The primary objectives of my funded research were two fold in construct and dealt with systems of management on both an industrial and individual level. The first was to examine the environmental and socio-economic burdens of resource management in relation to copper ore extraction in Chile, the world’s largest copper producer. Secondly, I visited a unique detoxification program at the Thamkrabok Monastery near the city of Phraputthabat in Thailand. This monastery helps individuals manage their addictive tendencies in regards to substance abuse. I combine these two very different avenues of research by drawing a direct correlation between copper and addiction management and the role these two subjects play within my interests as a creative practitioner.

Copper is the primary material in silicone bronze, my preferred material as a figurative sculptor. As an object maker that continues to examine the human condition throughout the maturation of my work, it is necessary to examine all aspects of the creative process, including the environmental impacts associated with copper ore extraction and the measures that are currently being undertaken by the mining industry; specifically CODELCO (Corporacion Nacional del Cobre de Chile), Chile’s nationalized copper conglomerate, to reduce the negative environmental and socio-economic burdens that have plagued the copper mining industry for over a century.

My research at Thamkrabok Monastery offered a non-western perspective to the issue of substance abuse management, a central theme in my past creative work. Thamkrabok Monastery is heralded as one of the most difficult drug rehabilitation programs in the world, combining various ceremonial practices, manual labor, and a personal commitment to sobriety as key aspects to recovery. In addition, I researched a unique fine art basalt casting process that was developed by the monks of Thamkrabok to construct very large ceremonial figures throughout the confines of the monastery. This casting technique provided additional correlation between my research in Chile and Thailand in that I was able to examine a new artistic media outlet that is less resource intensive than bronze casting but still archival in quality.

In Chile, I conducted a material assessment survey of the copper mining industry, concentrating primarily on the Codelco Norte mining division of the Atacama Desert region. I chose this region, which is one of four that make up the corporation of CODELCO, the others being Salvador, Andina, and El Teniente, for its size, production quantity, and geographic location. I visited a number of mines, smelters, refineries and mining communities within the regions north of Santiago, but will use the mining division of Codelco Norte, which incorporates the merged divisions of Chuquicamata and Radomiro Tomic as my primary focus of this project report. I was also able to conduct a thorough survey of an additional division known as Ventanas, which is located in the Punchuncia district north of Santiago. This was an unexpected addition to my research being that it is a recently acquired facility of CODELCO due to a merger with ENAMI, and is the only non-mining based division within CODELCO, serving its purpose as a coastline smelter, refinery and port operation.

While surveying the El Norte and Ventanas divisions, I would first perform an on-site visit of the industrial facilities, interview management or public relation personnel and document the indust...
trial processes incorporated within the facility. During interviews, in addition to familiarizing myself with the facility and its specific functions, I would place heavy emphasis on questions concerning worker safety regulations, plant emissions and recycling protocols as well as waste management systems that are currently being utilized. After visiting a facility, I would then take to the outskirts of the industrial sector and observe the surrounding environmental impact such as the presence and condition of flora and fauna, water and air clarity, and the existence of any uncontained industrial waste. Photographic images were taken of these environments for use as visual documentation of the surrounding conditions.

Once this was complete, the cultural counterpart of copper mining was investigated by conducting further interviews with workers and families within supporting communities to assess the socio-economic impact and importance of the mining industry and the role it plays in the support of a local and national economy. I considered any community known to contain large miner population numbers, such as the cities of Calama, Antofagasta, Copiapo, and Las Ventanas as locations of assessment, but will focus solely on Calama and Las Ventanas for this project report. The examination of quality of living standards was done through taking notice of the economic status of worker housing communities and the implementation of community green spaces and recreational facilities within these areas.

**Thailand**

**Methods**

My methods in Thailand were quite different from those utilized in Chile. To accurately understand the processes utilized by Thamkrabok Monastery to combat substance abuse, I felt it necessary to admit myself into their detoxification program to fully realize what it means to be addict, unable to gain control over your addictive tendencies. Therefore, upon arrival I requested entrance into the detoxification clinic for a period of twenty-eight days. During this time I took part in all aspects of the detoxification process, most of which found their basis in the Buddhist system of beliefs, but contained the emphasis of only providing an environment that allows a person to help themselves out of the bondage of addiction.

Nearly all methods of research that I used were actually predetermined by the monastery in that they were all pre-existing tools already in place as suggested techniques of individual management that had been formulated by the founders of Thamkrabok in 1956. The respect and application of eastern philosophical beliefs was recommended while in attendance at the detoxification center and I felt that my primary method of information gathering was the observance, participation, and recording of each aspect of the detoxification process in order to fully understand the system as a whole. Thamkrabok monastery and its staff open their doors to some of the most distraught and addicted substance abusers on the planet. Their methods begin with the taking of a sajja, or declaration to oneself that one will put into reality ones actions and values, this is followed by the taking of an herbal medicine for 5 days, this is then expelled from the body in a ceremonial process involving vomiting. After the completion of your first five days, a regiment of black medicinal pills, steam baths, herbal tea, meditation, group chanting and manual labor is adapted by those who are physically able to participate during the extent of their stay.

In addition to the pre-determined methods of rehabilitation that were offered forth by Thamkrabok, I also committed myself to continual examination and understanding of Buddhist philosophy and practice and delved deeply into the labor aspect of the treatment by apprenticing under an adjunct monk named Phra Thong, who was the one of the original sculptors of many large cast basalt monuments that exist throughout the monastery. The exchange of knowledge through a series of interviews with Phra Thong, and the time spent while working on a large bronze commemorative statue of one of the founding monks, Luangpoh Charoen Panchand, was invaluable to obtaining detailed information as to the constructs of the monastery, the detoxification center,
Throughout my survey of Chile’s copper industry I was awestruck at the magnitude of industrial operations and the degree of technological innovation that exists in the industry practices of the Codelco Norte Division. Codelco Norte is by far the largest producing division within Codelco, its annual production numbers are around 940,613 tons of electro-refined and electro-winned cathodes with a purity of 99.99%. Major by-products produced by the division are anodic sludge and sulphuric acid. The Chuquicamata mining complex is located 1,650 kilometers north of Chile’s capital city, 2,870 meters above sea level and includes two open pit mines, “Chuquicamata” and “Mina Sur”.

Copper concentrate, a black powder containing approximately 30% of the metal is the least elaborate form of mined ore that can be commercialized. Codelco, however, produces a much higher grade of product called a grade A copper cathode with 99.99% purity. Two stages of processing are required to transform the concentrate into a highly pure cathode: smelting and electro-refining. The first process utilizes the purification of the copper in high temperature furnaces. In this process, known as smelting, the copper is turned into a metallic form and is separated from a variety of impurities like sulfur, silica, and iron. The end product is known as an anode plate. This anode plate is then taken and transformed into a grade A product of 99.99% purity using the process of electro-refining.

The smelting process releases gases containing sulfur dioxide, arsenic and particulate material. Until recently, these gases were released into the atmosphere, impacting the air, environment, and quality of life of surrounding communities in the areas nearby the smelters. Sulfur dioxide is harmful to the respiratory system of workers, and after coming into contact with air, turns into sulfuric acid, a major contributor to acid rain. This in turn has a negative impact on plants and soil. This was especially apparent at the Ventanas division where, due to the recent acquisition of the facility by Codelco, all regulatory systems had not been fully implemented by the new parent company and the effect was obvious in the poor visual condition of the surrounding flora outside of the facility. Their leaves where burnt by the acidic air even with the implementation of a drip irrigation system obviously placed there by facilities maintenance personnel to keep the flora from dying off completely. Similar effects to surrounding flora species was not observed in the region of Codelco Norte division primarily due to its geographical location in the center of the Atacama Desert, the driest place on earth. Very little, if any, flora exists here to become decimated by the lack of air purity.

In addition, the pollutant known as arsenic, with continuous exposure, may lead to cancer in worker populations combined with the inhalation of particulate material like that of silica, which comes from the great degree of dust that is unsettled during mining operations. Silicosis, a disease of the lung, caused by fibrosis, which is the scarring of the connective tissue of the respiratory system due to particulate inhalation, was a major cause of death for mine workers during the early to mid 20th century. To safeguard workers and their families from continued exposure dust from the mine, in 2004 Codelco recently completed the relocation of the entire mining community of Chuquicamata to the town of Calama, approximately 16 kilometers south of the mine.

In the recent past there has been positive advancement in the redesign of emission management systems in Codelco Norte, consisting primarily of what is known as acid plants. These plants produce sulfuric acid from the sulfur dioxide in the gases emitted during processing. This sulfuric acid product is then commercialized or used in other mining processes such as acid leaching, adding commercial value to a product previously not recycled. The implementation of these acid plants and the degree to which they capture and treat the sulfuric acid and arsenic emissions have allowed all of the divisions of Codelco to reach certification of the International Standardiz-
tion Organizations ISO-9001 (Quality) and 14001 (Environmental) emissions standards and has greatly decreased the amount of pollutants that before were being emitted into the atmosphere during production. The specifics of this certification require the implementation of an environmental management system that uses a systemic approach to handling quality and environmental issues within an organization. This approach is based on a Plan-Check-Do-Review-Improve cycle being implemented as a management development tool.

In addition to ISO certification, Codelco Norte has gained certification of its health and safety management systems under OHSAS-18001 technical specifications in 2005. OHSAS 18001 has been developed to be compatible with the ISO 9001 and ISO 14001 management systems standards, in order to facilitate the integration of quality, environmental and occupational health and safety management systems by Codelco. In 2004, as a precursor to this certification, standard guidelines were issued for the entire corporation for the identification of hazards, assessment of risks, investigation of accidents and the development of risk maps to work on problem areas of industrial hygiene. These guidelines have been implemented as a standard risk prevention management model for all the work centers and contractors that are incorporated in the Codelco Norte division.

In regards to community relations, Codelco is currently working with the International Standardization Organization to develop a new standard of certification known as ISO-26000, which will set parameters for social responsibility in regards to company-community development parameters. Codelco Norte expected to be one of the first companies to receive this certification, which will be released to the international community in 2010, but to date they have not. After obtaining the ISO-26000 level, Codelco foresees in the near future that all the sustainability aspects of their divisions will be integrated into one central management system.

During my interviews with workers and community members regarding the socio-economic impact of the mining industry on their lives, the resounding theme of national pride was apparent. The majority of employees of Codelco say they work for Chile, the country, not Codelco, the company, implying that they are one in the same. They perceive Codelco as the great Chilean company, primarily for its economic contributions to Chile’s national revenue. This being said, there was ample recognition by a number of community members, specifically in Las Ventanas, that Codelco did not appear to be interested in economic development of communities as a whole and that this economic development was the most important need regarding their quality of life. This is understandable being that the Ventanas division was a recent acquisition by Codelco and also does not contain a high number of personnel in comparison to an actual mine site, therefore not warranting the same degree of attention by management.

I must mention that individuals who worked for Codelco as either employees or contractor spoke extremely high of the company. There are very few employees who quit once hired and it is considered the “best job” to have in Chile by the majority of employees and citizens that I spoke with. In Calama, under a new hire, Codelco will buy the employee a residential property. This house is for them to keep and is seen as a part of their benefit package for relocating to a remote area like the Atacama Desert. This is a new implementation, since before, when workers lived in the town of Chuquicamata, they lived in either shared or attached, barrack-style housing. Although modest, the majorities of the residences in Calama were well kept and had an automobile in the driveway. The town is quite expensive to stay in due to the high wages earned by the employee population at the mines, which speaks of the affluence of the community. There were a number of green spaces within Calama. Codelco did not develop these directly, but rather the community that it supported. A number of citizens commented on the need for Codelco to engage further in the development of green areas and the support of environmental education, decontamination, and reforestation.
During my stay at Thamkrabok monastery, I learned of the processes used by the monks and staff to combat addiction and found that their primary emphasis was clarification of an individual's mind and body in order to help them access the real problems that initially led them to addiction. The methods used at Thamkrabok are unorthodox by western standards and base their belief in Buddhist teaching and philosophy.

It is thought that the addiction covers a quite demanding life-task that hasn't been found our realized yet; and it covers the existential frustration and fear that is linked with this situation. They tell the patients to not waste any more time on addictions than they already have, because their lifetime is precious. This is a method of placing meaning or worth into a person that previously thought of themselves as worthless. Throughout the treatment they ask critical questions like: Who are you? What would you like to do and to become in life? How can you realize and reach it? Where should you start after the detox? How will you overcome future obstacles? Where and in what environment will you live? They then couple discussion of these questions with informative dialog that talks about life after detoxification and the unpleasant things that drugs have covered up until now and how these emotions or actions will probably show up in the future.

I observed a number of addicts begin to show intense cravings, states of despair and fear, spouts of irresistible boredom, a restless longing for distraction, or even violent acts taken upon themselves or other patients. The monks see these acts as traps, as struggle that needs to be fought in order to find out what a person is meant to become and do in life. They promote the nourishing of positive accomplishment, therefore decreasing the power of these dark actions. They do not promote the state of feeling like a victim and require that you leave guilt, blame and judgment behind you. Excuses such as a difficult childhood or poor societal status is never accepted as a reason for not being serious about life and the path that a person chooses to lead while on this earth.

In order to overcome drugs, a person must find that path that comes out of their origin, deep in their heart, that has always been waiting to be found. They compare this encounter of a path to walking a dog. Once you find your lost dog, you must build up enough will power to walk it constantly, or it may run away again. By using a number of simple, comparative examples like this throughout the treatment, many of the patients began to simplify the way that they viewed the world and seemed to find a bit of solace within themselves through this simplification. This, of course, is pure conjecture on my part due to the large number of patients that were admitted and then left the monastery during my 28 days there, but it seemed that when given analogies, patients could relate because it allowed them a concrete notion to "hang on to".

To enter the drug-detoxification area of the monastery an individual must go through the ceremony of Sajja. The Sajja is a very essential element at Thamkrabok that is a declaration about a truth that one will put into reality by one's actions. The sajja is a sacred act that you believe will connect you with your will power and is said to be the “whisper of God”, as termed by Luangpoh Charoen, one of the founding monks of Thamkrabok. The Sajja is a very powerful tool that will guide, protect and save an individual if it is taken seriously. The Sajja is a tool for everyone, regardless of religious background or individual belief.

After the first five days of treatment, an individual is then given a little piece of paper with a sacred word printed on it known as your Kahtah. The syllables have no intellectual meaning; their function is purely energetic. A person must learn the saying by heart and eat the paper within seven days. These words are repeated constantly during meditation or times when endurance or strength is needed such as in moments of craving and temptation. If this tool is used constantly it is thought to grow and become a powerful helping hand in the continued battle against addiction. It is thought of as a tree where you can hide, even when a tiger is roaming around looking for prey.

Luangpoh Yai, a holy woman and great teacher in Thamkrabok, now deceased, developed a very effective potion that is required by all admitted persons to take for the first five days.
There are more than 110 ingredients in it and it is taken orally in small quantities in liquid form. After consuming the potion, an addict then drinks roughly a pale of water mixed with herbal tea. It is then dispelled from your body by vomiting during an afternoon ceremony. This is seen as the primary detoxification process that addicts will use to rid themselves of addiction, but is only an initial stage. After the first five days, little black pills containing the same herbal mixture as the oral potion, but in concentrated form, are given to the addicts until they leave the monastery as a secondary and continual detoxification element.

Steam baths and herbal tea were given daily as further purifying elements of the treatment. Like the vomiting, the steam bath is a classical element of physical purification. Four kinds of herbs are added to the steam; they are exceptionally good for the skin, lungs, and eyes. For me, this was one of the most enjoyable aspects of the detoxification process, although necessary, it provided me with a great deal of pleasure and physical clarity that I had never experienced before. The herbal tea was a watered down version of the oral potion, heavy in taste and texture. It could be drunk voluntarily throughout the day, but its intake was required before going to the steam bath to enhance the detoxification effects within the superheated environment.

Chanting was also offered by the center as a communal activity where addicts were welcome to come and join in on the ritual ceremony performed by the monks and nuns of the monastery after dinner. This was a good place to practice meditation, which was another method of internal cleansing encouraged by the staff. Meditation literally means, "moving towards one's middle". It can be done standing, walking, sitting, or lying down. Emphasis is placed on being fully aware of your bodily sensations, your feelings, the never ending chatting in your mind, and the impressions coming from the outside world. An individual should take the position of a mindful witness. They should accept what is happening with loving kindness, but they need not indentify with it or attach themselves to it.

The final portion of the detoxification process at Thamkrabok had to do with manual labor. This was seen as a vital aspect of recovery, but was not required of all patients due to some lacking the physical ability to participate. Those who did participate took part in a variety of tasks like preparing meals, making bricks, or gardening. I informed the monks that I was trained in the arts and was quickly put to work sculpting a large wax commemorative piece of Luangpoh Charoen Panchard, the founding monk of Thamkrabok who recently passed away in the spring of 2008. It was to be cast in bronze and placed in the ceremonial altar where his body was laid to rest. This was a great honor for me and proved to be a key element in my initial research regarding the basalt casting processes developed by the monks at Thamkrabok.

I was initially introduced to Phra Thong, one of the four adjunct monks at the monastery who was also formally trained in the arts. An adjunct monk is one that is considered a teacher within the monastery and who is well on his way to enlightenment. During my daily duties, I would sculpt for hours, then talk with Phra Thong about the methods used when casting large basalt objects, such as mold construction, material usage, fuel sources, basalt mixtures and finishing techniques. Phra Thong was reluctant at first to share detailed information with me concerning the specifics of the basalt casting process, but eventually shared with me every detail including the recipe for making man made basalt. Being that it was the wet season in Thailand during July, I was unable to witness a basalt pour first hand, but I did study various sculptures, some that were fully completed and some that were in the midst of construction. The processes used to melt the basalt are not unlike the process used in the United States in contemporary iron casting, but the recipe for making basalt is quite unique. I was asked by Phra Thong to not share the specifics of the recipe, except by process of demonstration, so I cannot provide it in this project report. I can say that the materials for making basalt are of partial recycled origin, which makes it a welcome alternative to traditional bronze casting which is very energy intensive.
Although Chile and Thailand are vastly different areas of the world, for myself, as regions for personal research, they shared similar characteristics. Whereas in Chile I was concerned primarily with informing myself of the origins of copper, the surrounding industry, and the impacts associated with mineral extraction, I left asking myself questions similar to those asked of addicts in Thamkrabok, listed above in paragraph two of the findings section. Who are we? Why do we mine these specific minerals? How can we obtain them safely? How will we continue to overcome obstacles of mass production? What type of environment do we want to live in the future? I do not claim to have answers for these questions, but do see a balance beginning to form between corporate management, community, and the environment.

I am always skeptical of corporate interest and tend to side with the community opinion when it comes to need for progressive implementation of environmental policy and regulation as well as economic stability. It is the job of industry to self-manage its operations in a manner that benefits the regions and communities that exist within its boundaries. It is then the job of citizens to continually put pressure on industry to be pro-active towards innovation, both internally in regards to systems management, and externally in regards to community support. In a developing nation like Chile, it is refreshing to see a company like Codelco take initiatives like obtaining ISO-26000 certification even before release of its certification criteria to the international community, but reform must not stop there. Continual skepticism of management and the push for corporate interest to further its contributions to community and environment are necessary until there is equitable distribution of wealth coupled with the least amount of environmental degradation.

This is similar to the mentality that must be adopted by an addict who wishes to rid themselves of their addictive tendencies. Although often frustrated with the environment of Thamkrabok monastery, including the individuals at the detox center, I found it necessary to consistently take a step back, look at the broader picture, and then address the issue at hand. Thinking before acting is practice not utilized by the majority of human beings; unaware of the ripple effect that their actions contain, we often see negative products of a once positive intention. I can honestly say that my experience at Thamkrabok opened my eyes to aspects of myself, and others around me, which I would have never noticed before; containing an inherent common belief of entitlement and inner self-loathing. These are issues that can only be addressed if made apparent, even if they are seemingly menial in nature, and are an important step in securing a platform of success in future life struggles.

Consistent management of a battle that will never be won but forever fought is reminiscent of the atmosphere that needs to be more strictly adhered to by corporate interests in Chile and abroad. We must regard the unpleasant aspects of our existence and work to mediate if not wholly eliminate the negative preponderances that continue decrease our quality of life. We can do this by not only continuing to adapt through change, but also recognize that there is an initial good in all humans, and that this good only needs to be nurtured before a positive change can be seen. So, whether dealing with a large copper conglomerate, or an individual who has lost their place in the world, management is key to delineating the difference between a positive and negative action. This action then determines the next steps that we as a global community can take towards securing a cleaner, more productive future.

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Conclusion

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