

# DISCUSSIONS

The Case Western Reserve University Undergraduate Research Journal

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WATER HEATING  
SYSTEMS**

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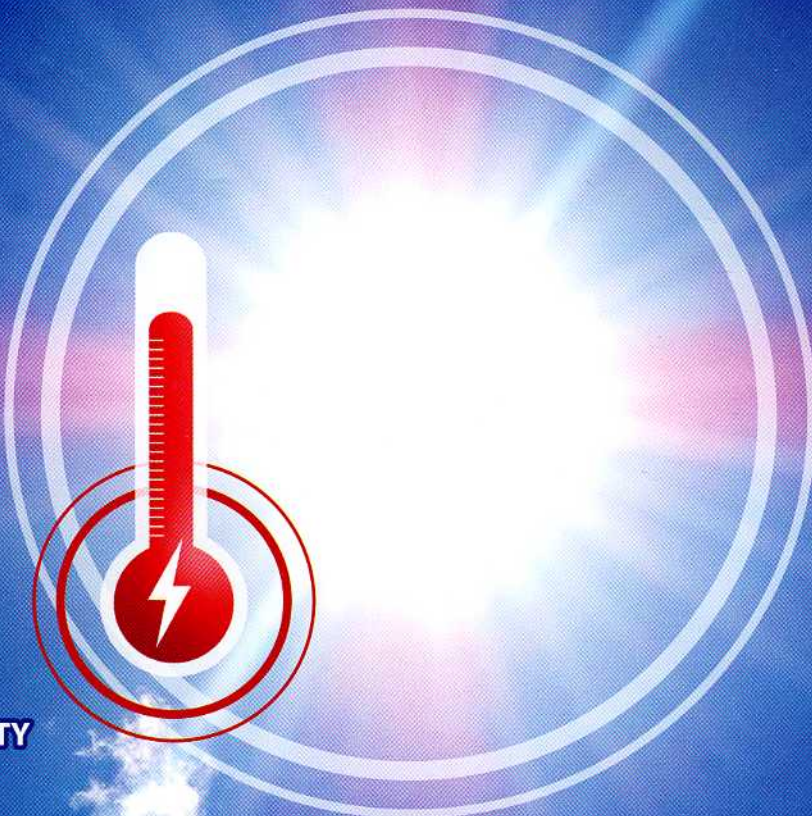
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# DISCUSSIONS

Case Western Reserve University Undergraduate Research Journal

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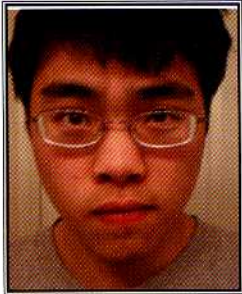
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## LETTER FROM THE EDITOR

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Dear Readers,

First of all, if you are not familiar with our publication, Discussions is Case Western Reserve's undergraduate research journal. It is our goal to make known to a wider audience the incredible work student researchers have done and will continue to do. As Case Western School of Medicine garners national attention for its work on reversing Alzheimer's symptoms, one wonders how today's student researchers will affect the world with their future work.

I would like to remind you that we accept papers from any discipline and from any university. This semester's submission deadline is **March 19th**. To submit a paper, visit our website: <http://www.case.edu/provost/source/discussions/>. The instructions for submission are there. The last three pages of the journal include this information and more.

Also, if you are interested in Discussions but haven't done any original research, contact [discussions@case.edu](mailto:discussions@case.edu). We are always looking for new members. No research experience is necessary, and there are different levels of commitment. As a general reviewer, you are only required to attend a couple of meetings a semester. Our copy editors attend these meetings as well as work with the selected authors on refining their papers. The executive board puts in the most time, and after this year, there will be several spots that need filling.

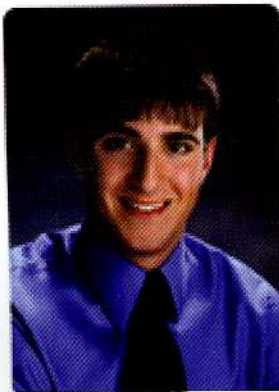
I personally remember signing up for Discussions my freshman year at the activities fair. At the time, I had no idea what Discussions would be like. The organization immediately grabbed my attention because I wanted to become more knowledgeable about research. As a graduating senior, I can say my time with the journal has impacted my life. Since starting off as a reviewer, I have learned to copy edit, was an advertising chair for a year, and have been the editor-in-chief for a year and a half. With my experiences, I have gained an understanding of the research process (which has been useful for my own lab work) as well as worked on my leadership skills. Also, I have gotten to know amazing people who have either worked or published with the journal.

During my last semester, I have excitedly watched as new members are stepping forward into active roles in the organization. I can't wait to see where the publication is headed. On this note, I would like to thank everyone who has helped with the journal in any way: Media Board for being a wonderful home for Discussions, fellow graduating seniors Jugnu Shreshtha and Tom Tee, and our insightful, helpful advisor Sheila Pedigo. Also, thank you for picking up this issue and hope you enjoy it!

Cheers,

Bharathi Muthusamy, Editor-in-chief





Steve LaDelfa

Steve is a fourth year undergraduate at Case majoring in Chemical Engineering and minoring in Environmental Studies. He is a member of the CWRU Cross Country and Track team. He is active in the Student Sustainability Council. He hopes that his research will encourage others to look at renewable energy.



Matthew Moss

Matthew Moss is a senior studying Philosophy and Environmental Studies at CWRU. He is active in the Student Sustainability Council and the Case Crew Team. After graduation, he wishes to study environmental science and policy, and start a career managing and constructing policy wherever necessary. In his free time he enjoys the outdoors, particularly rowing on the Cuyahoga river.

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## FEASIBILITY OF SOLAR THERMAL WATER HEATING SYSTEMS ON CASE WESTERN'S CAMPUS

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### ABSTRACT

Solar energy is an abundant and free resource that is available to all who have the space and capital to install the appropriate system to capture and convert the energy into a useable form. Solar thermal water heating systems are one way to use the thermal energy from sunlight to heat domestic water for a variety of uses. Current conventional systems that utilize coal or gas generate significant amounts of pollution that can be offset or even eliminated by this technology. Solar thermal systems can be expensive and complicated to install, and as such, require in depth analysis, significant preparation, and proper planning ensuring effective use of such technology. In order to determine the feasibility and cost-effectiveness of a solar thermal system on Case Western Reserve University's campus, we conducted an investigation into a variety of collectors and a detailed analysis of the potential performance of such systems using simulation software and first-hand accounts of professional installers and manufacturers. In addition, we also questioned companies with functioning solar thermal systems on the efficacy of their installed systems. We found that the technology was feasible for our location (Cleveland, OH), and the effectiveness (and return on investment) of solar thermal depended upon the average daily hot water demand and specific method of water heating in the desired building. Thus, we conclude that this technology is potentially beneficial in the long run pending hot water metering and specific site evaluations conducted by the appropriate professionals.

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### -Acknowledgments-

We would like to thank Gene Matthews, Director of Facilities Services for his sponsorship and guidance on this project, as well as Professor Philip Taylor for his support and advice throughout the summer. We would also like to acknowledge the SURES program, especially the work of Sheila Pedigo and Bethany Pope and also the CWRU's Director of Sustainability Stephanie Corbett. Many others outside the University aided us in our research, including Mike Heise from the MCCo as well as several installers, such as John Vanderhorst of EnerWorks and Jeff Burns from Dovetail Solar.



## Introduction

There are many ways to obtain this energy in the modern era, from more common resources such as coal and natural gas to less common resources such as the Sun. According to the National Renewable Energy Laboratory (NREL), Ohio receives enough solar energy capable of being harnessed by the appropriate technologies (NREL 2011). This is evidenced by the presence and success of photovoltaic systems currently in place not only on this campus (Case Western) but several other locations (including the Great Lakes Science Center), and solar installation companies such as SunRock Solar, ARP Solar and Dovetail Solar, among others. Companies such as these mentioned service homes and businesses in the greater Cleveland area as well as many other parts of Ohio.

Specifically, college campuses use energy to heat water for showers, research labs, cooking, and cleaning. As it pertains to this campus, Case Western Reserve University, this energy comes from coal-fired steam. In an attempt to lessen the demand for coal-fired steam, solar thermal water heaters potentially offer a cost-effective, carbon-neutral way to obtain the energy necessary.

Barbara Snyder, President of Case Western Reserve University, recently signed the American College and University President's Climate Commitment to Sustainability as a part of the Association for the Advancement of Sustainability in Higher Education (AASHE). This made the University's goal to become Carbon Neutral by 2050. Utilizing these solar thermal technologies is one way to achieve our goal of carbon neutrality.

## Experimental Background

### Solar heating systems

The systems we explored consisted of three different types of panels: Flat plate, compound parabolic trough, and evacuated tubes. Respectively, these are the Heliodyne's GOBI flat plate, Enerworks' HeatSafe flat plate, Solargenix's Winston Series Compound Parabolic Concentrator, and Apricus' evacuated tube collector.

Heliodyne's GOBI flat plate collector (fig. 1) is a panel consisting of a surface with an absorptive coating attached to copper piping that runs through several channels along the underside of the surface. The panel is also carefully insulated to prevent heat loss to the environment. These panels perform fairly well in cold weather because

the surface radiates enough heat to melt snow and ice, leaving the surface clear year round. All around, this is a versatile and efficient collector for most systems in most locations.



Figure 1: [https://www.altestore.com/store/i/multimedia/images/Heliodyne\\_no\\_tank.jpg/x180/y210](https://www.altestore.com/store/i/multimedia/images/Heliodyne_no_tank.jpg/x180/y210)

Enerworks' HeatSafe (fig. 2) flat plate collector is very similar to the Heliodyne. It differs in coating type and a few safety measures, including a vent for hot air to prevent pressure build up. The Enerworks panel is slightly smaller than Heliodyne's largest panel (the 410), with roughly 32 square feet as opposed to roughly 40.

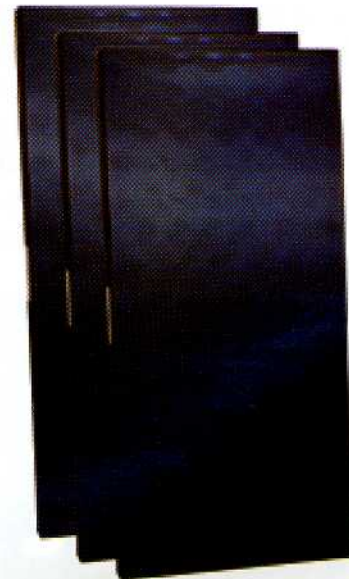


Figure2:<http://www.enerworks.com/images/HeatSafeCollectors.png>



Solargenix's Winston series compound parabolic concentrator (fig. 3) is similar to the GOBI in that ultimately it is a flat plate, however the internals are much different. The surface is a glass panel covering rows of parabolic mirrors that serve to reflect and concentrate light onto copper piping that carries the heat transfer fluid. As opposed to a flat black-body surface, these panels are generally more efficient at collecting light from a larger variety of angles than flat plate collectors.



Figure 3: [http://www.solarconsultants.com/images/SolarGenix\\_Winston\\_coll.jpg](http://www.solarconsultants.com/images/SolarGenix_Winston_coll.jpg)

Apricus makes an evacuated tube solar collector (fig. 4). These consist of a series of glass tubes that are evacuated to form a partial vacuum between the glass and a copper pipe that carries the heat transfer fluid. When pitched at an angle, the colder fluid pools at the bottom while warmer fluid rises up the pipe, setting up a convection current. These collectors are very efficient in that they emit very little heat to the environment, yet this can pose problems in cold climates due to the buildup of snow and ice. Another problem in inclement weather is that these tubes tend to be more fragile, resulting in damage from falling ice or hail. This can result in increased maintenance costs over the lifetime of the collector.



Figure 4: <http://ecosolarct.com/images/gallery/Zanes-Cycle-Apricus-solar-h.jpg>

## Conventional heating system

The most common method of heating water in campus buildings is to use steam purchased and piped over from the Medical Center Company (MCCo). To understand how this works and to know the Btu potential and cost of a unit of steam (usually pounds and thousands of pounds, respectively), we questioned several professionals involved in the company, including the president Mike Heise. Our initial estimates showed a pound of steam carries 6.7 British thermal units (Btus). After acquiring more accurate data from the MCCo, it turns out that a pound of steam carries roughly 1,414 Btus. At 13 dollars for 1,000 pounds (1.3 cents a pound), the offsets of conventional heating costs from a solar system are minimal when compared to the costs of steam. This result is discussed more below and in our conclusion.

## Procedure

In order to determine the feasibility of implementing a solar thermal system on Case's campus, we had to examine and compare several factors: location, system type, water use (daily average), operation temperatures, conventional fuel (steam in our case), and financial costs. The most important variable pertaining to the efficacy of a solar thermal water heating system is the daily average hot water use (the details of which will be addressed in the results section). It is challenging to organize and analyze all these factors and variables by hand, so to aid us in our investigation we made use of simulation software. RETScreen is a simulation program that enabled us to do this concisely. This program (originally developed mainly by the Canadian government, <http://www.retscreen.net/ang/home.php>) was developed to display the current costs of producing power or heating water for a particular location and demand and predict the energy output of a renewable energy system that could be implemented. In order to accurately predict a system's output, we had to input the correct user defined variables (those mentioned in the beginning of this paragraph).

Location itself is a very general term especially as it applies to this study. Pertaining to this case, location includes position on the planet, position relative to the sun, and the specific building. The location for our case was Cleveland, Ohio. Giving the location of the system allowed RETScreen to tap into its database for solar output data on different areas. Solar output data for such locations was aggregated with the aid of organizations such as NASA. Even within Cleveland, OH, there is variation in solar output. Various installers suggest a pitch angle of the present latitude + 5 degrees. The specific building we



tested was Emerson gym, a part of the Veale Athletic Center. We chose this location because it is one of the most demanding buildings with regards to hot water is used extensively by students. We also decided to examine Kelvin Smith Library because it has an electric water heater, not a steam converter.

RETScreen also comes equipped with a database of various solar thermal panels, allowing for a diverse selection; specifically it provided all the necessary data in regards to the particular collectors we are investigating. Data for the specific panels is acquired from the manufacturers, who acquire it from independently certified installers of their panels. However, performance data does vary from location to location (and specific installation to installation), so there is potential room for error (this risk can be reduced by an on site evaluation from a specific installer).

For our daily hot water usage, we estimated the amount in gallons per day based on the occupancy rate and time of year. For example, during the summer, there are few sports teams that shower in the Veale Athletic Center regularly, but during the school year, there are teams that shower almost everyday. During winter break in December and January, the campus is closed, so there is negligible water demand. However, it is impossible to know precisely how much water is being consumed without a meter on the line. In order to obtain accurate data, water meters are essential. Without this crucial measurement, our best prediction is formed from discussion with facilities services staff whose experience with the current systems provided the best perspective on actual hot water use in Emerson. The value suggested was a maximum turnover of 3 times for the 1300-gallon tank, resulting in at most 3,900 gallons a day. To make the calculations easier (and understanding this educated guess), we decided to use 3,500 gallons as our daily average use. This is because on weekends during the summer and various campus holidays, Veale/Emerson is closed, and the daily hot water used is approximately zero.

Another variable that we inputted into RETScreen was the operating temperatures of the water. During the winter months, the inlet water comes in at around 40 degrees, while in the summer the water can come in as high as 70 degrees. These varying operating temperatures will affect the system because it will change the seasonal demand and therefore the British Thermal Units (Btus) necessary to reach the desired temperature.

The next step was to appropriately identify the conventional fuel source that is currently used to heat water in most places on campus. Specifically, we needed to know the cost and the Btu load of a unit of fuel, in this case

steam. To acquire these numbers, we requested the average amount of thermal energy contained within a pound of coal from the MCCo, as well as how many pounds of steam this produces (~13,600 Btus and 9.18-9.93 lbs, respectively). RETScreen allows us to input our own type of fuel source, but it requires an accurate unit – Btus per lb of steam. With help from the MCCo, we calculated this to be about 1,414. This data is used to determine how much conventional fuel might be offset by the solar thermal system, and thus how much money could be saved.

Once this is complete, the next step is to recognize all of the costs (potential and actual) of a solar thermal system and how they compare to the operating costs of the current heating system. Included are initial installation costs (panel, mounting, piping, contractor fees), continual maintenance costs, and even opportunity costs. Fortunately, installers have a feel for this data, and their advice in combination with the calculations done by RETScreen makes acquiring this data fairly easy to do. For example, the cost of a ten panel Heliodyne system has been quoted at around sixty-eighty thousand dollars, excluding maintenance costs. The cost of the conventional system over time is calculated from the quantity of steam consumed multiplied by the cost, with maintenance costs already being known.

Once the desired manufacturer, type, and specifications of the solar thermal system is inputted into the program, RETScreen calculates the estimated number of panels the will be necessary. From our discussions with installers and solar thermal experts (more on that below), having a range of 50-80% of annual hot water demand coming from solar thermal is the optimal range in terms of payback. The payback period, otherwise known as a Return On Investment (ROI), is how long it takes for the savings from the system (the costs offset from the conventional heating system) to break even with the cost of the system. This is the most important factor to determine the economic feasibility. The shorter the payback period is the more appealing the project will be to University administrators.

### Expert Opinions

In order to make sure our understanding of a solar thermal system and the accuracy of our estimations, so we scheduled meetings with professionals in the field of energy management, specifically solar thermal installation. Professionals included administrators of the MCCo, workers at installers/manufacturers and town/city hall officials. Through discussions and interviews, we were able to grasp a better understanding of the benefits of having first hand



experience in designing an optimally sized system. The evident conclusion from many sources was that site analysis is imperative to determine the design considerations of a solar thermal system. Our research and analysis on buildings of Case Western Reserve University's campus were so site specific that a building's end result would vary from not receiving any short-term payback to receiving under a year payback. This led us to recognize how important having a site evaluation from a certified installer is to providing the maximum amount of solar thermal energy with the lowest ROI.

## Results

Before going into the results of our research, it is important to note the key variable in determining the size of a system, and thus the costs and ROI is the average daily hot water use. This value is, in other words, the amount of water (in U.S. gallons) consumed a day averaged over the course of a year (365 days). This number reflects the demand on a system on any given day, on average. In order to ensure that a system is appropriately sized (neither too small or too large), this value should be known as accurately as possible. A system that is too small will not provide enough energy to supplement the load on a conventional heater enough to warrant the initial costs. A system that is too large is basically wasting dollars on installation that could be utilized elsewhere. The executive director of the Northeast Ohio Advanced Energy District, Athan Barkoukis, provided us with information on a city fire station project. With only a month of meter data, a system was installed that anticipated at least 50% of the demand. After six months, the system was found to only supply 20% of the demand. Taking into account sinks, showers, and laundry machines, a lack of meter data warrants a safe, educated overestimate to determine the capability of a system on Emerson gym.

The best way to measure this variable is to install a meter in the hot water line and record the data over the course of a year. Currently Case lacks flow meters on many if not all of the hot water lines in individual buildings on campus, especially in our target building, Emerson. It would be foolish to attempt to install a system based on rough estimates, because again one would have to guess the size. An investment of around 2,500 dollars in a water meter can provide valuable information pertaining to a system's capability. However, a lack of data in this area does not preclude a system or an investigation into the overall feasibility of a system on campus.

Before deciding whether a system should be installed on campus, a professional should be consulted and

brought in to examine the site. The benefits of this are the experienced opinion afforded by the professional and a clearer understanding/assessment of the cost of installing a system such as piping, heat exchanger placement and solar capacity. The following tables (page 9) show the results of an attempt to overestimate the demand in Emerson to see if, even at a level that is likely to be higher than the average daily use, a system is cost effective or at least feasible given the available roof space and quoted installation costs.

For our system, RETScreen provided us with an estimate of the amount of Btus from the systems that we potentially would install, as well as crucial financial data. On the next page is a table listing the important data from our simulations. Factored into the ROI is a grant from Green Energy Ohio solar thermal rebate program of a maximum of 2,400 dollars. As a school, Case is eligible for this rebate. Solar fraction is the fraction of the water demand carried by the solar system, and outputs and costs are over the course of a year (note: assuming a daily average use of 3500 gallons. Again these are rough estimates).



As the data shows, the ROI exceeds a system lifespan of 25 years. At 1.3 cents a pound of steam (first mentioned earlier) and thus 1.3 cents for 1,414 Btus, the cost per Btu of solar greatly exceeds the cost of the current steam heating system. The MCCo has told us that the cost of steam has the potential to rise 20% in 5 years, and perhaps even higher in subsequent years. This could mean that solar thermal is more cost-effective as the price of steam rivals the cost of the technology.



<b>Emerson</b>	<b>Solargenix</b>	<b>EnerWorks</b>	<b>Heliodyne</b>	<b>Apricus</b>
# Of Collectors	175	70	60	90
Area (ft <sup>2</sup> )	4,220	2,164.4	2,421.8	2,796
Btu Output	324.1 million	281.5 million	334.5 million	274.3 million
Solar Fraction	58%	50%	60%	50%
Total weight	21,936.25 lbs	9,240 lbs	9,783	16,816.2
Weight/ft <sup>2</sup>	5.2 lbs	4.27 lbs	4.04 lbs	4.5 lbs
Cost (\$)	350,000	450,000	500,000	700,000
Steam Savings (\$ per year)	3,725	3,235	3,844	3,152
ROI (years)	93.9	140.5	131.3	223.5

**Results for Emerson Gym Analysis**

Steam, however, is not the only heat source for water on this campus. Some buildings use electric water heaters because they are not hooked up to the campus steam system, or their demand is too low to require it. Kelvin Smith Library is one such example. To see how the technologies compare, we decided to run some simulations on KSL as well.

We were able to calculate an offset from electric heating because the carbon production of electric power is more easily obtained. As the data shows, the payback periods for systems supplementing an electric water heater are much more reasonable. This is because we pay more per unit of energy for electricity than we do for steam.

<b>KSL</b>	<b>Solargenix</b>	<b>EnerWorks</b>	<b>Heliodyne</b>	<b>Apricus</b>
# Of Collectors	8	4	3	5
Area (ft <sup>2</sup> )	192.8	123.8	120.9	155.3
Btu Output	15.4 million	14.9 million	16 million	14.6 million
Solar Fraction	59%	62%	66%	60%
Total weight	1,002.8 lbs	528 lbs	489.15 lbs	934.2
Weight/ft <sup>2</sup>	5.2 lbs	4.26 lbs	4.05 lbs	6.02 lbs
Cost (\$)	8,000	8,000	8,000	8,000
MWh savings (\$ per year)	486	460	499	454
ROI (years)	11.5	11.6	11.2	12.3
CO <sub>2</sub> offset (tons)	1.1	1.2	1.15	1

**Table 2: Results for Kelvin Smith Library Analysis**



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## Conclusion

Considering the range of data results in the table above, we would recommend that the university install meters as soon as possible to start obtaining accurate data on daily hot water usage for high demand buildings. In addition to metering, a site evaluation should be conducted by professional installers that are certified by the Solar Rating and Certification Corporation (SRCC), the North American Board of Certified Energy Practitioners (NABCEP), or the Interstate Renewable Energy Council (IREC) which are the certifications that we found to be correlated with the highest quality installations. As far as our simulated estimates are concerned, it appears to be the case that solar thermal is not a cost-effective way to ultimately save money on conventional heating costs and to reduce the carbon footprint of our University as a whole given how cheap steam is for us. However, the cost of steam is expected to rise; at the same time, the cost of solar thermal technology could potentially decrease in the same amount of time. Furthermore, not all buildings heat their domestic water with steam. In buildings that use gas or electric heaters, solar thermal could still be a cost-effective replacement or supplement. With more data, consultation, and further scrutiny, a system may be beneficial on buildings that use electricity or gas to heat water.

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## REFERENCES

“NREL: Dynamic Maps, GIS Data, and Analysis Tools - Solar Maps.” National Renewable Energy Laboratory (NREL) Home Page. May 2011. Web. 18 Dec. 2011. <<http://www.nrel.gov/gis/solar.html>>.



# WHY WIND? A COMPARISON OF GERMANY, THE UNITED STATES, AND CHINA

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## INTRODUCTION

Almost every aspect of everyday life uses energy. Governments throughout the world have prioritized providing their citizens with reliable and abundant energy, though some countries use a very different mix of energy sources than others. This raises the question of how states choose their energy sources. This paper explores states that have chosen to draw much of their energy from renewable sources. The working hypothesis is that renewable energy policy would be linked to climate policy, and thus that states with an aggressive climate change policy – for example, internationally binding emission reduction targets, or carbon taxes – would also have a more aggressive renewable energy policy. In short, this is not the case. Rather, states choose to promote renewable energy for a variety of reasons, any of which can lead to effective action.

Germany, the United States, and China served as case studies because they lead the world in wind power capacity. The US and China also boast large amounts of hydropower and Germany tops any list of installed photovoltaic capacity (International Energy Association, IEA Scoreboard 2009 78). These three countries each have different stances on climate change, which allows isolation of the relationship between renewable energy policy and climate policy. Germany has agreed to binding emissions targets under European Union agreements and the Kyoto Protocol, while the United States refuses to ratify the Kyoto Protocol. China has acknowledged the issue of climate change by ratifying the Protocol, but, as a developing country, is not obligated to reduce its emissions. In short, Germany has promised to do something about climate change; China has acknowledged the problem but not taken action; and the U.S. ignores the threat. Yet despite these differences, all three countries have developed considerable capacity in renewable energy, particularly wind. Thus, concern about climate change cannot be the only cause for promoting renewable energy. Rather, each country has its own reasons, which also influence the shape of its policy.

## Germany: The Environmentalist

Germany gradually developed interest in wind power as nuclear and other sources fell out of favor. First, the oil crisis of the 1970s spurred German interest in alternative energy. While nuclear was an initial area of expansion, the 1986 explosion at the Chernobyl nuclear reactor raised public fears about the safety of nuclear energy. The German nuclear industry never recovered from the blow; it began to decline, and in 2000 the government announced a phase-out of all nuclear energy (Laird and Stefes 2621; IEA



Emily Sparks

Emily Sparks is a fourth-year studying history and music at CWRU. She is a member of Phi Alpha Theta and the recipient of the 2011 John Hall Stewart Prize for excellence in historical studies. Emily has also served on the SOURCE Advisory Board and the Wittke Award Student Selection Committee. Emily currently participates in several musical ensembles and is Vice President of the CWRU Swing Dance Club.

## -Acknowledgments-

I would like to thank the SOURCE office and the Dominion Foundation for their financial support, Jessica Green for intellectual guidance, and Iwan Alexander and the students of the 2011 SURES program for their support and help.



Shortly after Chernobyl, climate change began to garner scientific and public attention. By 1987, Chancellor Helmut Kohl acknowledged that Germany must address climate change (Jacobsson and Lauber 264). Ever since, Germany has been a leader in the international fight against climate change. The threat of climate change and the backlash against nuclear power, as well as growing scrutiny of coal subsidies, convinced German parliamentarians of the need to promote renewable energy. The policies they chose, discussed below, follow logically from Germany's commitment to reducing its carbon emissions. With the Kyoto Protocol imposing on Germany legally binding obligations to reduce its carbon emissions, Germany cannot depend on private entrepreneurship or consumer goodwill to replace fossil fuels with renewables. Thus it has instituted a series of mandatory tariffs, ensuring that any wind power capacity built will be used.

The Bundestag passed the first such law, the Feed-In Law (Stromeinspeisegesetz, StrEG), in 1990. The law required utilities to connect renewably generated electricity to the grid and buy it at fixed prices, a policy known generically as a feed-in tariff. Because the prices were more favorable to wind energy than to other forms of power, the StrEG boosted the wind industry most dramatically. In the ten years of the law's existence, installed wind power capacity in Germany leaped from 68 MW to over 6000 MW (Laird and Stefes 2622). Germany's commitment to environmental protection became more strongly institutionalized in 1998 with the election of the so-called "red-green coalition," an alliance of the Social Democratic and Green parties (Bechberger and Reiche 50). The coalition updated the StrEG, ultimately replacing it with the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG) in 2000. The EEG adjusted tariff prices. Where the StrEG allowed variable rates based on utility revenue, the EEG set fixed prices. Although the feed-in tariff is the dominant policy in Germany, it is by no means the only one. The government's September 2010 "Energy Concept" and its associated 10-point immediate action program outlined other planned initiatives. The Energy Concept focuses on offshore wind power and improving grid connection. Other programs include incentives for solar roofing, loans, and tax allowances (Federal Ministry of Economics and Technology and Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety). The Energy Concept is only the latest development in Germany's long standing, consistent commitment to wind power.

The U.S., by contrast, has found other reasons to promote renewable energy. Both major parties in the U.S. espouse the goal of energy independence or energy security, claiming that the U.S. should provide its own energy rather than depending on oil imports. However, the parties differ greatly in how that should be achieved. Based on original review of official party platforms from 1974 to 2010, Republicans tend to support expansion of domestic energy supply in any way possible, including drilling for oil and natural gas. Democrats are less enthusiastic to drill, especially in ecologically sensitive areas such as the Alaskan National Wildlife Refuge, and also tout renewable energy's potential for creating jobs.

In the U.S., climate change has become a politicized issue. While Democrats push for ratification of the Kyoto Protocol, Republicans refuse to fully accept scientists' warnings and balk at an international agreement which might "harm economic growth and destroy American jobs" (Republican party platform 2004). Perhaps to avoid the wrath of climate change-doubting voters, yet maintain an opportunity to promote renewable energy, Democratic platforms have only twice (2000 and 2008) mentioned reducing carbon emissions and generating renewable energy in the same section, suggesting that they prefer to keep these concepts separate.

This political baggage has given U.S. policy several distinct features. First, U.S. programs to promote renewable energy are voluntary. Tax credits for producers of wind (and other renewable) power and research funding are available, but only serve to incentivize private action, not mandate it as Germany's feed-in tariff does (U.S. Office of Energy Efficiency and Renewable Energy). This allows politicians to avoid the wrath of utilities saddled with mandates for a problem those same politicians will not admit exists. Second, U.S. policy is inconsistent. The production tax credit, which started in 1992, has been scheduled to expire in 1999, 2001, and 2003. Although it was extended each time, the possibility of discontinuation created a discouraging uncertainty for potential investors. Similarly, the budget for the Renewable Energy Production Incentive, a financial incentive for public utilities to produce renewable energy, depends on yearly Congressional appropriations and thus varies annually (Bird et al. 1398-99). Thirdly, renewable energy policy is fragmented. The Departments of Energy, Agriculture, Interior, and Defense all administer renewable energy programs (United States Department of State 65-68).

On closer inspection, U.S. policy is even more fragmented than it appears at first glance. In addition to the



myriad federal agencies with some jurisdiction over energy policy, each state has its own energy policy. Although the political battles of the federal level do often appear in the states, the states are by no means a simple microcosm of the country. Notably, many states are unafraid to implement mandatory policies. As of August 2009, 30 states had passed renewables portfolio standards, requiring utilities to draw a certain percentage of energy from renewable sources (United States Department of State, 63). State policy does not follow party lines as clearly as federal policy does. The five states with the most wind power capacity are Texas, Iowa, California, Minnesota, and Washington, a group of states that spans the political spectrum (U.S. Energy Information Administration). Texas and Iowa particularly stand out as surprises: both are Republican-controlled. Given the trends at the federal level, one would expect this to mean a lukewarm endorsement of renewable energy at best. Indeed, the state Republican parties take a similar view toward energy and climate change as their national counterpart. Despite this, both states have implemented a variety of policies to aggressively promote renewable energy. Party politics, then, does not predict a state's action on renewable energy. Overall, however, individual states add to the fragmentary and inconsistent nature of U.S. policy.

#### China: The Latecomer

China's overall demand for energy is growing rapidly as China develops and brings electricity to previously off-grid rural areas. For China, renewable energy is not a replacement for fossil fuels but a supplement to them to meet growing demand. At the same time, wind power provides an opportunity for China to develop its domestic manufacturing industry and demonstrate environmental consciousness to the international community. Up to 2005, renewable energy growth in China came mostly from small wind systems in isolated places. Small subsidies from certain provinces and the national government, low-interest loans to manufacturers, and technical support from Sweden, the Netherlands, Germany, and Italy spurred this early growth (Lew 276-7). In what Lema and Ruby describe as the "import phase," lasting from 1986 to 1993, soft loans from Denmark and other countries helped China build wind capacity but not develop domestic manufacturing industry. The "Strategic Development Plan for Generation of Wind Energy in China," issued in 1994, laid out the government's goals for wind power and established regulations requiring utilities to buy available wind power at fixed prices. Wind power did increase after the plan, but high prices, conflicts among different government agen-

cies, and lax enforcement of the laws hindered growth (Lema and Ruby 3883). Bureaucratic and power sector reform in the early 2000s helped fix these problems. Such restructuring, plus a wind power concession program lasting from 2003 to 2007 that sold wind farm development rights to the lowest bidder, led to a significant increase in China's wind capacity. All of this paled, however, in comparison to the effects, discussed below, of the 2005 Renewable Energy Law (REL). The REL set quantified renewable energy goals and fixed prices, guaranteed renewable energy grid access, established a public fund for renewable energy development, and provided tax benefits for renewable energy (Wang, Yin, and Li 1873-4).

The shift in Chinese policy mirrored a parallel shift in Chinese motivation. When China's goal was to electrify rural areas, small wind was the best choice and policy was tailored accordingly. Beginning in the late 1980s, Chinese policymakers began to consider the environmental and health effects of coal. International cooperation exposed China to a variety of policy options (Lema and Ruby 3881-2). However, China's attempted market creation strategies were ineffective until the early 2000s with power sector reform and the wind power concession program (Lema and Ruby 3884). Recently, China has learned to leverage carbon finance and global climate concern to help meet its own domestic renewable energy priorities (Lewis 2875). In its first National Communication to the UN Framework Convention on Climate Change, China touts its efforts to slow greenhouse gas emissions "in the spirit of being responsible for the global environment" (The People's Republic of China 73). In other words, China realizes that the world will more favorably view its efforts to increase electric capacity and domestic manufacturing if those efforts are framed as climate mitigation efforts. It is with this attitude that China found a big, flashy policy like the REL attractive. Fortunately, the REL has also been effective: since its passage, China's wind power capacity has doubled every year (Liu and Kokko 5521).

#### Conclusions

Germany, the U.S., and China display significant differences in their reasons and policies for promoting wind power, yet, unexpectedly, all are leaders in wind energy. In other words, each country achieved the same result, but through very different means. Therefore, states can and should tailor their policies to their individual needs. International organizations such as the UN need not dictate any specific approach. Rather, they should set goals and let states reach those goals individually. The possibility for such an approach to be effective is exciting, especially for



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the U.S., because it would avoid conservatives' objections that international cooperation surrenders sovereignty.

These three countries offer a long list of reasons for promoting wind power: environmental protection, energy independence, meeting new electricity demand, boosting domestic manufacturing, creating jobs. All of these reasons have provided sufficient incentive for political action. Thus any person or group who wants to promote renewable energy can potentially use any of these reasons to persuade others. Environmentalists looking to mitigate climate change, for example, can appeal to manufacturers by pointing out that policies which encourage installing wind turbines will increase demand for turbines and parts to be made. In short, groups with separate interests can all have an interest in working toward the same final result: increased renewable energy capacity and use. The differences among Germany, the U.S., and China ultimately show that there are many paths to a renewable energy future.

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# A PRIVATE SOLUTION TO A PUBLIC PROBLEM: DOMESTIC MIGRANT WORKERS

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## Abstract

Economic structural reforms used in order to pay off foreign debt have increased women's unpaid labor in economic south countries. With few occupational opportunities available, even for women who are highly educated, migration becomes one of the few options for women to ensure economic survival for their families. This review examines the push and pull factors that influence a woman's decision to migrate and to attain a job as a domestic worker. Additionally, this review focuses on the definition of transnational motherhood, its components, and the conflicting class status, which results from being a domestic migrant mother. A discussion of possible solutions for economic north and south countries to consider is also included.

## Introduction

The United States is known as the "melting pot" of cultures. It is a country in which people, cultures, and ideas are constantly flowing from all corners of the globe. It is also a country in which people migrate to increase their quality of life. These trends of migration have been present in the U.S. since the beginning of the country's history. A more recent trend, however, is the feminization of migration. Over half of all international migrants are women (Chang, 2009). The feminization of migration results from the effects of globalization, which can make economic survival extremely difficult in economic south countries, which are less developed nations with low-income economies. Many women leave their families and friends, in their country of origin, to migrate to economic north countries, which are wealthy and more developed, in hopes of obtaining financial stability for their families. Through various push and pull factors, women migrants often work in jobs that reflect their traditional gender roles, such as domestic work. In the past, research has focused on physical and verbal abuse and exploitation of domestic migrant workers. In comparison, less research has focused on the social and personal effects of geographic separation of women from their families. This literature review aims to discuss the various push and pull factors in economic north and south countries that influence a woman's decision to migrate, identify and further explore the meanings

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of transnational motherhood, explore the personal, social, and familial consequences resulting from being a domestic migrant mother, and identify possible solutions to decrease the need for women to migrate.

### Women's Work in a Global Economy

In the past few decades, countries have experienced economic globalization to move towards a more cohesive global economy. Economic globalization refers to the "integration and rapid interaction of economies through production, trade, and financial transactions by banks and multinational companies" (Burn, 2005, p. 167). In this new global economy, the World Bank and International Monetary Fund (IMF) play an important role in lending money to developing countries (Enloe, 2006). Due to the global recession in the 1980s, economic south countries experienced a decrease in exports, high global interest rates, and a depletion of foreign exchange reserves (Burn, 2005). As a result, many developing countries could not make payments on foreign development loans in a timely manner. As interest rates rose, loans became more expensive to pay off, forcing these countries to ask the IMF and other economic north countries for money (Burn, 2005).

### Push Factors in Economic South Countries

To ensure that developing countries would pay their debts, new loans prescribed preconditions, or a series of reforms to be implemented in the country asking for the loan. These reforms, known as structural adjustment programs (SAPs), were imposed by local governments to raise money (Chang, 2009). Although SAPs sound reasonable in theory, they strike women in Third World countries the hardest (Chang, 2009). Side effects of SAPs and globalization increase women's unpaid labor in multiple ways. SAPs directly affect women by cutting wages and government expenditures for social services, such as schools, hospitals, and public transportation (Burn, 2005). Production of goods for local use is discouraged. Instead, goods for export and "cash crops" (crops grown for profit) are strongly encouraged. Rising food prices combined with wage cuts result in women and young girls sacrificing their own health and nutrition in order to feed the men and boys of the family (Chang, 2009). Because women are in charge of providing food for the family, women who have to find water or grow food are at a disadvantage. Cuts in transportation and utilities result in women and/or children having to travel longer distances to obtain these necessary resources (Burn, 2005). Additionally, the number of transnational factories in economic south countries has increased. Transnational factories are production facilities run by large corporations, which are centralized in countries outside of the one of the factory location. The rise of transnational

factories often results in pollution of local resources and land, due to relaxed environmental laws. These laws are used to attract foreign resources to help create jobs (Burn, 2005). All of these factors increase women's unpaid labor in economic south countries.

Economic structural reforms, resulting from globalization, make survival in home countries very difficult. Therefore, migration becomes the one of the few viable options for women to ensure a better life for their families. According to Ehrenrich and Hochschild (2002), there are four major paths of migration: 1.) from Eastern to Western Europe, 2.) from South America, Latin America, and Mexico to the U.S. and Canada, 3.) from Africa to Europe, and 4.) from Southeast Asia to the Middle and Far East (Ehrenrich & Hochschild, 2002). Globalization has resulted in the migration of millions of women from economic south to economic north countries. The total number of international migrants has increased from 99 to 190 million between 1980 and 2005 (Siddiqui, 2008). In addition to this increase, the percentage of all international migrants who are women has also increased since 1960, as shown in Table 1 (Siddiqui, 2008).

There are two main methods of migration. The first is through word of mouth and personal contacts. Women who have relatives or friends that have gone abroad and brought back stories and money find the move appealing. Knowing individuals who have successfully completed the migration process and can help them to migrate heavily contributes to women's migration decisions. Having a contact also helps with finding a job, arranging travel documents, and settling into life in a new country (Hochschild, 2002).

The second common method of migration is through government support. Governments in Sri Lanka and the Philippines, for example, encourage women to migrate, because the remittances, or migrant income sent back to families in countries of origin, contribute to reducing poverty and stimulating the economy. The World Bank estimated that in 2005, \$167 billion, out of the total migrant income of \$232 billion, was formally transferred to developing countries (United Nations Population Fund, 2006). The actual amount of income transferred is higher as this figure does not take into account remittances transferred through non-formal methods (United Nations Population Fund, 2006). In the Philippines and Sri Lanka, government policies are in place to provide low-interest loans and minimal insurance coverage in order for women to relocate (Siddiqui, 2008). Chang (2009) states that "Instead of selling coconuts and sugar, the Philippine government is now engaged in the sophisticated practice of selling its own people to industrialized countries" (p. 591). The exportation of labor has now become a part of the structural



Table 1: *Female migrants as percentage (%) of all international migrants*

Year	Female migrants as percentage (%) of all international migrants
1960	46.8
1965	47.1
1970	47.2
1975	47.4
1980	47.2
1985	47.2
1990	49.0
1995	49.3
2000	49.7
2005	49.6

Source: Siddiqi (2008)

adjustment plan, called the Labor Export Policy (Chang, 2009). This means that the government relies on the remittances to help pay off national foreign debt. In Sri Lanka, government funded pre-departure skills training programs for future migrant workers also encourage women to consider migration as a viable option to support their families financially (Vachani & Kalambakas, 1995).

Language barriers, gender, and migrant status are negative factors that make obtaining a job difficult in new affluent countries (Raijman et al., 2006). Some women who migrate leave school to support their families at a young age. The lack of qualifications in addition to the other factors listed increase the likelihood that a migrant woman will find a job in the low-wage sector (Raijman et al., 2006). Even women who do have appropriate qualifications are unable to get better paying jobs solely based on legal migrant status and language barriers alone. Therefore, once a woman migrates to an affluent country, she is often restricted to occupations that are traditionally “female,” such as domestic work.

#### Pull Factors in the United States

Although migrant women are often relegated to what are considered to be low-wage jobs in economic north countries, labor demand for domestic services, especially in the care sector, combined with government training and assistance from their home countries pull women to migrate to economic north countries. According to Hochschild (2002), the growing care sector makes

up 20% of all American jobs. The structural constraints that lead many migrant workers toward domestic service are due to the care deficit. In the U.S., the number of employment opportunities and the number of women with children entering the workforce are increasing. According to the U.S. Department of Labor, the percentage of mothers, with children younger than 18, who were employed or looking for work has increased from 47% in 1975 to 72% in 2002 (Pugh, 2005, p.731). The increase in the number of mothers in or entering the workforce has contributed to the societal transition from the male breadwinner/female caregiver model to the dual breadwinner/female caregiver model (Boris & Lewis, 2006). This current model illustrates that the current institution of work still assigns a full-time caregiver role to women.

For working mothers, trying to be a full-time caregiver poses a challenge, because “good mothering” implies “doing it all” (Garey, 1999). To be considered a good mother, women must spend quality time with their children doing intense mothering. Intense mothering is quality time that is packed with activities to make up for time spent at work rather than with the children (Hochschild, 1997). Because caregivers are marginalized at work, they face a maternal wall (Williams, 2000). The maternal wall prevents women from further upward job mobility due to a woman’s motherhood status. According to Williams (2000), the “ideal worker” is one who is free of family responsibilities and is able to be available 24 hours a day and 7 days a week. Therefore, many mothers find it difficult to balance



the demands of being a good mother and an ideal worker. Women who try to balance both work and family often lose out on leisure time (Crittenden, 2001).

Although men's contributions to family work have doubled since the 1960s, the time that women spend on the second shift has only declined by one third (Coltrane, 2007). Although fathers spend more time being involved with caregiving and household tasks, time at work often competes with family time for fathers (Daly, 1996). Embedded in the institution of work is the idea that being an active member of the paid labor force, or a breadwinner, is one of the main components of being a good father (S. Hinze, SOCI 372 lecture, November, 8, 2010). This has resulted in the lack of workplace supports for fathers to be more involved in the raising of children. Mandatory overtime, lack of paid sick leave, limited vacation time, and the inability to rearrange work schedules to care for a sick child or attending a school function are major impediments to the amount of time that both parents can spend with their children (Coltrane, 2007). Conversely, workplaces that offer on-site childcare, paid family leave, paid sick time, and flexible scheduling are often not taken by men. Men are reluctant to accept these initiatives or acknowledge the need for workplace supports in fear that they will be perceived as a less committed worker.

This second shift of unpaid caregiving and housework, poses a problem for working parents, because the current caregiving public policies and facilities are not adequate enough for adults to fulfill and balance wage earning and caregiving responsibilities. The United States is one of the few First World countries that does not offer paid maternity or family leave. The Family and Medical Leave Act allows workers to take "up to twelve weeks of unpaid leave in any 12-month period for the birth of a child or an adoption, to care for a child/spouse/parent with a serious health condition or for the worker's own serious health condition that makes it impossible to perform a job (Hinze, 2010)." The lack of paid government family and maternity leave policies can force working parents to look for alternate sources of care for children, ill family members, or the elderly. However, approximately 80% of child care centers and over 90% of nursing homes are substandard (Drago, 2007). The lack of good public child and after-school care leaves working parents with few quality options. Immigrant women's desperation for work combined with the lack of adequate care facilities, in the U.S., make hiring a domestic migrant worker a possible solution to allow parents, especially mothers, the ability to work. Hiring a domestic migrant worker can be cheaper than placing children in other forms of childcare. Additionally, in the U.S. it is more popular to hire an illegal immigrant over a legal immigrant, because it costs three times less (Chang,

2006). Hiring a domestic migrant worker is a private solution to a public problem.

The male breadwinner/female caregiver model is the dominant model present in countries with high percentages of women emigrating from them, such as the Philippines, Sri Lanka, and Mexico (Lan, 2003). In this model, the men are expected to financially sustain the family, or be the "breadwinner" of the family. Women are responsible for the housework and taking care of children, the elderly, or any ill family members. In countries with strict gender rules, sex segregation and wage gaps in jobs are difficult to avoid (Lan, 2003). A women's income is considered to be secondary to a man's income. Women's jobs are less valued and therefore less profitable. Employment opportunities for women are limited to options resembling wife-and-mother roles, such as household work, teaching, and nursing (Lan, 2003). For this reason, women accept domestic jobs in First World countries, as they are easy to find and fit within the expected roles that they were socialized into in their home country (Lan, 2003).

In many situations, the men of the family migrate first to fulfill familial obligations as breadwinners (Hondagneu-Sotelo & Avila, 1997). Scarce job opportunities for men often lead to women migrating to join family members who have already migrated. When mothers decide to migrate, they are often criticized for abandoning their role as primary caregivers. Hondagneu-Sotelo and Avila (1997) state that when women migrate, the act is regarded as a radical gender transformation. In contrast, when men migrate, they are still considered to be fulfilling their role as breadwinners. Because migration involves a geographical separation from children, spouses, and country of origin, women have to cope with the guilt and stigma associated with trying to make a better living for their families (Hondagneu-Sotelo & Avila, 1997). In addition, paid carework is considered incompatible with unpaid primary care that is expected of a woman to provide for the family (Lan, 2003). The shift in status, associated with switching from unpaid home labor to paid domestic work, and the geographic separation of mothers from their children results in mothers redefining their construction of motherhood.

#### Redefining Social Constructions of Motherhood from Countries of Origin

Transnational motherhood involves redefining social constructions of motherhood from home countries to fit the lives of domestic migrant mothers. Usually this means abandoning the expectation of biological mothers being present at home daily in order to raise their children (Hondagneu-Sotelo & Avila, 1997). Transnational motherhood emphasizes the role of women as breadwinners instead of men, which is contrary to the convention that women



should not combine employment and caregiving (Raijman et al., 2006). Transnational motherhood still places an emphasis on mothers to care for their family; however, these mothers change their method of care to include employment. In other words, in order for these mothers to support their children and other family members, they almost have no other option than to leave home and migrate. Rocío is a mother of a four-year-old daughter, who is left staying with other family members in her home country while Rocío works in Israel (Raijman et al., 2006). Rocío says that, "Very few mothers are ready to make the sacrifice of those women who go abroad and leave their children behind. It takes a mother to do so. Many women don't do anything in order to overcome the difficult situations. Instead those who leave their children really give their best for them. One feels more of a mother" (Raijman et al., 2006, p. 156). This new construction of motherhood emphasizes that taking economic responsibility to support the family is equally or more important than the mothers' daily presence at home (Raijman et al., 2006.). Migrant mothers see themselves as being better mothers by being able to financially support their children. Therefore, migration is viewed as a sacrifice that also strengthens their commitments to motherhood.

#### Components of Transnational Motherhood

Before leaving to work abroad, there is a transfer of caretaking that occurs. In countries where the separate spheres ideology is strong, many women feel that role reversal between who is the breadwinner and caregiver that results from migration is no guarantee that men will take over domestic duties. Because men often feel ashamed of being unable to financially support their families, women fear that the men will drink or gamble away the money that is sent home for the children (Lan, 2003). If he is willing to take over the caregiver role, the migrant mothers choose the father of the children to care for them. Most often, migrant mothers choose their own mothers or close female relatives to care for the children (Lan, 2003). Migrant mothers hope that by transferring the responsibility of care to a trustworthy family member will decrease their apprehension regarding their children's proper nourishment, schooling, and mental health (Hondagneu-Sotelo & Avila, 1997). To show their appreciation, migrant mothers send money or gifts to the guardians of their children.

Similar to American cultural constructions of motherhood, transnational motherhood maintains the importance of "quality time" with children. Recall that working American mothers engage in intense mothering, qual-

ity time that is packed with activities to make up for time spent away from their children at work (Garey, 1999). In addition to the time constraints that American mothers experience while trying to balance work and family, migrant mothers have a geographical barrier separating them from their children. Migrant mothers try to ensure that their physical absence does not affect their children's mental health (Lan, 2003). To distinguish transnational motherhood from abandonment in the eyes of their children, migrant women try to establish firm emotional bonds with their children, through "quality time," and by showing maternal visibility when they visit their home countries (Lan, 2003). "Quality time" entails regular phone calls, letters, and pictures to maintain mother-child relationships. Maternal visibility can be indirect. Migrant mothers may use extra earnings to send their children to better schools or buy them gifts (Lan, 2003). Migrant mothers also try to go back to their home country whenever possible. Migrant mothers hope that making the effort to maintain relationships with their children will result in bonds that do not have a material basis.

#### Personal, Social, and Familial Consequences Resulting from Being a Domestic Migrant Mother

The large distance between a migrant worker's home country and country of employment can result in separation anxiety and stress (Parrenas, 2000). Although these women are trying to support their families by working abroad, the distance denies them the daily bonding between friends and family that comes from living in the same country. Caring for the aging parents or children of employers while unable to be physically present to care for their own family members can add to the strain that migrant domestic workers feel (Parrenas, 2000). Additionally, living in a country, such as the U.S., in which the expectations for women's roles in society differ from the migrant worker's home country, may result in the migrant worker feeling disconnected from socialized cultural expectations and practices found in the home country. Parrenas (2000) found that "displaced mothering/caretaking" is a consequence of the separation from the home country (p. 576). "Displaced mothering/caretaking" is the treatment of individuals, who domestic migrant workers are being paid to care for, as members of their own family (Parrenas, 2000). For many migrant mothers, this method of mothering helps them to maintain their identity as a mother while their own children are being cared for by other family members. However, migrant mothers have to be careful to not get too attached to the children they care for. Jeal-



ously by the actual mothers of the children can cost migrant mothers their jobs. Despite this fact, “displaced mothering” can be emotionally rewarding and ease the separation between migrant workers and their families (Parrenas, 2000).

A second consequence of migration is upward social mobility in the migrant worker’s country of origin. Remittances sent to families in the country origin help to bring families out of poverty. In general, more than half of female remittances are used for better healthcare, nutrition, and education for children (Siddiqui, 2008). An additional sign of upward social mobility is the hiring of the services of a low-wage domestic worker in the home country by the now class-privileged migrant workers (Parrenas, 2000). Hiring a domestic worker to care for family members is a relief for many migrant workers. They feel that they have the power to critique the care that a hired domestic worker provides, which is not always respectful to do to a family member caring for children. The transfer of caretaking responsibilities among women in different countries is known as the international transfer of caretaking (Parrenas, 2000).

Although migrant workers experience upward social mobility from higher wages, educated migrant workers often feel embarrassed by their occupation, due to the characterization of domestic work as a low-wage job in their country of origin. Contrary to the popular belief that most migrants come from the poorest populations, emigrants are usually better educated than those who are left behind; this is especially true for migrants from the Philippines and Sri Lanka (United Nations Population Fund, 2006). In general, over a majority possess a high school (secondary) education or higher. According to Siddiqui (2008), 45% of Sri Lankan migrants completed a secondary education, and 25% had received a college education or higher. Parrenas (2000) found that many women who had finished college or postsecondary vocational training earned higher wages as a migrant domestic worker than in a job in their field of study in their home country. Carmen’s story illustrates the emotional consequences resulting from downward mobility to a lower-status job (Parrenas, 2000). Carmen is a Filipino woman in her mid-40s. She worked as a project manager of a military food service at an U.S. Air Force Base in the Philippines for fifteen years. When the military base closed, Carmen was unable to find a comparable job in the Philippines. Consequently, Carmen migrated to Rome to work as a domestic worker. Carmen says the following:

My life is difficult here. Would you believe that here I am a ‘physical laborer’? When I was working in the Philippines, I was the one supervising the supervisors... sometimes I would just cry. I felt like I was slapped in the face. I resent the fact that we cannot use our skills, espe-

cially because most of us Filipinos here are professionals. We should be able to do other kinds of work because if you only do housework, your brain deteriorates. Your knowledge deteriorates. Your whole being is that of a maid. (Parrenas, 2000, p. 574).

Carmen’s story illustrates conflicting class mobility as experienced by many domestic migrant workers. The discrepancy between actual educational training and role as a domestic worker reflects a decline in occupational status. This decline in status conflicts with the increase in class status as obtained from the international transfer of caretaking. The increase and decrease in class status results in migrant domestic workers feeling conflicted about being in the middle of this labor division (Parrenas, 2000).

On a larger scale, the discrepancy between level of education and available occupations in the country of origin results in “brain drain” and “brain waste” (United Nations Population Fund, 2006, p.8-9). Carmen’s story illustrates “brain waste,” which occurs when professionals are unable to find outlets for their profession and skills in their home country. As a result, neither the country nor the professional can obtain many benefits if the individual stays in their home country (United Nations Population Fund, 2006). The loss of highly trained individuals can be detrimental to developing countries. This phenomenon is known as the “brain drain.” The “brain drain” can result in continued economic stagnation (United Nations Population Fund, 2006). Although remittances are helping to balance losses from the “brain drain,” a cycle of migration is emerging. Migrant mothers are now seeing their daughters, nieces, and other female relatives in the next generation following their same path of migration (Vachani & Kalambakas, 1995). The continuation of the migration cycle within families indicates that very little progress is being made to increase economic opportunities in developing countries.

## Solutions

When thinking about solutions to ease the consequences experienced by domestic migrant workers, steps can be taken by both economic north and south countries.

### Solutions for Economic South Countries

Recall that structural adjustment programs (SAPs) were imposed as preconditions for loans to help economic south countries to reduce their foreign debt. While SAPs sounded reasonable, in practice they increased women’s unpaid labor. SAPs and other development projects were constructed with a gender-blind perspective. By ignoring and devaluing women’s labor inside and outside the home, faulty assumptions were made regarding solutions to stimulate economic growth. SAPs increased women’s



unpaid labor by cutting funding for social services, rising food prices, and increasing time needed for water and food collection (Burn, 2005). These structural reforms can make economic survival difficult, causing migration to become a viable solution for many women.

In order to reduce the need for migration, women's status and power need to be improved. A proposed solution is to reduce the impact of SAPs on women. This can be accomplished if economic north countries could forgive some of the economic south countries' debt (Burn, 2005). If some of the debt could be reduced, more money could be used toward funding for social services that were cut, improving access to healthcare, increasing access to education, and increasing agricultural yield for the community. A small-scale grassroots approach would be applicable, in which women were included in development projects. By taking into account women's labor and daily routine, women can help to develop an economy in which migration is no longer necessary and work to make structural changes that reduce gender inequality.

### **Solutions for Economic North Countries**

Due to the isolating nature of being a domestic migrant worker, women are vulnerable to varying degrees of physical, psychological, and sexual abuse. Migrant workers often work long hours, up to 20 hours/day, and have no access to health care (United Nations Population Fund, 2006). Isolation can also make organizing into unions difficult in countries where it is legal to do so. The United Nations has developed a document to protect the human rights of all migrant workers, regardless of legal status, known as the International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families. These provisions include: protection from enslavement and violence, rights to cultural identity, freedom of religion, the right to join trade unions, access to medical care, education for the children of migrant workers, access to housing, adequate working conditions, and informing migrant workers of their rights (United Nations Population Fund, 2006). The Convention encourages the facilitation for family reunification when wanted. Additionally, the Convention restricts migration to occur only through government agencies or authorized private agencies (United Nations Population Fund, 2006). This comprehensive document has been in development since 1990 and became available for ratification in 2003. Currently, the U.S. and most developed countries have yet to ratify the document. The U.S. has been slow in the past to ratify human rights treaties, with ratification still pending on the Convention on the Elimination of Discrimination Against Women (CEDAW). The United Nations Population Fund (2006) states that the United States has not seriously exam-

ined ratification of the Convention, because it is focusing on ratifying other human rights treaties first. Other reasons for the delay in the ratification are equally vague, including potential inconsistencies with immigration laws. These delays may have valid causes, however, it is essential that as international citizens, migrant workers are given the basic human rights that they are entitled to.

The State of New York has taken steps towards ensuring certain rights and protections for domestic migrant workers. On November 29, 2010, the "Domestic Workers' Bill of Rights" took effect in New York. This law provides domestic workers with the right to minimum wage, overtime pay at time and a half after 40 hours of work per week, one day off per week, three paid days of rest each year, insurance coverage when injured, and protection from harassment (New York State Department of Labor, 2010). The law has a great potential to improve the lives of migrant workers in New York. However, methods of enforcement for this law are unclear. The law does not address the isolating nature of being a domestic migrant worker. How are migrant workers informed about this law if, for example, their employer restricts their access and communication outside of the employer's family? The law states that the employer cannot abuse or exploit migrant workers (New York State Department of Labor, 2010). Additionally an employer cannot retaliate if a migrant worker files a complaint. Despite the beneficial nature behind these provisions, the steps to educate migrant workers about how to take steps towards filing a complaint or taking advantage of the law's provisions are missing. Although there are holes in this law, it is a step in the right direction to improve the working and living conditions of migrant workers in the United States.

In terms of policy, the United States should take steps to decrease the care deficit in order to decrease the need for domestic migrant workers. Possible solutions that can reduce the care deficit in the U.S. include federally supported programs with leave benefits, such as those in place in certain European nations. In Sweden, parents of infants and young children are supported by government programs. These parents are given paid family leave for up to 16 months (Zimmerman et al., 2006). Parents of young children are entitled to paid leave to care for a sick child or family member for up to 60 days per year (Zimmerman et al., 2006). Parents in Denmark are eligible to take up to an entire year of leave to care for a seriously ill child with two thirds wage replacement (Coltrane, 2007). Additionally, the Swedish government guarantees preschool for all children ages 1-6 and after school care for children ages 7-12 (Zimmerman et al., 2006). Programs in Denmark and Sweden encourage fathers to alleviate the strain of the second shift for working mothers. These European nations



reserve paid parental leave days especially for use by fathers, in which the days are nontransferable and lost if not used (Coltrane, 2007). These public programs have helped to decrease the impact of the second shift on women and are great models for the United States to look toward when thinking of solutions for government supports.

### Conclusion

The purpose of this review was to more closely examine the reasons behind women's decision to migrate from economic south to north countries, the factors influencing the number of women working in the domestic care sector, and the personal, social, and familial consequences of migration. It was found that economic structural reforms, resulting from globalization, increase women's unpaid labor in economic south countries. With few occupational opportunities, regardless of educational status, migration becomes one of the few options for women to ensure economic survival for their families. Once a woman decides to migrate, she often obtains a job that reflects traditional gender roles. Migrant workers often find jobs in the care sector because of the care deficit in many economic north countries. In the U.S. inadequate care facilities, poor family leave policies, minimal contributions of men to the second shift and the increase in women joining the formal employment sector all contribute to the widening care deficit. The availability of jobs due to the care deficit often lead migrants towards obtaining jobs as domestic workers.

Although domestic work in an occupation that reflects traditional gender roles, the migration, in general, is viewed as a radical gender transformation. Women have to cope with the guilt and stigma that stem from being separated geographically from children, spouses, and other relatives. The result for migrant mothers involves the redefinition of cultural constructions of motherhood from the country of origin to fit their current role as a transnational mother. This new definition of motherhood emphasizes that taking economic responsibility strengthens a woman's commitments to being a mother. Additionally, the transfer of caretaking from a domestic migrant worker to another family member or hired domestic worker in the country of

origin is a major component of transnational motherhood.

Steps can be taken in economic north and south countries to reduce the need for women to migrate. Efforts to reduce the impact of SAPs on women's unpaid labor combined with debt forgiveness by economic north countries could result in more money available to be used to improve social services and access to healthcare, food, and education. Using a gender perspective to apply this money towards community development, at a grassroots level, could improve the overall quality of life in economic south countries. Using a similar gender perspective, government support to reduce the care deficit would reduce the pull for domestic migrant workers in economic north countries. Additionally, the ratification of the International Convention will guarantee basic human rights to migrant workers. These solutions combined can result in ensuring that migrant workers are protected under international law and help improve the status and power of women in economic north and south countries.

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## THE MACDONALD SISTERS: HOW THEY VISUALLY CREATED EQUALITY BETWEEN MEN AND WOMEN

The prevailing issue of fin-de-siècle Europe was the increasing autonomy of women. Independence for women threatened traditional social and gender roles, and consequently men's civil power. Margaret and Frances Macdonald embodied this "new woman" with their status and education as professional artists and the visual motifs that they accordingly employed. They managed to combine feminine and masculine characteristics into one figure in their works, effectively establishing an androgynous figure. In the process they managed to establish an equality between women and men.

Margaret Macdonald was born in November, 1864 and Frances was born in August, 1873 into an upper-middle class family. This socioeconomic status enabled both sisters to attend art school and to initiate innovations in the art world. The social position of the Macdonald family ensured that they were educated and that they had a certain amount of independence. From the beginning, they were enrolled in the most progressive schools, including the Orme Girl's School. This institution pioneered female education including Latin, French, German, English, mathematics, music, natural sciences, ancient and modern history, and art in their curriculum. Margaret enrolled in the Glasgow School of Art in 1884 with her sister closely following her in 1890. As early as 1878, it was understood that many day students attending the school were women. The director, Francis H. Newbery, was committed to an excellence in art that combined functionalism with beauty while encouraging individuality and experimentation among his students. Instructors at the school trained the Macdonald girls as professional artists. This is also where they met their future husbands, Charles Rennie Mackintosh and James Herbert McNair, respectively.

Margaret, Frances, Charles, and James became to be known as the "Glasgow Four" during their time at the school. They had their first group exhibit held at the Arts and Crafts Society in 1896. Around this time, Margaret and Frances set up their own studio at 128 Hope Street in the city of Glasgow. The Glasgow Four often collaborated on posters and artworks submitted to the school Magazine, a student-based publication that showcased various works of art and literature. This extensive collaboration between the youths caused them to often be classified as the "Spook School" by their critics in the community due to the unusual motifs they employed. Their furniture and graphic designs were recognized as original, if not thoroughly avant-garde, for they were influenced by Celtic art and Symbolism.

Part of the curriculum at the Glasgow School was learning from the nude model. However, neither the Macdonald sisters nor any of their female



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friends were encouraged to make 'life-like' representations of the nude figure except for in these classes. The figure that entered their compositions was always a stylized, de-sexualized figure and crossed the boundaries of debates about representation of the female body. Margaret was elected a member of the Royal Scottish Society of Watercolours in 1898, thus establishing her place in the public eye. She also exhibited at the International Society of Sculptors, Painters, and Gravers in London and at the International Exhibit of Art in Venice in 1899 near the end of her Glasgow career. Also around this time, Frances married Herbert McNair. Although it is assumed that Margaret was involved with Charles at this point in time, they did not marry until 1900.

Margaret and Frances grew apart after their marriages, and, more often than not, aligned themselves with their husbands' art rather than each others'. Frances' work, especially, changed after the birth of her son in 1900. It experienced a transformation from an interest in gothic elongation to distorted female figures surrounded by a typical sweet femininity. From this time until her death in 1921, Frances made various jewelry, decorative arts, (with her husband, particularly for their home in Liverpool) and watercolor drawings. In nearly every instance the watercolors elaborate upon phases of the female experience. In 1908, Herbert and Frances then returned to Glasgow and accepted low-pay positions as instructors at their alma mater, the School of Art.

Margaret, unlike Frances, had a significant amount of freedom after her marriage. The lack of children resulting from this union opened up possibilities for furthering their respective

careers. This allowed Margaret and her husband, Charles, to travel and participate in numerous exhibitions all over Europe. As a result, their popularity and acclaim in the art world soon out-paced that of the McNair's. In 1902, she participated in the Esposizione Internazionale d'Arte Decorativa Moderna in Turin, Italy. She again, in 1909, participated in an exhibit of women artists at the International Society of Sculptors, Painters, and Gravers. After moving to Chelsea, England and then Collioure, France, Charles died of cancer in 1928. Margaret lived on her own in London until she died in 1933 in her studio in Chelsea.

Work done by the Macdonald sisters, on account of their sex, was often attributed to their respective husbands. Consequently, scholarship that covers them is far and in between. P. Morton Shand, in 1933, was recorded as claiming that "while Margaret was her husband's 'constant inspiration and collaborator,' she was nonetheless 'of a decidedly inferior artistic calibre.'" Even as late as 1990, Jocelyn Grigg stated that "Charles may have 'exaggerated her role in his work'." The fact is that there was, and still is, a gendered hierarchy in the art world - architecture and commerce as masculine, decorative design and education as feminine. This hierarchy, and resulting bias against female artists, continues into the Postmodern period when feminist theory becomes popular. In the definition for "Macdonald" at Oxford Art Online, it states that "at times weak and whimsical in design and execution, [Macdonald] production[s] are often of considerable originality...". The following discussion will be an attempt to categorize, and create an argument for the positive and distinctive valuation of the Macdonalds' work.

Starting with Margaret, her work was often gentler than that of Frances. Solitary depictions of the female figure are mostly seen in her early posters from the Glasgow School. Yet there are some examples that feature a particular type of woman whose elongated body and expressive features combine with a heavily symbolic content. In *La Mort Parfumee* 1921 (Fig.1), the rose is used as a symbol for the feminine. There are other female figures present, but they are seen in a supplicating position, bent over the flowers that are being presented to the prominent female figure. This "leader" is seen wearing some type of elaborate headdress and seems to be in command of the roses, or, by association, her femininity. Thus, this can be conceived as a visual representation of the power Margaret felt later in life as a female artist. The contrast between the dark background and the pastel-colored roses emphasize this distinction



Fig. 1 *La Mort Parfumee* Margaret Macdonald, 1921



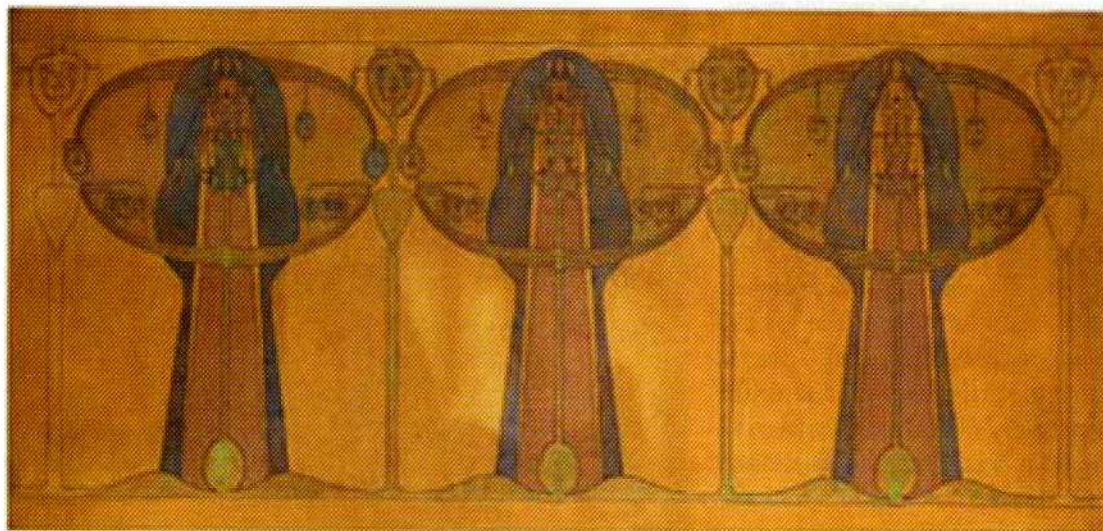


Fig. 2 The May Queen Margaret Macdonald, 1900

between the “dark”, critical world and her individual competence as a feminine figure.

The headdress, itself, would have perhaps been classified in fin-de-siècle France as Amazonian due to its primitive and geometric structuring. The Amazon woman was often seen as a “threat” to the established cultural roles. She embodies everything that put traditional social and gender roles in peril; the independent and strong woman. This “new woman” was a rising concern as the increase of autonomous females emerged into the French scene. While Margaret stayed within the “safe” boundaries of the decorative arts, she increasingly pushed the public’s limits with her success and innovation in the art world.

She focused on the female figure, seen in groups of three or more, throughout her career. This motif safely asserted feminine fellowship. Camaraderie is present in her well-known, *The May Queen* 1900 (Fig.2). Originally this piece was made for the 1900 Vienna Secession and was shown on a wall with a mirror and brass/ivory clock underneath. The clock Margaret created herself as part of her experimentations with metal-work. The mirror, however, took many of the visitors by surprise. Some suggested that it “led the viewer into a remote, ghostly world which, once the alien aspects of it were understood, could be recognized as poetical, magical, and spiritual”. The painting itself depicted five, stylized women in three distinct groupings. The middle figure is isolated from the other two groups on either side of her. Again, there are roses seen as a symbol of the figures’ femininity and the side figures are holding strings of the flowers across the image. They cross over the middle figure, yet it is unclear whether she is also holding the strings or has her hands hidden. Nonetheless, the emphasis is put on her as the central figure and the one with the most femininity.

This central figure is thus assumed to be “The May Queen”. The title alone evokes the tradition of the May Pole. As a pagan tradition, the activity centers on their concept of the goddess symbolizing the fertility of earth. The strings of flowers in the image are seen as the ribbons that are used to wrap the May Pole and the flowers themselves suggest spring. As a result, the viewer can assume that this “May Queen” is the epitome of femininity due to her explicit association to the pagan goddess. Even the inside fold of her robe seems slightly labial. Although the pole is traditionally seen as a phallic symbol, here the female figure becomes the phallus. Thus she gains phallic power normally possessed by male figures.

Continuing the theme of powerful female figures,

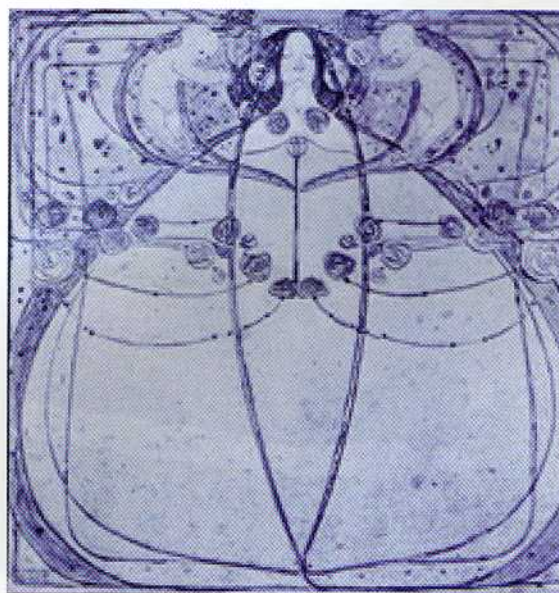


Fig. 3 Panel on desk Margaret Macdonald, 1902



Margaret often depicts the maternal figure. She creates many images of the female figure with children, most often infants, although she herself never reproduces. One such example is a panel (Fig. 3) that decorates a desk presumably made by her husband. It depicts a female figure in a huge, bulbous gown with no visible arms, hands, legs, or feet. Two figures of children float on either side of her head, reaching towards her. Roses, again, decorate this image although the figures are not manipulating them this time. The woman's eyes are closed and she seems to have a gratified smile on her face. These maternal images are perhaps an attempt at fulfilling societal expectations of reproduction that the artist has failed to fulfill with her own body. The labial folds, evocative of maternal fertility, is seen at the center of the image. Thus she asserts the power of maternal figures.

Frances' work, similar to Margaret's, was characterized by the use of decorative linear patterns and gaunt, stylized human and plant forms. Yet the reading of Frances' imagery of the female sexuality and maternity in the light of the often "sad" circumstances of her life take on a special poignancy. Frances' art defies categorization within modernity; rather, her art was displaced by a Modernist critical discourse and labeled mysterious, feminine, or fairytale-like, resulting in her subsequent disappearance from the discourse and from the archive. While she does depict all female figures like her sister, isolation often envelops Frances' figures. They speak of women's continuing struggle for equality and recognition.



Fig. 4 Pond Frances Macdonald, 1894



Fig. 5 Girl and Butterflies Frances Macdonald, 1907

She presents a sexuality that is either not available to be consumed or available but melancholy; we see loneliness, despair, and, finally, a shift from confrontation to resignation. She creates unique images of a woman's search for identity and as such they are explorative rather than definitive and efficacious. Frances' work provides women some control over their own representation thereby allowing them to explore femininity and sexuality. In her Pond 1894 (Fig.4), she radically opposes prevailing standards of female sexuality. The nudity combined with sexlessness effectively distances it from the Pre-Raphaelite beauty, the Victorian maiden, and the fin-de-siècle femme fatale. This figure, being created at the beginning of her career, significantly contrasts her later figures produced after her marriage. This change is particularly seen when comparing Pond to Girl and Butterflies 1907 (Fig.5).

Pond's figures are virtually nude as their angular joints show through their thoroughly transparent robes. Their hair blossoms out behind their torsos then forms skinny streams that run to mid-calf and pool together in the center. Smiling "ghosts", suggestive of sperm, float behind them as their tails fall behind the figures' hair and mix with the various streams. These figures nearly represent the opposite of the figure seen in Girl and Butterflies. Here, the woman is completely covered by her bulbous skirts and enveloping veil. Roses make an appearance here, continuing Margaret's symbolic usage. There is some type of cage, or perhaps a crib, revealed under her skirts which may contain a child presumably still in the womb. If so, she echoes Margaret's maternal themes. However, the meaning changes because Frances does reproduce and does fulfill the societal expectations of women, namely raising children.





Fig.6 Ill Omen Frances Macdonald, 1893

Frances, although she conforms to this one aspect of “womanhood”, is far from embodying the ideal woman of the period. Isolation is the theme most prominently portrayed through her use of the female figure. The combination of pale greens, blues, and mauves surrounding the woman’s attenuated body convey a sense of remoteness, aloofness, and aloneness in *Ill Omen* 1893 (Fig.6). This woman exists independently in a world of her own making . This particular image is the first of many to depict the struggle between fantasy and reality. Here, the figure is alone against a backdrop of mixing colors while black crows fly by behind her. Her hair is also trailing behind as if she stands erect against an intense wind, hoping to blow her away. This “wind” may be the many cultural conventions Frances was fighting to displace, but this point is up for debate. Because of her erectness, she may also be seen as a phallic symbol, thus possessing the power conventionally reserved for male figures.

Continuing the theme of isolation, Frances creates many images in which the woman is caught between various choices. She specifically contrasts the isolated woman against various influences. The title is self-explanatory in *Prudence and Desire* 1912-15 (Fig.7). The woman depicted is obviously rejecting both for a life of isolated alienation. She stands with her abdomen thrust forward and hands

visually pushing away the male figures meant to personify Prudence and Desire. These male figures seem to embody the criticizing looks of an unwelcoming public with their squinted eyes, down-turned eyebrows, and thin mouths. The form behind the woman’s head looks to be filled with apples, which conveys biblical connotations. This is perhaps a comment on, or illustration of, Eve being expelled from Paradise. As such, the figure is portrayed as possessing the forbidden “knowledge”.

While both sisters portray the female figure and use some of the same themes, they infuse their images with different meanings. Many of these meanings come from their experiences in marriage. Margaret and Charles had the more public relationship of the Glasgow Four, mostly due to their lack of children and their resulting mobility. Frances and Herbert, however, have often been called “two artistic people” who had “produced one baby and a multitude of spooks” . Just from this, one can gather that the public looked more favorably upon Margaret and Charles’ relationship, although they weren’t the ones to conform to the expectations of reproduction.

When directly comparing the two sisters, it is required to examine the work they completed together while attending the Glasgow School of the Arts. One such work is a GSA Poster from 1895 (Fig.8). The two female figures de-



Fig.7 Prudence and Desire Frances Macdonald, 1912-15



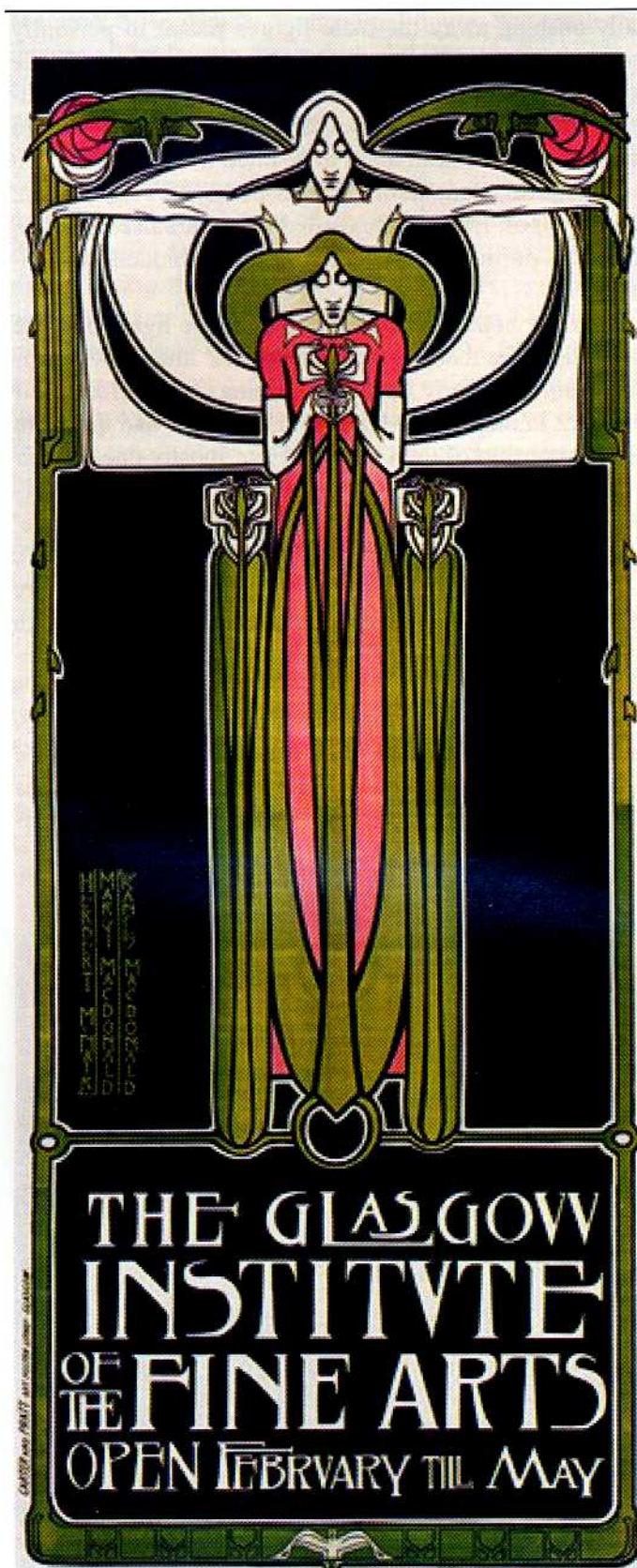


Fig.8 GSA Poster Margaret & Frances Macdonald, 1900

picted are angular and linear, geometrically symmetrical with the rest of the composition. Both of the sisters' styles originated here. Frances retains this form that is neither explicitly male nor female for a significantly longer period of time than Margaret. This linear androgyny may be perceived as the first assertion of their female figure embodying the phallus, thus possessing its power. Stylized labial folds are seen along with the rose motif to characterize the feminine, but in moderation.

The Macdonalds also completed a four seasons series, starting with Spring (Fig.9) by Frances in 1897. This series was originally exhibited in metal frames also created by the sisters. To really look at these works, it is essential to consider the frames for they exemplify a marked contrast between the soft watercolors and the hard metal. Again, the dichotomy between feminine and masculine aspects of the artwork is seen. Spring, especially, is seen as a fertile, maternal figure with her sex organs clearly delineated. There is also the faint outline of a child figure at her feet. The frame contains bulbous forms that provide the gendered opposite in the form of testicles or sperm.

While Frances made Spring and Fall, Margaret created Summer and Winter 1898 (Fig.10). The various seasons markedly signify fundamental differences in the sisters' styles. Spring and Fall, as seasons, are very similar in temperature and epitomize change. Thus they are seen as liminal seasons. Summer and Winter, on the other hand, are opposites in terms of temperature and represent the two extremes. Thus they are seen as dichotomous seasons. Frances, as an individual and as an artist, floats in this realm of liminality. She struggles throughout her life with not fitting in, caught between the world of motherhood and the world of public power. On the other hand, Margaret exists in a truly dichotomous realm. She is accepted publicly as an artist, albeit through her husband, yet does not conform to reproductive expectations. Frances spends her life looking for a niche, arguably creating the most dynamic artwork of the pair, while Margaret easily fits into society as a woman, albeit a woman who possesses phallic power.

The foremost difference between Margaret and Frances is visualized in their respective representations of the famous literary figure, Ophelia. She is well known in western culture as the epitome of the victimized female. In Shakespeare's Hamlet, she is caught in the archetypal dichotomy between the virgin and the whore. She eventually goes mad and drowns, unable to endure unjust expectations. Frances was the first to visualize this subject in Ophelia 1898 (Fig.12), while Margaret created her Ophelia in 1908 (Fig.11). Many visual differences surface in this decade. Frances thoroughly rejects androgyny in her depiction of the literary heroine. This woman has curves and can almost be considered an ideal





Fig.8 GSA Poster Margaret & Frances Macdonald, 1900



Fig.8 GSA Poster Margaret & Frances Macdonald, 1900

beauty. Her brunette hair demurely frames her face as her hands delicately reach up to cup a fish. It is hard to tell whether Ophelia is actually dead in this image, for she still possesses a life force. Her dress floats around her and butterflies hover on the surface of the water. Margaret, on the other hand, depicts her Ophelia as excessively elongated and definitively dead. Her eyes are closed and her skin has lost all color of life. There are roses present, but this figure is clearly androgynous and phallic.

It would almost seem that these two images are mixed up. Margaret's is more like Frances' style, and vice versa. Yet it is the content that makes each Ophelia characteristic of each sister. The issue of representation up for

debate is the power behind Ophelia's liveliness. Margaret shows Ophelia as fin-de-siècle culture viewed her; as a subversive female figure. The public approved of Ophelia as dead, because then she lost all of her phallic power and was thus a victim of castration. This places the male characters in Hamlet in the right and Ophelia in the wrong, and thus subverted, position. If Ophelia was alive, as Frances has depicted her, she still threatened the established social and gender roles. She served as a constant reminder that the expectations derived from the virgin/whore dichotomy are thoroughly and utterly unreasonable. And that maybe the gender roles, so heavily enforced into the twentieth century, were unwarranted and unfair. Frances infuses her





Fig.11 Ophelia Margaret Macdonald, 1908



Fig.12 Ophelia Frances Macdonald, 1898

Ophelia with a life force that has the possibility to obliterate the survival of traditional gender roles.

Margaret and Frances Macdonald embodied the “new woman” of fin-de-siècle France because, through their art, they attempted to introduce the idea of a phallic woman to the world. The power of the phallus provided them with an autonomous existence. Not only were they educated and raised to be independent, professional artists, they continued this power through their art. Their respective artworks challenged the status quo in an effort to provide femininity and motherhood with the respect of the phallus. Their androgynous figures, and eventual phallic maternal figures, were the perfect balance between the feminine and the masculine.

Thus the women they depicted had as equal access to phallic power as men did.



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# CRITIQUE OF MANDLER'S THEORY OF PERCEPTUAL ANALYSIS

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Recently, cognitive development has become a topic of mass popularity within the world of academia. Among the various developmental benchmarks, one topic that has eluded many is concept formation. Possibly the oldest and most famous theory regarding concept formation originates from psychology – Piaget’s theory of sensorimotor development. In recent years, Jean Mandler has proposed an alternative explanation to this phenomenon. Unlike Piaget, Mandler has clearly outlined the steps that transform perceptual information into concepts. After extensive reading, I was convinced that she postulated a more probable and convincing theory. After closer inspection, however, I have located a major shortcoming in Mandler’s explanation – her theory does not seem to account for blind infants (Keil, 2008; Zlatev, 2007). Due to the plethora of people worldwide who suffer from visual impairment, there must be an explanation for concept formation that includes this sample of individuals as well. Since Mandler’s theory does not account for the blind population, the basis of her perspective is substantially weakened. In this paper, I intend to critique Mandler’s theory of perceptual analysis by exploring its main tenet: the importance of visual perception for cognitive development (Mandler, 1992; Zlatev, 2007). By providing examples of other ways in which these two are intertwined, it can be concluded that Mandler has the right idea. If vision truly affects cognition, however, does this mean that a lack of vision interrupts proper cognitive development? If so, how do blind individuals form concepts? In this paper, I plan to address these questions. Before I begin, I will first review the key components of Mandler’s theory of perceptual analysis.

In her various articles, Mandler has suggested that perceptual analysis is the mechanism through which concepts are first formed (Mandler, 1992; Evans, 2010). According to Mandler, infants attend closely to a perceptual array presented to them by their senses. In doing so, a new kind of information is abstracted. Now the once perceptual information has been recoded into a non-perceptual form that represents meaning. This conceptual primitive is called an image schema, in which “spatial structure is mapped into conceptual structure.” (Mandler, 1992, p. 591). These conceptual primitives later form the foundation of the human conceptual system. The basis of this entire process begins at the process of perceptual analysis. According to Mandler, infants are able to engage in perceptual analysis from the time of birth; thus, it is an innate ability. However, in order to carry out this process, the infant must receive spatial information from his senses. She argues that the spatial information most crucial to concept formation comes from the visual system (Zlatev, 2007). Mandler was certainly not the first to assume that cognitive development is de-



pendent on visual input (Hupp, 2003). In order to consider Mandler's theory credible, it must be shown that the two are, in fact, intertwined.

Support for the idea that vision affects cognitive development comes from many sources. For instance, Sternberg argued that cognitive mechanisms are sight-dependent (Hupp, 2003). Going back to the time of Descartes, he believed that, "although vision is influenced by one's cognitions, a coding of the physical properties of an image must mechanically move through the optic nerve and thusly represent a picture to the nervous system" (Hupp, 2003, p. 7). For example, thoughts may be able to influence the perception of an apple, but one must first see the apple for a mental picture to exist before any kind of cognitive work can take place. The idea that vision precedes thought was further supported by Pylyshyn in later years (Hupp, 2003). He reported that visual perception may lead to changes in the way in which we mentally represent the observed world.

Further evidentiary findings have demonstrated the interrelatedness of vision and cognition. For example, by modulating cortical cells located in the posterior parietal cortex of the brain, Pylyshyn was able to illustrate the function of an "extra-visual effect" (Hupp, 2003). Signals in both the visual and motor cortexes jointly activate these cortical cells. Activation in the motor cortex does not necessarily suggest movement; as in this case, simply thinking about a plan of action can also stimulate this area. Thus, the cortical cells studied were activated by both vision and thought. This study provides convincing evidence that the systems work together. Other researchers, namely Milner and Goodale, termed this phenomenon: "vision for action" (Hupp, 2003). This concept of "vision for action" was further illustrated by Kosslyn (Hupp, 2003). By using both positron emission tomography (PET) and functional magnetic resonance imaging (fMRI), he showed that cognitive activity was coupled with general activation in the visual system.

Even further evidence can be seen from individuals who suffer from some degree of neural trauma, rendering them unable to perform normal cognitive functioning. For example, in the case of visual agnosia, the individual is able to perceive an object (as there is nothing wrong with his retinal cells) but cannot identify it (Hupp, 2003). Wiring has been severed between neural areas of perception and those of recognition.

This type of visual agnosia, anomia, is clearly demonstrable by PET, MRI, and neuropsychological testing that implicates a disconnection of sensory impulses and cognitive evaluations between Wernicke's area in the temporal lobe and the visual cortex, located in the occipital lobe (Hupp, 2003, p. 8).

Given these findings, scholars of cognitive science have come to accept the relationship between vision and

cognition (Hupp, 2003). As an active member in the field, Mandler was correct to believe that visual perception and cognitive development are linked. Considering the studies just explored, her theory of perceptual analysis – visual perception leads to conceptual primitives – seems plausible. However, concept formation for blind individuals in the context of perceptual analysis has yet to be addressed. If visual input is necessary for conceptual output, then individuals without vision would not be able to form complete concepts. If Mandler's theory is accurate, the blind should display delayed cognitive development.

Cognitive theorists have proposed that blind individuals "may have developed different cognitive pathways to acquire, process, and accommodate sensory information" (Hupp, 2003, p. i). In other words, the blind may "think differently" in comparison to sighted individuals. According to Siegler's rule-assessment approach to cognitive development, any kind of obstacle presented to the encoding of novel stimuli may hinder the developmental process (Hupp, 2003). The loss of vision can be included as an example of a sensory impairment that ultimately interferes with the encoding process. Thus, in line with this approach, blind individuals should have mental capabilities far different from those with normal vision. However, current studies regarding the mental capacities of the blind and sighted do not, in fact, support this conclusion (Hupp, 2003).

Before the studies below are explored, it is important to first consider the problem with using a "blind-versus-sighted comparison" (Orlansky, 1988). According to Warren, we must not assume that any set of common measures applied to a group of blind individuals and a group of sighted individuals will result in truly equal measurements (Orlansky, 1988). Since there is no test that is completely equal for both groups, the available data must be considered with the understanding that there may be a slight margin of error.

In 1968, Tillman and Bashaw conducted a study in which both blind and sighted children completed the Wechsler Intelligence Scale for Children (WISC), which generates an IQ score representative of the child's general intellectual ability (Begum, 2003). Tillman and Bashaw were interested in the verbal IQ in regard to subtest scores. Their findings showed equal mean verbal IQ between the two groups of children, but different patterns of high and low scores on the subtests (Begum, 2003). Thus, intellectual ability between the two groups is somewhat comparable, with differences in specific areas of strength and weakness.

In 1989, Ittyerah and Samarapungavan compared the performance ability of three groups of children – (1) congenitally blind, (2) sighted children who were blindfolded, and (3) sighted children with no blindfold (Begum, 2003). They all completed the same set of tasks that have been commonly used to indicate level of development. "Results indi-



cated that cognitive development in the blind is not identical to that in sighted groups. Moreover, the differences in performance between groups are content or task-specific and do not take the form of a global deficit across all developmental tasks" (Begum, 2003, p. 60). In a way, these findings mirror those found in Tillman and Bashaw's study. In the previous study, differences in overall IQ mean were negligible. In this study, Ittyerah and Samarapungavan found no overwhelming disparity in global intellectual ability. In both, however, there were variations in performance on particular subtests and specific tasks. This can be explained by the fact that blind children and those with normal vision "think differently"; thus, certain areas of performance will prove to be stronger, while others remain weaker.

Just four years earlier, in 1985, Singh conducted a study that found the same results as the previous two. Unlike the other studies, however, the participants were adults. They completed a revised version of the Wechsler Adult Intelligence Scale (WAIS), called the WAIS-R (Begum, 2003). Their overall scores, as well as their performance on specific verbal subtests, were compared. Results show that scores "did not differ significantly" between those who were visually impaired and those with normal vision (Begum, 2003).

Tobin and Gottesman considered the literature available on this subject (Begum, 2003). As indicated by the three studies discussed earlier, differences in cognitive functioning between blind individuals and sighted individuals are minimal and trivial. "There can be little doubt that developmentally, and in every other way, such [blind] children have more things in common with their sighted peers than things that separate them" (Begum, 2003, p. 56).

This conclusion poses a challenge to the consistency of Mandler's theory. Blind individuals are certainly able to form concepts, as suggested by their comparable levels of cognitive functioning; moreover, they are able to do so without visual perception. Thus, it appears that Mandler's focus on visual perception, in the context of perceptual analysis, falls short. So how do blind individuals form concepts? Results from a number of studies suggest that other sensory systems may become highly sensitive for blind individuals. With additional information from the other senses, their bodies may somewhat counterbalance the lack of vision (Hupp, 2003; Orlansky, 1988).

The child's remaining senses – primarily hearing and touch – may develop into useful avenues of sensory input but can never fully compensate for the loss of vision, nor can they usually provide information that is as exact, complete, spontaneous, and continuous as that normally gained by children who are constantly able to see their environment (Orlansky, 1988, p. 98).

According to Marzi, blind individuals often behave differently to sensory input than sighted individuals (Hupp,

2003). A beautiful example of this was illustrated by Morgan:

Morgan then described how a sample of blind individuals was able to form a three-dimensional cognitive map based on auditory information. These individuals used this cognitive map to assist them in moving about, or orienting, to the physical world. Morgan concluded that blind individuals would often compensate for their lack of vision with over-developed abilities in other sensory functions (Hupp, 2003, p. 9).

As this example shows, blind individuals were easily able to attain spatial information from auditory stimuli alone. This clearly goes against Mandler's preference for visual perception as the preceding element in concept formation.

In addition to auditory information, blind individuals seem to also rely on tactile stimuli. In fact, many researchers have used touch to measure intelligence in the blind (Hupp, 2003). Worchel conducted a study that attempted to assess the perception of tactile form in blind individuals (Begum, 2003). There were three measures: reproduction, verbal description, and recognition. The findings indicate that sighted individuals were better at reproduction and verbal report, but the blind do just as well in the recognition of tactile form (Begum, 2003). These conclusions mirror the findings discussed earlier. Blind individuals and sighted individuals tend to differ in performance on subtests; this, in turn, indicated that the blind have certain strengths and weaknesses. Perhaps these data apply to the tactile stimuli as well. Thus, blind individuals perform better on tactile recognition, and worse on reproduction and verbal description. Regardless, the idea that blind individuals are able to gain spatial knowledge through their other senses directly opposes Mandler's theory.

Let us, for a minute, accept the idea that spatial knowledge can be acquired by the other senses. Using the premise of Mandler's theory, this information must then be recoded into a non-perceptual form that represents meaning. If blind individuals are receiving spatial information from other sensory inputs and are able to form concepts, it must hold that their concepts are formed from image schemas based on non-visual perceptual information. This reasoning would only work given that we follow the process in Mandler's explanation of concept formation. At this point, however, a rather large shortcoming in her theory has been exposed. Thus, it does not make sense to apply her notion of image schemas. If we were to modify her theory of perceptual analysis to include all sensory systems, however, then we can keep the roots of her perspective.

As I mentioned at the beginning of this paper, Mandler's theory is highly appealing since it offers an explanation for the relationship between spatial information and concep-



tual formation. Since Mandler first proposed her theory of perceptual analysis, she has dramatically impacted the way in which other members in the field of cognitive science view infant cognition (Keil, 2008). I applaud Mandler's efforts, but the fact that her reasoning does not seem to account for blind individuals cannot be overlooked. A credible theory would include all kinds of people, especially a subpopulation that is constantly growing. Currently, there are over ten million people in the United States alone who suffer from "significant impairment of vision which cannot be further improved by corrective lenses" (Hupp, 2003, p. 1). If Mandler's theory is deemed accurate, how would cognitive development, including concept formation, be explained for these people?

I believe the information from this paper questions the validity of Mandler's current theory. By showing that cognitive development in blind individuals is comparable to that of sighted individuals, we can disregard the main tenet in Mandler's theory of perceptual analysis: visual perception leads to concept formation. Without this basis, the entire theory crumbles.

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