outline of each WTO member’s document has a set of guidelines to which the participating country should adhere. These boundaries are set for the protection of the parties involved, as well as the non-objective third parties that could be affected by any listed service provided. These sectors and sub-sectors usually have the same or similar title for every participating country’s document (i.e. Horizontal Commitments are found throughout all documents). For instance, if an engineer from Wichita, Kansas, U.S.A. wanted to conduct business in Brazil or India, he or she would look under the sub-sector for Brazil to India, entitled Business Services, then continue to Professional Services or any engineering-related service provided (i.e. architecture, IT, machinery, etc.). This would list specific rules and regulations to which one is bound while conducting business in Brazil or India.

Services are defined in the GATS to include any service except for those that are bought by governments (procurement, i.e. military service). The Agreement applies to four “modes of supply:” (1) *cross-border supply* of a service (that is, not requiring the physical movement of the engineer from the U.S. or a foreign country); (2) *consumption abroad*, which refers to possible movement of the consumer to the location of the supplier (this would be a person from a foreign country coming to the U.S. to seek services from an engineer or firm or vice versa); (3) *commercial presence*, refers to services sold in the territory of a WTO member by (legal) entities that have established a presence there but originate in the territory of another WTO member (this is explained when IT services are sent overseas to India from an American engineering firm because of cheaper rates); and (4) *presence of natural persons* indicates the temporary movement of natural persons (this is when the U.S. engineer actually goes to India, Brazil, or any other foreign nation and physically conducts business in that country).

Despite its differences with the GATT, GATS is clearly modeled after the former Agree-

ment. That is, “an attempt was made to agree to general rules and principles relating to trade policies and to obtain country-specific liberalization commitments” (Hoekman 99-100). The above statement is interpreted as “no similarities of policies were pursued,” which is in direct contrast to the TRIPs Agreement. The GATT 1994 and the GATS do not require governments to pursue specific policies; they merely impose disciplines on WTO members regarding the types of policies they may pursue. The TRIPs Agreement differs from the above multilateral trade context: it *compels* governments to take positive action to protect intellectual property rights.

The TRIPs Agreement

The Agreement on Trade-Related Intellectual Property Rights, or TRIPs Agreement, is similar to the GATS in that it also extends the reach of the multilateral trading system to intellectual property (IP), and yet it goes beyond the GATT by addressing investment policies and domestic regulatory regimes, as well as trade policies (Hoekman 85). This agreement also differs from the GATS because the GATS, modeled after the GATT 1994, merely attempts to provide uniform regulations for each country when it came to trade policies and country-specific commitments. The TRIPs agreement specifies and establishes minimum standards of IP protection that have to be agreed upon from all 153 countries within the WTO. In other words, this Agreement is more specific than the GATS and the GATT 1994 because it specifically defines the scope and duration of IP rights and *not* a wide and vague range of goods and services. The TRIPs also differs from GATS in that it is “a much more solid and transparent agreement” (Hoekman 101).

Of course, MFN and National treatment still run strong within TRIPs, as it does in the two previous agreements. However, more substantive obligations are included within this last agreement. Obligations regarding six types of IP are specified, including protection of trademarks, graphical indications, industrial designs, layout designs of integrated circuits, copyright, and patent protection. Like the GATT 1994 and GATS,

there is a measure of enforcement and dispute settlement procedures spelled out in some detail. Hoekman noted that “[T]hose countries seeking protection of IP [need] to have binding and credible enforcement provisions if they [are] to forsake unilateral retaliatory action” (104). Enforcement authority resides in the WTO, and they are once again in authority to assign penalties and compensation to any party involved.

The BRIC Countries and the WTO Agreements

When conducting business internationally, one must look to these WTO Agreements for guidance. Referring to these documents is especially helpful for engineering firms wanting to conduct business with foreign nations, specifically the four BRIC countries (Brazil, Russia, India, and China). These countries are specified because of their fast emerging economies (Peng 13). Most businesses, especially western firms, want to conduct business relationships with these emerging markets in hopes of high return investments. Therefore, like every other country within the WTO, the BRIC countries, with the exception of Russia, have specific guidelines that are outlined and enforced according to the GATT 1994, GATS, and TRIPs Agreements. These documents also have categories, or sub-sectors, based on how the service is provided, such as Movement of Natural Persons, Investment, Commercial Presence, and so forth. Because global engineering services are being used in this context, this research focuses more on the specifics of the GATS Agreement. Each country is shown to have differences when it comes to the extent to which market access is opened, and these are demonstrated in Tables 2, 3, and 4. Each table is narrowed to engineering services, sometimes grouped with business or architectural services.

Even though the BRIC countries have GATS agreements in common, they do in fact have different requirements for trade in services. Each BRIC country, with the exception of Russia, specifies through what “mode of supply” a service must be provided. There is also the difference of limitations for each country when

it comes to market access and national treatments. Even though Brazil, Russia, India, and China are linked as developing economies that are ripe for investing, they have to protect themselves from those who want to take advantage of them. This protection is made possible when each WTO country identifies the extent to which it has opened access to its market by foreign service providers for each mode of delivery.

Through each one of these documents, regulations are set, and even sometimes, open to interpretation; however, each document is drafted the same way, with similar sectors and sub-sectors. The actual title of each document is "Schedule of Commitments." The "commitments" in a member's schedule "set out the levels of liberalization that have been undertaken in a given sector," meaning that these commitments are promises and binders of how liberal or conservative a country wants to be when it comes to trade in services ("Business Briefing: Trade Policy"). A schedule begins with two parts: the horizontal and the sector-specific sections. In the horizontal section, a country often lists economy-wide limitations, which apply to all sectors included in the schedule. For example, restrictions on the ability of foreigners to own land or permanently stay in another country are listed in this area. This section is designed to avoid repetition and is often referred to throughout the document with "except as indicated in the horizontal section."³ These limitations are listed by column and by mode, which will be discussed in greater detail below. It is important to note that some restrictions may apply to only one mode of supply, whereas others may affect more than one or all modes. Also, the horizontal limitations apply to all services sectors that follow it, unless otherwise specified.

The second part of a member's GATS agreement is known as the sector-specific commitments in a schedule. This list of commitments is described and then classified according to the United Nations Provisional Central Product Classification list (usually referred to as CPC or UNCPC) ("Business Briefing: Trade Policy"). This area of the document is where a person can find the service that is being traded. For

instance, engineering is most likely found under "Business services."

These two parts are then divided up into four columns that are labeled "Sector or sub-sector," "Limitations on market access," "Limitations on national treatment," and "Additional commitments." The first column specifies the sector or sub-sector concerned (i.e. Business services, Communication services, Financial Services, etc.). This section is where one would look to officially deem whether or not an engineering service is "allowable." The second column sets out any limitations of market access under the four "modes of supply" (cross-border supply, consumption abroad, commercial presence, and presence of natural persons). The third column contains any limitations of national treatment with the same "modes of supply" listed above. This column usually has no restrictions except where indicated in the horizontal section. After all, every WTO member is supposed to treat others equally when it comes to trade (i.e. discriminatory tax measures or subsidies, or residency requirements). The last column provides the opportunity to post additional commitments concerning the sector or sub-sector subject. Usually, additional commitments relate to qualification, technical standards, licensing requirements, or procedures and/or other domestic regulations.

It is important to note the terminology that each schedule contains. When "none" is entered into either the market access or national treatment columns, in any mode, it means that the country in question does not maintain any of the relevant limitations. A "partial" commitment is undertaken whenever a country inscribes one or more limitations under the relevant sector entry of its schedule for any given mode. "Unbound" is usually entered into either the market access or national treatment columns, in any mode, and means that the country retains full discretion to introduce measures inconsistent with either market access or national treatment. Other than that, a country has made no commitment in the particular sector or mode.

The BRIC Countries and their GATS Agreements

The BRIC countries are thought to be the most important developing economies. The Central Intelligence Agency adds that these countries are among the most influential in the world: Brazil is fifth, Russia is ninth, India is second, and China is first ("Country Comparison: Population"). Brazil was admitted into the WTO on January 1, 1995. This was the official first commencement of the WTO; therefore, Brazil is one of the oldest members of the World Trade Organization. As a senior member, it has an extensive trading history with many other countries, including the United States of America. Brazil's economy, although still developing, is diverse and strong. It stands as the eighth largest economy in the world, and has major exports including aircraft, electrical equipment, automobiles, and ethanol (*World Economic Outlook (WEO): Rebalancing Growth*). Even though these products are exports, some services for these products can be imported. For instance, if a U.S. engineer is needed for consulting, this is still considered trading services. It might not be that the engineer is physically in Brazil, but he or she offers a service that will be compensated. This service would have to be checked by Brazil's Schedule of Commitments (see Table 2). One can see that, according to this table, this service has no set boundaries that either party must abide by. Instead, they are allowed to conduct their business worry-free. This is shown with "unbound" in the section of cross-border supply, under market access and national treatment limitations. This means there are not any restrictions at this time for engineering business to proceed.

The Russian Federation is not a part of the World Trade Organization, although negotiations for its admission are underway. Economic growth in Russia was bolstered at the turn of the century due to rising oil prices, increased foreign investment, higher domestic consumption and greater political stability. The country ended 2007 with its ninth year of growth, averaging 7% annually since 1998. The Gross Domestic Product in services surpasses China and India with

60.5% (Brazil is 68.5% in the service sector ("Russia")). These facts are encouraging the rest of the world to trade with Russia despite its not being a part of the WTO; therefore, the regulations in the GATT, TRIPs, and especially the GATS, do not apply to Russia. This means other countries can choose whether or not to show favoritism.

India shares several similarities with Brazil, membership details being among them. India was also admitted into the WTO on January 1, 1995. Since then, India has become one of the fastest-growing economies in the world. It averaged an annual GDP (Gross Domestic Product or the total of a country's overall economic output) rate of 6.5% for 2009, the second highest growth in the world among major economies. Also, India has made wise financial decisions in the past with cautious banking policies and a relatively low dependence on exports for growth (thus escaping the brunt of the 2008 global crisis) ("India"). In 2009, the Global Competitiveness Report ranked India 27th in business sophistication and 30th in innovation (both areas that cover engineering services). Seven of the world's top 15 technology out-sourcing companies are based in India, and the country is viewed as the second most-favorable outsourcing destination after the United States (I70-I71). According to India's GATS agreement, almost everything is unbound except for a commercial presence in the market access column (see Table 3). This area on the document reads "Only through incorporation with a foreign equity ceiling of 51 percent." This means that the most equity a foreigner can own is 51% of any of the services he or she either outsources or dispenses, meaning that most services are unbound except where indicated in the horizontal commitments.

China is the third largest economy in the world (*World Economic Outlook (WEO): Rebalancing Growth*). This is a result of its economic transition over the past 30 years. It moved from a centrally-planned system, which was largely closed off from international trade, to a more market-oriented economy that is rapidly growing ("China"). However, to protect itself, China has included extremely specific boundaries in its GATS agreement. For example, when it comes to

Professional Services (i.e. Engineering Services, see Table 4.1), only joint ventures are allowed; almost nothing is solely owned.² The only exception is that within three years of China's accession to the WTO, wholly foreign-owned enterprises were permitted. Unfortunately, this rule ended on December 11, 2004. However, through these exceptions, China has become one of the leading players in the global economy.

Engineering and International Business

The GATT 1994, GATS, and TRIPs Agreements are vital to business firms, especially those that choose to participate in international business. Among these firms are engineering businesses such as Black & Veatch and Burns & McDonnell. These businesses, of course, must adhere to rules and regulations that are outlined by the above agreements.

This research was conducted to benefit those who wish to harmonize engineering and international business. Through findings of the National Academy of Engineering, many facts are made known that will help understand the rapid increase of globalization, offshore engineering, and whether or not one should take part in this rapidly growing experience. First, offshore engineering, "an inevitable aspect of globalization," has become more popular in the last decade. This is especially true in the areas of IT-related industries (software, semiconductors, PC manufacturing, etc.) (1-2). This, in turn, has made engineers, as well as a number of other professionals, the source of international competition. To ensure that the United States stays in the "race of globalization," policy makers need to have a firm understanding of changes in comparative salaries, education levels, language skills, productivity, and other trends and their causes. Second, "offshoring appears to have contributed to the competitive advantage of U.S.-based firms in a variety of industries, and the negative impacts of

offshoring on U.S. engineering appear to have been relatively modest to date" (2). Cutting costs was the initial motivation for offshoring, but now with countries like Brazil, Russia, India, and China, western firms want to establish a presence in a rapidly growing economy. Third, the U.S. has a competitive edge with engineering education at the undergraduate and graduate level. Because the United States remains the best trained and most flexible in the world, other countries are forced to make significant efforts to upgrade their engineering education capabilities (3). Therefore, the U.S. engineering enterprise should consider supporting programs and other approaches that help engineers manage their careers, renew and update their skills, and sustain their capabilities to innovate, create and compete. Finally, the U.S. needs to sustain its core strengths (to continue attracting and retaining world-class engineering activities); further its studies and discussions on offshoring (for a better understanding of potential benefits and costs such as immigration policies); and address security concerns related to the offshoring of engineering (especially for the IT and construction industries) (3-4).

Conclusion

In conclusion, engineering and international business are harmonized within this study. A particular focus was added with a detailed look at how the GATT, GATS, and parts of the TRIPs Agreements can be used if an American engineer is considering doing business in a BRIC country. Many issues must be taken into consideration: the principles of the above agreements; whether or not the country is a part of the WTO (i.e. Russia is not); how one is to interpret certain guidelines; and if the boundaries set can be pushed and to what limits. This research has also included facts from the National Academy of Engineering that reveal how the offshoring of engineering can be beneficial and inspiring for engineers, as well as students everywhere.

Notes

1. *European regional integration* is the process of political, legal, and economic integration of states wholly or partially in Europe. Today, this has primarily come about through the European Union (EU) and the Council of Europe.

2. A *Foreign Direct Investment*, or *FDI*, is defined by Mike W. Peng as “directly investing in activities that control and manage value creation in other countries.” He notes that this is long-term participation by country A into country B. An FDI usually involves participation in management, joint-venture, transfer of technology and expertise. According to Hoekman, services account for a large share of the total stock of inward FDI in most host countries. Therefore, this is not surprising that as of the early 1990s, about 50% of the global stock of FDI was in service activities alone (86).

---a joint venture is a form of FDI: a legal entity formed between two or more parties to undertake an economic activity together. This entity can be split 50/50 or at an unequal.

3. “...except as indicated in the horizontal section” refers to a statement commonly seen within GATS Agreements. The statement refers the reader to look for exceptions under the sector entitled “Horizontal Commitments.”

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Tables and Figures

Table 1 Basic Principles of GATT and GATS

	GATT	GATS
Most-Favored-Nation Treatment	Requires that a contracting party provide any GATT member treatment no less favorable than that accorded to any other supplier of the same product when imposing tariffs or applying regulations regulated to the entry/exit of goods into/from its territory.	Identical to GATT obligation. A major difference is the one-time possibility to exempt specific industries from the Most-Favored-Nation (MFN) obligation when signing the agreement, an option that does not exist under the GATT.
National Treatment	Requires that foreign goods, once they have entered into the territory of a contracting party—having satisfied whatever customs formalities are applicable, including the payment of customs duties and/or other charges—be treated no less favorably in terms of taxes and measures with equivalent effect than domestic firms.	Same as GATT, except that the obligation only applies to service sectors and subsectors that a country decides to list in its schedule of commitments (see below). Even then, the obligation only applies to the extent that the country does not list policies that violate national treatment in its schedule.
Market Access	No obligations exist.	Six types of measures are in principle prohibited for sectors that are included in a country's schedule, unless the measures are listed. Most of these measures are regulatory policies that apply equally to foreign and domestic firms.
Definition of Trade	Agreement applies only to cross-border trade.	Agreement applies to four modes of supply, including investment.
Schedules of Commitments	Each country must provide a list of its tariffs to the GATT. In principle these are "bound," that is, tariffs cannot be raised above the level listed in its schedule of concessions without incurring a penalty.	Each country must list the sectors to which it will apply the national treatment and market access obligations, subject to whatever measures it seeks to maintain that will violate these obligations. Scheduling commitments implies that these are bound. Modifications to schedules require compensation to be "paid."
Dispute Settlement Procedures	GATT and GATS share a common dispute settlement mechanism under the WTO. Cross-retaliation is possible, that is, non-implementation of a panel decision pertaining to one area may lead to retaliation being authorized in another.	

Table 2
Brazil's Schedule of Specific Commitments

Modes of Supply	Limitations on market access	Limitations on national treatment
Cross-border supply	Unbound	Unbound
Consumption abroad	Unbound	Unbound
Commercial presence	Same conditions as Architectural services (this section is further explained in the research commentary of this paper)	None
Presence of natural persons	Unbound except what is specified in horizontal commitments (this section is further explained in the research commentary of this paper)	Unbound except what is specified in horizontal commitments (this section is further explained in the research commentary of this paper)

Table 3
India's Schedule of Specific Commitments

Modes of Supply	Limitations on market access	Limitations on national treatment
Cross-border supply	Unbound	Unbound
Consumption abroad	Unbound	Unbound
Commercial presence	Only through incorporation with a foreign equity ceiling of 51 percent (this section is further explained in the research commentary of this paper)	None
Presence of natural persons	Unbound except as indicated in the horizontal section (this section is further explained in the research commentary of this paper)	Unbound except as indicated in the horizontal section (this section is further explained in the research commentary of this paper)

Table 4.1
China's Schedule of Specific Commitments: Professional Services—Engineering Services

Modes of Supply	Limitations on market access	Limitations on national treatment
Cross-border supply	None for scheme design Co-operation with Chinese professional organizations is required except scheme design	None
Consumption abroad	None	None
Commercial presence	Only in the form of joint ventures, with foreign majority ownership permitted.	Foreign service suppliers shall be registered architects/engineers, or enterprises engaged in architectural/engineering/urban planning services, in their home country.
Presence of natural persons	Unbound, except as indicated in horizontal commitments (this section is further explained in the research commentary of this paper)	Unbound, except as indicated in horizontal commitments (this section is further explained in the research commentary of this paper)

Table 4.2
China's Schedule of Specific Commitments: Construction and Related Engineering Services

Modes of Supply	Limitations on market access	Limitations on national treatment
Cross-border supply	Unbound	Unbound
Consumption abroad	None	None
Commercial presence	<p>Only in the form of joint ventures, with foreign majority ownership permitted. Within three years after China's accession to the WTO, wholly foreign-owned enterprises will be permitted. Wholly foreign-owned enterprises can only undertake the following four types of construction projects:</p> <ol style="list-style-type: none"> 1. Construction projects wholly financed by foreign investment and/or grants. 2. Construction projects financed by loans of international financial institutions and awarded through international tendering according to the terms of loans. 3. Chinese-foreign jointly constructed projects with foreign investment equal to or more than 50 percent; and Chinese-foreign jointly-constructed projects with foreign investment less than 50 percent but technically difficult to be implemented by Chinese construction enterprises alone. 4. Chinese-invested construction projects which are difficult to be implemented by Chinese construction enterprises alone can be jointly undertaken by Chinese and foreign construction enterprises with the approval of provincial government. 	<p>None, except for the following:</p> <ol style="list-style-type: none"> (a) The existing registered capital requirements for joint venture construction enterprises are slightly different from those of the domestic enterprises. (b) Joint venture construction enterprises have the obligation to undertake foreign-invested construction projects. <p>Within three years after China's accession to the WTO, none.</p>
Presence of natural persons	Unbound, except as indicated in horizontal commitments (this section is further explained in the research commentary of this paper)	Unbound, except as indicated in horizontal commitments (this section is further explained in the research commentary of this paper)

RESEARCH SUMMARIES



DIGGING BENEATH THE SURFACE: ANALYZING AND UNDERSTANDING URBAN CONCENTRATED POVERTY AMONG AFRICAN AMERICANS IN KANSAS

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The epidemic of urban concentrated poverty in African American communities has existed for many years, and it remains a complex and multifaceted issue. Scholars have identified numerous causes that have contributed to this problem including: the lack of opportunities, enactment of poor governmental policies, negative cultural perceptions, racial discrimination, segregated neighborhoods, lack of education, lack of access to resources, racial isolation, and recession and global competition. Additional factors also perpetuate the “cycle of poverty.” It is evident from the large number of studies and perspectives that there is not a sole cause for the multi-generational economic disadvantages among blacks. This project explores the reality and roots of multi-generational poverty within the African-American community in Kansas.

Using “The State of Black California 2007” report as a model, this research examined the economic standing of African Americans in five Kansas counties: Leavenworth, Johnson, Sedgwick, Shawnee, and Wyandotte. These counties were chosen because they contain the largest African American populations. In order to create an economic index, this study uses a variety of key measures, including household median income, unemployment rate, and poverty rate. Obtaining the raw data from the U.S. Census Bureau 2006-2008 and the Kansas Department of Labor reports for 2008, this research compares the findings for blacks, Asians, Hispanics/Lati-

nos, and whites and used the location quotient formula to create a weighted average index and determine the economic status for each group. Ultimately, these numbers were used to determine the overall economic standing for each racial group. This study synthesizes the data gathered with an extended literature review to help facilitate analysis and concludes with some policy proposals to improve the socio-economic standing of African Americans in Kansas.

Various scholars have explained the pervasiveness of black urban poverty by looking at racial segregation, government policies, neighborhood effects, family structures, lack of education, and unemployment/underemployment. These theories are applied to the case study of Kansas, looking at Johnson, Leavenworth, Sedgwick, Shawnee, and Wyandotte counties. The explanation for urban concentrated poverty among blacks (in general) also explains black poverty in Kansas.

The results of this research show that although African Americans have made extraordinary strides in obtaining civil rights and access to education, they are still more likely to be less educated than whites and experience significantly higher rates of unemployment and poverty. In every county, with the exception of Wyandotte, blacks have the highest poverty rate. The findings also show that blacks earn the least amount of household income of any racial group (in every county). It is important to note that Asian household median income (\$82,133) in John-

son County was several thousand dollars higher than white household median income (\$77,129). Additionally, black household median income (\$52,605) in Johnson County was nearly a third less than Asian household median income. Interestingly, black household median income in Johnson County was only about one thousand dollars higher than the household median income for Latinos (\$51,011).

These findings are particularly troublesome because they highlight the fact that many black Kansans are in dire economic situations. This is indicative of a disturbing trend: rapidly increasing urban black poverty. Although blacks have been in the U.S. longer than the above mentioned minority groups, they are still at a greater disadvantage. The data clearly displays the vulnerable economic state of African Americans.

The results suggest that multigenerational poverty among African Americans in Kansas is driven by numerous factors including: racial segregation, racial discrimination, government policies, neighborhood effects, weakened family structures, lack of opportunities, lack of education, and unemployment/underemployment. As indicated in the results, the economic disadvantage of black Kansans is a pervasive problem. Solving this problem will require Kansas’s leaders to implement an aggressive approach that involves state and local governments. Additionally, involvement by educators and the faith-based community will be crucial to achieving this goal. Eradicating poverty among blacks will demand multiple efforts on various fronts. In order to

achieve progress in addressing this issue, local leaders must develop a long-term perspective.

Drafting legislation to strengthen primary and secondary education in Kansas’s public schools will lay a solid foundation that is essential to increasing high school graduation rates among black students. Achieving this objective will require increases in both government funding and parental involvement, especially in school districts with high levels of minority enrollment. A greater emphasis must also be placed on obtaining post-secondary education. A college education is central to gaining the skills and credentials needed to secure higher paying jobs and lucrative careers.

Another important objective that must be met is comprehensive workforce development. This training will help equip African Americans with the job skills needed to compete in an ever-shrinking, global market. Additionally, well-trained workers will be assets to employers across Kansas. An increase in highly skilled workers will attract more businesses to Kansas, thus increasing the number of employment opportunities for all Kansans. Because of the rapidly growing global marketplace, meeting this objective is critical and demands diligent effort.

The pervasiveness of urban concentrated poverty among African Americans in Kansas is a complex social issue. It is clear that the underlying cause of this crippling poverty stems from various sources. In order to eliminate it, community, local, and state intervention must take place. All Kansans must be involved in stopping and preventing the destruction of our collective future.

Table 2: Income

Income measurements for households in Kansas.

Household Median Income		Johnson	Leavenworth	Sedgwick	Shawnee	Wyandotte
	Asian	\$82,133	\$76,860	\$57,462	\$53,313	\$44,497
	Black	\$52,605	\$40,602	\$26,472	\$27,703	\$29,922
	Latino	\$51,011	\$54,868	\$37,488	\$29,843	\$33,419
	White	\$77,129	\$61,598	\$52,828	\$50,877	\$45,804

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RATING AGENCIES AND THE SUBPRIME MORTGAGE CRISIS

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In looking at the rating agencies and their ratings of residential mortgage backed securities (RMBS), it became apparent that one needed to also look at the deteriorating quality of the underlying mortgages. After the fact of the crisis, it is apparent that mortgage qualifications were lowered and subprime mortgage loans were on the rise. According to Adelson (2008), who stated that “there is a clearly discernable trend of deteriorating subprime loan quality that starts in late 2005 and runs into 2007,” this deterioration contributed to the recent crisis. The use of ‘low-doc,’ ‘no-doc,’ and adjustable rate mortgages was also a contributor. Increasingly, securitization was used to increase the credit of the subprime borrower (Adelson, 2008). These issues tie back to the lenders that made the subprime loans.

Securitization, on the other hand, leads to the rating agencies. The rating agencies deserve some of the fault as well because, without investment grade ratings, the large fund investors would not have been able to purchase these securities. Large fund investors are required to purchase only those investments with ‘AAA’ to ‘BBB’ ratings. Any rating lower is off limits to investment by these funds. The rating agencies are those who give out investment grade ratings to high-risk investments.

The rating agencies have tried to deflect the fault from themselves. Ashcraft quotes a Stan-

dard & Poor’s spokesperson as saying in 2006, “our ratings represent a uniform measure of credit quality globally and across all types of debt instruments... a ‘AAA’-rated corporate bond should exhibit the same degree of credit quality as a ‘AAA’-rated securitized issue.” This quotation makes one wonder if the rating agencies suspected more than they were willing to admit. If so, they were right, because the crisis really hit in 2007. ‘AAA’-rated securitized issues do not behave the same as ‘AAA’-rated corporate bonds. “Subprime ABS (asset backed securities) ratings rely heavily on quantitative models while corporate debt ratings rely heavily on analyst judgment” (Ashcraft, 2008). Quantitative models are non-numeric models. Using non-numeric models for investment purposes is a scary way of investing when looking for numeric gains.

Some have written papers on exactly how the model used for valuing these securities was figured. Others have looked at what can be done to improve the model. No consensus yet exists for the improvement of the model, though most do admit that it is flawed. Future research needs to be done on how the rating agencies justify the rates given to the subprime securities and how the model can be improved, as well as what the public can do to help avoid the same mistakes in the future. As a society, we need to understand what precipitated the recent crisis in order to avoid the same pitfalls in the future.

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WARMTH AND EDUCATIONAL DIFFERENCES BETWEEN EURO-AMERICAN AND LATINO FAMILIES

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Many problems in the American educational system, including high dropout rates and poor test scores, may be due to the growing populations of minority children in the schools. The fastest growing minority population is the Hispanic/Latino; however, the current school system is designed mainly for Euro-American children (Eirzen, Zinn, and Smith, 2009). Most, if not all, Hispanic/Latino students are the children of immigrant parents and face growing up in a country with unequal opportunities as a result. For example, California passed a proposition eliminating bilingual education in public schools in 1998 (Eirzen, Zinn, and Smith, 2009). Hispanics/Latinos are shown to have the highest dropout and lowest completion of high school rates than any other minority (Fry, 2002).

Research on Latino families has focused on how their culture defines education and the importance of being educated. Two reviews indicated that education or *educacion* has definitions that are culture specific to Latinos. *Educacion* is being well-mannered, ethical, righteous, and respectful, as well as obtaining a good academic education (Reese, Balzano, Gallimore, & Goldenberg, 1995). Azmita & Brown (2002) similarly indicate that Latino parents stressed the importance of the "good path," which expressed behavioral ideals for their children, as well as high achievement in schools. Having respect for others, being moral, having strong values, avoiding

bad influences, exhorting good work/education ethic, getting married, and making a family are essentials for following a good path. This perception of education has a heavy influence on how Latino parents rear their children, because it puts the values of being a good person before getting ahead in life. This perception reflects the parents' positive, warm and nurturing qualities because it emphasizes being a good person. Familial and community ties, as well as economics, seem to be the reasons of less commitment to traditional colleges for Latino students (Fry, 2002).

Guilamo-Ramos and colleagues (2007) described Latino parenting styles as authoritative, with high levels of demand and responsiveness to instill confidence and competence in both genders of children, but still give freedom and warmth to their children. This article went on to explain similar virtues of a good path in parenting styles but focused more on discipline techniques and outcomes. Latino parents favored an authoritarian style of parenting, but did not follow it in that they instead focused on having a warm and accepting relationship with their child. They felt importance in building a good relationship, explaining parental decisions, and making time to talk (Guilamo-Ramos et al., 2007). This parenting style makes room for children to misbehave without consequence, as well as disrespect or not listen to their parents in tasks that are difficult for them to follow.

Learning how to read, write, and do arithmetic is the foundation of what is taught in all

schools. These skills are obviously simpler for a person to grasp if they are a native speaker of the language in which they are being taught. Davis-Kean & Sexton (2009) found that higher parental expectations for academic success were a strong predictor for achievement in all groups except Hispanic. This may mean that parental expectations in Hispanics are not a good predictor of achievement because these students may have parents who do not know the system well. Reading in kindergarten was a good predictor of children's third grade achievement for all groups in the study, including Euro-American, Hispanic, African-American, and Asian-American (Davis-Kean & Sexton, 2009). These data imply that early education predicts later achievement, and it is important to focus on early education because it is so powerful.

Solutions for some of the educational gaps for Hispanic/Latino, or minority students in general, would be to continue allowing bilingual education programs like ESL or TOELF courses, which are already established in most schools with high numbers of bilingual students (Henderson, 1997). Another solution would be to prohibit legislation that promotes segregation or racism or determine laws that will affect the powerless. Creating a system which is less biased and promotes an equal opportunity for all students is another possible solution for the educational gap, in accordance with Reese, Balzano, Gallimore, & Goldenberg's (1995) study. The creation of programs for parents to be more involved in their children's education has also been shown to have influences on child academic achievement, as mentioned in Davis-Kean & Sexton (2009).

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OLD GREENSBURG: THE ECONOMIC DEVELOPMENT OF GREENSBURG, KANSAS

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On May 4, 2007, the town of Greensburg, Kansas, was devastated by an EF5 tornado. With 95% of the town destroyed, the residents decided to rebuild their community as a Leadership in Energy and Environmental Design (LEED) certified, environmentally-sustainable city.

Many have suggested that this decision will provide the economic boost needed to help rejuvenate the town's economy. Some, however, have questioned whether or not the community's economy was in as bad a state as the community leaders indicated. A careful examination of census data and records, however, reveals a steady decline in population, employment, and income.

Statistics show Greensburg's population was at its highest peak in 1960, with 1,988 people. From then on, the population began to decline. By 1990, Greensburg had lost 196 residents, resulting in the population being 1,792 people. The population continued to decline from 2000 to 2005, resulting in the population being 1,398. According to the U.S. Census, Greensburg's average age is noticeably higher than the Kansas and U.S. averages. When compared to Kansas and the United States, the 2000 U.S. Census makes it clear that Greensburg was below average in its average household income, average house value, its number of college students, and the percentage of the population that obtained a bachelor's degree. With the population steadily declining, it can be concluded that people were either dying or were simply leaving.

	1990	2000	2005
Population	1,792	1,574	1,398

Source: U.S. Census Bureau, 1990 Population Estimates, Census 2000, 2005 Census

The first oil well was drilled in Kiowa County in 1917. Since the oil was discovered, there were most likely as many oil-producing wells as there were gas-producing wells. The industry grew to approximately 500 oil and gas wells, with the numbers being equally divided. In order to make gas move faster, it was necessary to have processor stations, commonly known as booster stations. The development of these stations eliminated a number of jobs that were previously performed by people rather than machines. Additionally, in Kiowa, the first wheat crop was raised in 1876. In the beginning, soil erosion caused by wind and water was a major issue. In the 1930s, there was a unified effort made to save Kiowa's soil. In the 1950s, commercial fertilizers of nitrogen, phosphate, and other nutrients were applied to the tired land of Kiowa County. With the new fertility, large crops of soybeans, corn, milo, and wheat were not unusual for the county. Livestock development also became outstanding. Throughout the years, technological advancements eliminated jobs that would usually need man-power, like planting, harvesting, and cultivating. These could now be done by one person and a machine, which may have resulted in employees being fired or laid off.

From 1999 to 2005, there were more deaths of businesses than births, which supports evidence of a decline in the economy preceding the tornado of 2007. The lost businesses ranged from construction to retail trade and educational services to Health Care & Social Assistance.

From 1990 to 2008, the labor force steadily decreased, while the number of people unemployed and the unemployment rate increased.

Based on the evidence presented, it can be concluded that Greensburg was facing a loss of its

economic base due to the fact that its population was steadily aging and the younger population was either leaving to pursue college or experience life outside of a small town. The decline can also be credited to the development of more advanced technologies, which displaced many workers and left them without jobs. To the already small and steadily declining population, this only quickened the economic decline. There was really no other option, but for Greensburg to go green in order to survive.

Year	Business Births	Business Deaths	Difference
1999	7	10	-3
2000	6	4	+2
2001	9	8	+1
2002	7	7	0
2003	7	9	-2
2004	5	10	-5
2005	4	5	-1
Total	45	53	-9

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NEW GREEN: WHY DID GREENSBURG, KANSAS, DECIDE TO REBUILD THE TOWN GREEN AFTER THE TORNADO OF MAY 4, 2007?

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Tornado watches in South Central Kansas are not uncommon. It is, after all, the heart of Tornado Alley. So when the forecast on May 4, 2007, called for terrible weather in the Kiowa County area, most residents thought little of it. At approximately 9:52 p.m., an EF5 tornado terrorized the town for 12 minutes, devastating the community with golf ball-sized hail and winds of up to 200 miles per hour. Almost two miles wide, the tornado leveled 95% of the town and killed 11 people. Most were left homeless, completely displaced by the storm.

In the wake of such gross devastation, the residents of Greensburg were faced with a difficult choice: to leave their lifelong homes or to rebuild their community. When she heard that the community intended to rebuild, Kathleen Sebelius, who was governor of Kansas at the time, proposed the idea of implementing a restoration plan that was environmentally friendly and sustainable. After much deliberation, the town decided to move forward with this strategy and drafted a document that came to be known as the "Master Plan," which outlined the town's 20-year plan for rebuilding.

With its new dedication to environmentalism, the town decided to construct every home and building to LEED Platinum standards. LEED, which stands for Leadership in Energy and Environmental Design, is a rating system that was developed by the United States Green Building Council (USGBC) to evaluate

the environmental performance of a building and promote market change toward sustainable building. Platinum is the highest standard of certification, and in order to achieve this rating, Greensburg established a wide and varied set of environmentally sustainable practices. These practices are focused into two primary categories: energy efficiency and conservation and sustainability.

In order to render the town more energy efficient, the community built the Greensburg Wind Farm, which consists of 10 wind turbines that are 350 feet tall, with 210-foot blades. These turbines produce enough energy to power all of the commercial and residential facilities in the community. In addition, as homes are continuing to rebuild, they are outfitted with a number of small devices and appliances that help to conserve energy. The list is long and varied, but one of the most prominent examples is the lighter-colored roofs, which helps a house to run more efficiently, thereby decreasing the amount of energy required to power it, which in turn reduces the air pollution emitted by nuclear and other power facilities. Another example is appliances, such as toilets, that reuse water. Similarly, the town has used a number of strategies to increase the long-term sustainability of these buildings by constructing them from materials which are either eco-friendly or have been produced from recycled materials. These products include such things as carpeting that has been made with renewably sourced material.

Despite some objections from community members, reconstructing the town in a sustainable fashion has significant benefits. The use of Insulated Concrete Forms (ICF) in the construction of homes and businesses will protect the town from winds of up to 200 miles per hour.

This material is also sustainable and eco-friendly, which is better for the local eco system. The community is now equipped to deal not only with another major natural disaster, but also to grow and develop with longevity that will preserve the surrounding environment for years to come.

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EVALUATION OF THE WICHITA STATE UNIVERSITY RONALD E. McNAIR POST BACCALAUREATE ACHIEVEMENT PROGRAM

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The Ronald E. McNair Post Baccalaureate Achievement Program is a federally-funded program that provides academic assistance to low income, first generation and under-represented students in post-secondary education to assist them in attaining a graduate level degree, ultimately a doctoral degree. The program provides a wide range of services such as tutoring, academic counseling, an opportunity to conduct research with a mentor and present at academic conferences, and financial assistance. The McNair Program was developed in honor of Ronald E. McNair, Ph.D., physicist and missions specialist aboard the space shuttle *Challenger*. He was an astronaut and held three honorary degrees, as well as a fifth-degree black belt in karate.

The Wichita State University McNair Program began in 1995 with Deltha Q. Colvin's and Larry Ramos's joint effort. Colvin, who was the author of the grant, hoped that the McNair alumni would return to their hometowns after graduate school, and give back to their communities. She also hoped that this program would increase the number of minorities with doctorate degrees. Larry Ramos, who was the first director from 1995 – 2001, said that the program was slow in starting, but was up and running within a year. As of Summer of 2010, the McNair Program has served more than 200 students.

The McNair Program has been evaluated statistically on a national level, in terms of graduation rates, employment outcomes, and satisfaction

and expectations of the participants, but the impact of McNair services have not been evaluated by the participants themselves. The purpose of this evaluation was to find what services kept the students engaged in the program and what services had the most impact on their academic lives. This evaluation also sought service need and areas of improvements. The study was composed of mixed methods, including both quantitative and qualitative. Surveys were issued to both current and past participants. The questions were separated into six subheadings: Participation, Program Impact, Research Mentors, Service Use, Recruitment, Demographics and Degree Attainment. One hundred three surveys were mailed out (both electronic and paper copies); 52 responded with a 52% response rate. Validity and reliability of the surveys was established through a panel of experts, and by consistency in answering the responses respectively. Interviews were conducted with the directors, staff, and the author of the grant to help determine what the staff thought were important aspects of the program and to formulate questions for the survey. Responses were reported as percentages. Overall, the results were positive: respondents found the mentoring component to be the most useful of services provided, with a 72% positive response. Continuing with the research component, the majority of respondents also indicated that the research component was well-structured (83%); they were taught effective research skills (86%); enjoyed research activities (85%); and had help complet-

ing the research project (70%). The majority of the respondents (59%) have maintained contact with their mentors, after the completion of their projects.

In the section on program services, the top effects of the McNair services were listed as

conducting a research project (80%), academic counseling (64%), and research seminars (64%).

This data will potentially help improve the WSU McNair Program and ensure that the McNair participants are getting the assistance they need to successfully pursue doctoral level studies.

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A CASE REPORT ON THE IMPACT OF STRUCTURED PHYSICAL ACTIVITY ON FITNESS AND QUALITY OF LIFE ON MULTIPLE SCLEROSIS

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Introduction

The purpose of this case study was to design an exercise program that would enhance all physical components for Multiple Sclerosis (MS) patients and, at the same time, possibly alleviate the negative physical and mental declines associated with MS. Multiple Sclerosis is an autoimmune disease that attacks the myelin sheath, an insulating layer that coats the axon nerve and spinal cord and conducts electrical impulses to and from the brain, stimulating muscular movement (“Autoimmune,” n.d.). Symptoms of MS include tingling or numbness of the face or parts of the body, lack of balance in walking, and memory problems, such as difficulty retaining information and concentrating (“Signs and Symptoms,” 2002). The most common type of MS is Relapsing-Remitting Multiple Sclerosis, which affects 85% of the MS population (“Four disease courses,” n.d.). Symptoms associated with this type of MS include acute attacks, which are equivalent to flare-ups or a relapse of ongoing symptoms (“Acute Attacks,” 2010).

In the treatment of MS, there are two primary kinds of therapy: physical fitness and rehabilitation. There are four components of physical fitness, which include cardiovascular endurance, resistance training, flexibility, and balance and coordination. A study conducted by Coote & Hogan, suggested that aerobic exercise training is one of the most effective physical activities for persons with MS. “The purpose of aerobic exercise,” suggested J. Kileff and A.

Ashburn (2004), “is to increase overall activity and cardiovascular effort, prevent general muscular weakness, and reduce health risks due to deconditioning and disuse of muscles,” and in MS patients, it helps to improve walking speed, gait parameters, disability, fatigue and quality of life (p. 166). The most preferred type of training for patients with MS includes upright leg cycle ergometry and arm cycle ergometry (Durstine & Moore, 2009). In addition, resistance training reduces muscle atrophy and improves muscular endurance and strength. In a study by Surakka et al., the first three weeks of resistance training improved knee flexion in women, which helped increase walking speed (Surakka, Romberg, & Ruutianen, 2004). Research by Stroud & Minahan, indicates that forms of resistance-based exercise programs decreased cytokine profiles, which are associated with fatigue in some individuals with MS (Stroud & Minahan, 2009). Furthermore, flexibility can be used to help patients with MS obtain a complete range of motion (ROM) in joints. This is done primarily through stretching, of which there are three kinds: Ballistic, Static, and Proprioceptive Neuromuscular Facilitation (PNF) (Durstine & Moore, 2009). The recommended type of stretching for MS patients is a combination of static stretching and PNF stretching. With this combination, the patient is able to accomplish full ROM.

Besides physical activity, there are several rehabilitation and treatment programs that are available to help MS patients. These programs

include physical therapy, occupational therapy, speech language therapy, neurophysiology, and vocational training (“Rehabilitation,” n.d.). Physical therapy includes stretching, strengthening, and range of motion exercises, while occupational therapy includes training on how to use adaptive devices that simplify tasks (“Rehabilitation,” n.d.). Speech pathologists are able to evaluate problems with speech and swallowing; neurophysiologists can provide treatments that will help with MS patients’ declining of thinking and reasoning, and vocational trainers provide training for mobility and assist in job placement (“Rehabilitation,” n.d.).

Methods

The participant used for this case study was a 56-year-old caucasian female who was diagnosed with Relapsing Remitting Multiple Sclerosis in 1986. She approached the Center for Physical Activity and Aging (CPAA) Director, Dr. Ruth Bohlken, about the possibility of participating in a CPAA exercise program that could alleviate the negative symptoms associated with MS.

The subject was tested using Rikkli and Jones Functional Fitness tests designed for older adults. This type of testing “measures physiologic parameters using functional movement tasks, such as standing, bending, lifting and walking” (Rikli & Jones, 2001). The functional fitness tests consisted of chair stands, arm curls, back scratch, chair sit-n-reach, and 8-foot-up-and-go. In addition to the Rikkli and Jones Functional Fitness tests, the Berg Balance Scale (BBS) was also used to test balance and coordination skills. After pre-testing was completed, the Modified Fatigue Impact Scale (MFIS) was used to measure her fatigue. Post-exercise training assessments were performed following 20 weeks of training.

The subject participated in a group exercise class 5 days a week. Mondays, Wednesdays, and Fridays, the subject began with a 10-15 minute warm-up that included stepping in place to increase the heart rate and static stretching. The main exercise focused on resistance training with Badger weight machines. The subject performed one set of 10 to 12 repetitions using the inner/outer thigh exercises, overhead press, leg curls,

leg press and lat pull downs. The subject also focused on balance and core training with Thera-band exercise balls. The exercise balls were used to improve balance, core, and muscle strength. Bicep and tricep curls were completed with 3.3 to 4.4 pound soft weights, while the subject was sitting on the ball. The exercise session ended with 10 to 15 minutes of PNF stretching that focused on all of the major muscle groups.

Tuesdays and Thursdays the subject participated in a Flex & Tone class, which also included a 10 to 15 minute warm-up. In a group format, the subject was able to perform standing, sitting, supine and pronated exercises. These exercises allowed the subject to perform a variety of exercises using several types of exercise equipment including weighted bars, resistance bands, soft weights, dumbbells, and medicine balls. The exercises lasted 10 to 12 minutes and each exercise had 30 repetitions. At the end of the exercise session, flexibility training was performed using static types of stretching, 10 to 15 minutes, of all the major muscle groups, holding each for 10 to 30 seconds. The participant was encouraged to hold each stretch to the point of mild discomfort.

Results

Results indicate an improvement in Arm Curls, 30-Second Chair Stand, and Back Scratch, which indicates an improvement in upper and lower body strength. Results of the Chair Sit-and-Reach indicated that the participant was at high risk for falling. For the 8-Foot-Up-and-Go test, the participant completed three trials for this test and was considered to be in the risk zone after pre-testing was conducted. The Modified Fatigue Impact Scale had a choice of five answers; collectively the participant answered 0-2 to the majority of the questions, which indicated that the participant was at a low level for fatigue. Results indicate that each test score from the Berg Balance Scale is measured from 0-4. The total came to 49 and 50, with the participant being at low risk for falling. The results came out the same for both pre-testing days. Results indicate no change between pre- and post-test measurements. The participant

was able to complete pre-testing cardiovascular measurements using the YMCA submaximal cycle ergometer test. Pre-testing measurement estimated VO_2 max to be 39ml/kg/min, which is in the normal range. Post-testing for cardiovascular measurements was incomplete as the participant requested the testing to stop.

Discussion

Although the participant completed the pre-test VO_2 max test, the post-testing was not completed due to fatigue, which is a major symptom associated with MS. However, there was improvement in muscular strength. With the 20-week resistance training program, the participant improved in Arm Curl, 30-Second Chair Stand, and Back Scratch. The participant also made improvement in balance and coordination, which is considered to be a major risk factor for persons with MS. The participant did not have any declines in balance and coordination between the pre-testing and post-testing, which is significant because some studies lose volunteers due to

symptom exacerbations. Despite these improvements in muscular strength and endurance, it was evident that the participant needed improvement in flexibility. The warm-up and cool down session of the exercise program focused on static and PNF stretching. With these stretches, the participant was able to improve the test results; however, she is still considered to be in the risk zone on the left side.

Conclusion

In conclusion, the participant with Relapsing-Remitting Multiple Sclerosis improved significantly. The 20-week exercise program improved the participant's muscular strength, flexibility, and balance and coordination. Although the test results were in the risk zone for the flexibility component, there was still an improvement. Further research needs to include all components of physical fitness. With the improvements in these components, the participant has an improved quality of life, as well as physical fitness.

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BLACK STUDENTS ON PREDOMINANTLY WHITE CAMPUSES: GREEK LIFE AND THE CO-CURRICULAR EXPERIENCE

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Phi Beta Kappa and other Greek letter-bearing organizations have been a part of the American college campus life since the mid-1700s. Many Black students felt uncomfortable when they joined the White Greek-lettered organizations, so groups of Blacks joined together to found their own organizations. The Black Greek movement emerged and provided Black students with the opportunities to earn scholarships, develop leadership skills, and achieve personal growth. Yet even today, some Black students are not aware of what Greek-lettered organizations entail, because Black students are often unseen in upper-office positions. In fact, many non-members do not feel that these organizations benefit the campus community, but evidence shows that Black students who give back to the community have the opportunity to make necessary changes within their environments, enabling them to succeed.

Traditionally, White Greek Organizations had incorporated policies that hindered or set restrictions upon Black students. In 1903, Alpha Kappa Nu was founded to give African-Americans a voice. Lack of participation caused this organization to last only a few years, but it did pave the way for future Black organizations. Sigma Pi Phi is the oldest Black fraternity still in existence today. It began as a professional, non-college organization to bring upper-class Black men together. Today this organization has over 5,000 members and 112 chapters throughout the world. They help guide students and teach

leadership, interpersonal communication, and community service, as well as develop social skills and provide help with academics for students. The fact that organizations such as this provide students with such invaluable skills suggests that there is a continued need for Black Greek Organizations, and this should not be overlooked. They serve or provide a primary outlet for student engagement. Without these organizations, some Black students may not find a place for self expression and development.

African-American students' involvement in such organizations is a critical factor in student satisfaction, which is key to retention. Students who describe themselves as being satisfied with academics, social integration, and spiritual activities on predominantly white campuses, which are used to measure satisfaction, are more likely to stay in school or at the university. Thus, exposure to or participation in honor societies and social functions will prove to be a great asset for African-American students, enabling them to join other organizations, which could be key to their getting involved in their community.

Why, then, does it seem that Black students are opting out of co-curricular experiences at predominately White institutions? Research suggests that African-Americans are, in fact, participating in a wide variety of co-curricular experiences outside of the classroom, but that many of the groups to which they belong may not be considered mainstream organizations. In addition, the size of these organizations may

cause them to be overlooked, especially if the group meets off campus. This suggests that, though it may appear that African-Americans are isolated, they now have a wider variety of choices

available in terms of the co-curricular experience, allowing them to participate in organized groups or pursue their own interests.

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THE CAUSES OF DIVORCE: A DEEPER LOOK AT WHAT CAUSES DIVORCE WITHIN THE AFRICAN AMERICAN AND CAUCASIAN COMMUNITIES

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The divorce rates in the United States have steadily increased over the past several years, begging the question of what causes couples to conclude that their marriage is no longer sustainable. Have they forgotten what marriage is over the years? Have they settled for divorce since it seems to be the norm in today's society? According to Carrie Yodanis, a marriage culture includes beliefs, assumptions, and practices that marriage is given and forever. A divorce culture, in contrast, is a set of beliefs and practices that define marriage as optional and conditional, with divorce being an option if the marriage does not work (Yodanis, 2005). The purpose of this research is to compare and contrast the causation and rates of divorce of the African-American and Caucasian communities, if any, and to provide couples with access to resources needed to mend their marriages.

The goal of this research project was to gather baseline data that describes and explains the causes of divorce among the African-American and Caucasian communities. This includes couples' experiences going through divorce and their explanations of the factors that caused their marriages to dissolve. A literature review was conducted, and the information gathered during that process was then used to design a survey. After the Office of Research Administration for the Protection of Human Subjects granted permission, the survey was administered to Wichita State University students using the SONA Experiment Participation System.

The survey consisted of several questions

asking the participants about demographics, such as if the participant was currently single, married, separated or divorced. The survey also asked participants who were divorced what they believed were the causes of their marriage's dissolution. The survey took approximately 20 minutes to complete. The survey was kept confidential, and the students were not required to participate in the study. There were two requirements to participate in the survey: to sign a consent form and to be 18 years of age or older.

After the surveys were collected, they were analyzed. The participants for this study were 51 college students who attended Wichita State University. The main participants for this study were either African-American or Caucasian students who were currently married, newly separated or divorced. The average age was 22 years, with the youngest participant being 18 years of age and the oldest 50 years of age.

The research did not reveal a distinct difference between the causes of divorce in the African-American community compared to the Caucasian community, and so one can conclude that the causes of divorce are universal within each ethnic community. The first section of the survey asked for the participant's demographics, in which 57% of the participants were Caucasian, 23% were African-American, and the remaining 20% were participants from other ethnic backgrounds and will not be discussed.

The study tested several factors that cause divorce such as getting married at a young age,

infidelity, finances, domestic violence, and several other factors. Participants were to answer if any of the factors listed resulted in divorcing their spouse.

After running a Chi-square test on the data and receiving the frequencies for the data, results show that getting married too young, financial instability and communication had the highest frequency rate among both the African-American and Caucasian communities. Furthermore, participants felt as though they were not well-prepared for marriage. In individual responses, several participants indicated that their main determination for divorce was not being able to communicate with their spouse. In individual responses, several participants pointed out that there was constant arguing between the couple. Also, 31% of participants indicated that they should have engaged in taking premarital counseling prior to getting married.

There were several limitations throughout this study. A number of the participants that contributed to this study were either not married or have only been married for less than a year. In addition to the skewed responses, the age of participants consisted of the average age being 22, with an outlier of 55 years of age. Also, the participants who were single answered survey questions as to what they believed would be the main reason that couples would divorce. Married participants were mainly newlyweds and at the time of the survey, were not considering divorce. Participants also answered

survey questions on why they believe couples get divorced. Also, other limitations within the study were the overwhelming responses from the Caucasian community rather than the African-American community. Over half, 57%, of the responses received from the survey were from the Caucasian community, with the African-American community accounting for 24% of total calculations.

Future recommendations for researching this topic would be to have individuals from both the Caucasian community and African-American community that have been divorced or recently divorced answer survey questions as to why they believe their marriage did not last, and to answer survey questions about what they believe would have made their marriage stronger and last. Also, with having such information, we will be able to develop programs that would be beneficial for couples that are dating, engaged or newlyweds to participate in.

In conclusion, this study does not illustrate significant results that there are differences in the divorce rate between the African-American community and the Caucasian community. Although divorce affects the African-American community more, the reasons for divorce are universal throughout each ethnicity. This study does illustrate the need for premarital programs, such as premarital counseling, finance classes, and communication exercises that are available within each community so that couples will be more prepared to partake in the joys and complexities of marriage.

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EYE MOVEMENT DESENSITIZATION AND REPROCESSING: A SURVEY OF PRACTITIONER'S ASSESSMENT OF THE TECHNIQUE

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Eye Movement Desensitization and Reprocessing (EMDR) is a therapy that was first proposed by psychologist Francine Shapiro in 1987 (EMDR Institute, Inc., 2004). Since EMDR's conception, there has been controversy over its effectiveness and efficiency. Many believe that EMDR is most useful in the treatment of Posttraumatic Stress Disorder (PTSD) (EMDR Institute, Inc., 2004). PTSD is a disorder that can develop following a traumatic event that threatens one's safety or makes one feel helpless. (Diagnostic and Statistical Manual of Mental Disorders, 4th Edition TR). This disorder is often associated with battle trauma in soldiers, but any traumatic event, such as rape, natural disasters, car or plane crash, kidnapping, violent assault, or sexual or physical abuse can trigger this disorder (Post-traumatic Stress Disorder (PTSD) Symptoms, Treatment, and Self-Help, 2007).

This survey was designed to address the issue of therapist's perceptions of the effectiveness of EMDR in their practice. Although the survey is largely descriptive, a general set of hypotheses was tested: It was hypothesized that survey respondents would find that EMDR was differentially effective based on therapeutic discipline, level of training, length of experience, type of client, client issue, and treatment setting.

This research was conducted using an online survey of clinicians that use EMDR in their practice. This sampling process produced a nonrandom sample of convenience, also called a purposive

sample. There were 23 clinicians originally contacted, five men and 18 women, 13 clinicians in all completed the survey.

EMDR is perceived as having variable capabilities depending on the client's problem (Kolk, 2007). Different practitioners and disciplines vary in their use of this approach based on the type of client, client problem, and therapeutic setting.

EMDR is thought to provide the brain with ways to reprocess and store trauma in a more appropriate way (Maxfield, 2002). The focus and efficiency of the therapy makes it an attractive method of treatment because of its goal of reducing the intensity of the emotions and feelings that ensue following trauma. Although there is some doubt concerning the long term effects of EMDR, research regarding its use revealed that a significant number of clinicians find it to be a strong treatment and would use it in the future (Tatyana Biyanova, 2009). EMDR involves recalling a stressful past event and "reprogramming" the memory in a positive light of a self-chosen belief, while using rapid eye movement to facilitate the process (EMDR Institute, Inc., 2004).

There are eight steps used in the process of EMDR: History, Preparation, Targeting, Reprocessing, Installation, Body Scan, Closure, and Re-evaluation. All of these steps are essential to the success of this therapy. Although there are many steps to the process, it works more quickly than some of the other therapies, such as Cognitive Behavior Therapy (CBT).

EMDR has been applied to a wide range of client types and issues. Wagner suggested that the therapy is able to help with “phobias, generalized anxiety, paranoid schizophrenia, learning disabilities, eating disorders, substance abuse, and even pathological jealousy” (2006), but its main application has been in the treatment of post-traumatic stress disorder (PTSD). Despite this, EMDR is not for every client. The trained therapist knows after working with the patient whether or not this form of therapy will be beneficial. The client, though, makes the final decision as to its use or not. For some clients, Cognitive Behavioral Therapy may be a better fit. In fact, research shows that both forms of therapy are about the same as far as the success they have on clients. One difference with EMDR in relation to other

forms of therapy is that the client does not need to discuss the traumatic events in detail, which might be appealing to some clients.

In the 23 years that EMDR has been in existence, it has proven itself a competent and substantial rival to other types of therapy. It is a therapy that has relevance and promise for the treatment of PTSD and other types of trauma a person might experience. The research of this study revealed that clinicians who were currently using EMDR therapy in their practice found the therapy to be both effective and efficient. Clients responded well to its usage and, for the most part, understood its process. Studies such as this might help focus on the areas and issues of greatest effectiveness, and prompt reflection on ways to improve the techniques to aid clients in the future.

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INVESTIGATING CROSS SECTIONS

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Introduction

Analysis on data taken from the Main Injector Particle Production (MIPP) experiment at Fermilab has been ongoing since 2005. MIPP is a fixed target particle collision experiment designed to improve existing interaction data. Data gathered by MIPP will have many applications to particle physics, such as non-perturbative quantum chromodynamics (QCD), cross sections, and verifying a scaling law of hadronic fragmentation [1]. Because of the scope of the experiment, analysis can be arduous and lengthy. Many precautions are required so that results can withstand scientific scrutiny. The research presented in this paper not only seeks to verify the scaling law, but also hopes to validate results produced by the MIPP experiment.

The Detector

What gives the MIPP experiment the ability to have a profound impact on current interaction measurements is the detector. Experiments in the past used outdated bubble chambers, which can add significant errors and inconsistencies to measurements. The MIPP detector uses four charged particle detectors, two massive electromagnets, electromagnetic, and hadron calorimeters, and drift chambers. Together, these components make a robust detector with the capability of high-resolution particle identification (PID) and three-dimensional reconstructions of events.

Verifying Data

As mentioned earlier, many precautions must be taken to guarantee we are producing accurate results. One such precaution involves transforming data into the center of momentum (CM) relativistic reference frame and confirming momentum symmetry for proton-proton interactions. All observations of the physical universe are conducted in reference to something else. Because of this, we can change reference frames so it appears as though the beam and target are moving toward each other with the same momentum. The symmetries in momentum seen before the collision should hold after that as well.

One technique used for analyzing MIPP data involves a Monte Carlo simulation. This method generates random events using data from old experiments, like the ones mentioned earlier, and uses them as input for the simulation. This input data is called truth. Truth data is then run through a geometrical simulation of the detector. The output from running truth data is called reconstructed data. Using this information, detector efficiency can be achieved by comparing truth and reconstructed track multiplicities.

Applying a Lorentz transformation in the center of momentum reference frame on truth Monte Carlo data should yield perfectly symmetric results for proton-proton collisions. If so, it would show that the Monte Carlo is properly calibrated. Results displayed a lack of symmetry for momentum. This is cause for suspicion. Right now, it is undetermined whether or not this is

due to the Monte Carlo or some other error. If the problem is resolved, it will add more validity to the MIPP experiment.

It has been discovered that total charged track multiplicities between truth and reconstructed data for a given event disagree. It was suggested that the decay of neutral particles can account for the lack of agreement. After applying this suggestion, the tail did not disappear as expected. Because of this, other measures have been taken to achieve agreement between truth and reconstructed charge track multiplicities. If this problem is not fixed, it can cause significant errors to the cross section analysis.

Cross Sections

Cross Sections come in two varieties exclusive and inclusive. MIPP seeks to locate the latter of the two. Inclusive cross sections give the probability of an interaction occurring without worrying about all particles produced. Using Monte Carlo data, we are capable of determining the efficiency of the detector. Recognizing this, we can adjust for particles that may have been missed during the experiment. This adjust-

ment is called acceptance. It is also necessary to adjust results due to interactions that may not have occurred between the beam and target. This is possible by subtracting empty target data from full target data. Finally, the MIPP experiment produces differential cross sections based on momentum and $\cos\theta$ of particles produced. Making these adjustments, we can calculate the final cross sections.

Conclusion

Achieving adequate results takes a large amount of time and effort. Investigations such as transforming data in the CM frame and resolving discrepancies between truth and reconstructed charged track multiplicities are necessary when validating results produced by MIPP. As of now, cross sections for carbon interactions are preliminary and require fine tuning in both PID and acceptance. Current cross section code is being adjusted to implement an improved method of particle identified called global PID. The code is also being modified to use a more robust version of acceptance. Publication of the results found by MIPP are expected in the near future.

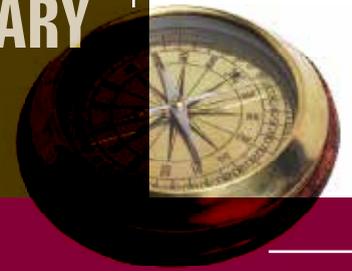
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MALE ATTITUDES TOWARD WOMEN AND WOMEN'S STUDIES COURSES: PRELIMINARY RESEARCH ON THE IMAGE AND REALITY OF GENDER EQUALITY IN THE U.S.

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Many Americans like to believe that contemporary society has reached a state of gender equality—the time of gender discrimination has been laid to rest. There has been limited research conducted on gender in the household and workplace in order to test whether the image of United States' society as one in which gender equality has been achieved actually matches the reality of men and women's lives. The literature suggests that a more complex picture of gender emerges in terms of household and workplace equality than that of the popular image. According to a U.S. House of Representatives subcommittee report in 2007, in roughly 80% of families with two parents, both parents work, and 75% of all mothers, single or married, work. An AFL-CIO report stated that in 2004, women earned 80.4% as much money as men. Because men and women earn different amounts, as well as have different goals for themselves, they also have different fallback strategies. They also face different challenges in both the workplace and at home.

Women's studies courses help to bring light to these challenges, as well as encourage students to help "right the wrongs" of an unequal society. Taking such a class has been shown to have positive effects on students, increase awareness of male privilege, and increase women's identification of themselves as feminists. Among the many research studies done with college students, few have dealt with the issue of male college students' attitudes toward women's studies courses. Because

of the lack of information published on this topic, it is difficult to say whether those attitudes might be positive or negative. For this reason, it is imperative to pursue this topic. An example of how to pursue this topic further would be to conduct a survey. For future research, the author would survey male students at his own university, Wichita State University in Wichita, Kansas, where women's studies classes are offered. According to its website, the Center for Women's Studies at Wichita State is "one of the longest-standing, degree-granting, and autonomous women's studies centers in the country." The length of the program suggests the rich history of women's studies on the campus. At universities where the women's studies programs have been introduced more recently, the results may differ because newer programs may be viewed with more ambiguity or even hostility. Surveys would be offered to the entire population of male college students at Wichita State University. Survey Monkey would be used to email all currently registered male students. An email would be sent to the entire male student body with a link to the survey and a request for participation. The survey would investigate two basic research questions: first, what barriers to taking women's studies courses might exist for male students?; and second, if male students have taken a course, how do they think the courses impacted their attitudes toward the contradictory picture and persistent inequalities outlined above.

The research results might be beneficial to the developers of women's studies courses and

departments in addressing the male students' viewpoints of those courses. Developers might use research results to design or market curriculum with outreach to male students in mind, as well as to document that male students gain an understanding of gender inequality from taking women's studies courses. By surveying male students at a large Midwestern university, the body of research would be increased. Gaining the male perspective is an important step toward com-

pleting the body of knowledge that encompasses women's studies as a whole, as well as students' attitudes about women's studies courses and who should take them. Conducting research in this area is vital to understanding it. When we more clearly understand the area of women's studies, we will be able to more effectively and more efficiently cultivate the equality of women in the United States and worldwide.

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ASSESSING THE EDUCATIONAL ASPIRATIONS OF MIDDLE AND HIGH SCHOOL STUDENTS

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There have been numerous studies that document the ways in which the aspirations of young ladies can be impacted by a variety of factors. These factors can have either a positive or negative impact on the course of young ladies' goals. A study by Roth and Brooks-Gunn, for example, suggests that parental influence drops significantly during the teenage years, and this leads to teenagers spending most of their time alone. This isolation is a state which they must come to face as young adults, who perceive themselves as not needing the care of others. This can be detrimental to the aspirations of these children, as it may derail their paths to success.

Using a mixed-methods approach, a survey was administered to young ladies participating in the Upward Bound Wichita Prep and Talent Search Programs. These programs, funded by the United States Department of Education, are designed to assist low-income and first-generation students to attend college. The Upward Bound Program focuses specifically on helping students develop the skills necessary to be prepared for college entrance, increasing the rate in which partici-

pants complete secondary education and enroll in and graduate from post-secondary institutions. The goal of the Talent Search Program is to increase the number of youth from disadvantaged backgrounds who complete high school and enroll in and complete their post-secondary education.

There were a total of 45 female participants. Of the participants, 29 were Black, 4 Asian, 7 Hispanic, 3 American-Indian, and 4 of the students reported being multiracial. The participants were low-income and first-generation. The surveys were administered during the summers of 2009 and 2010, with the 2009 survey being administered individually and the 2010 survey being administered to the participants as a group.

The results of this study indicated that, though a variety of factors can impact the course and development of a young woman's aspirations, a single, primary cause of that change cannot be pinpointed. The combination of a variety of factors can, however, have a significant influence on young women. Further research is needed to identify which factors can and/or should be targeted in order to help young women maintain healthy aspirations.

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