Proposal to establish the

OUTWARD BOUND INTERNATIONAL INNOVATION INSTITUTE (O.B.I.I.I.)

by Derek Cabrera

A Proposal to Establish the

Outward Bound International Innovation Institute (OBIII)

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OUTWARD BOUND INTERNATIONAL INNOVATION INSTITUTE (OBIII)
Executive Summary

This is a proposal to establish and seek funding for The Outward Bound International Innovation Institute (OBIII). OBIII is an educational, nonprofit 501(c)(3) corporation organized as an autonomous system to develop and deliver interdisciplinary program innovation to the Outward Bound Schools of the world.

Outward Bound is the founder of adventure-based experiential education. Its concepts and practices have fostered thousands of facsimiles and interpretations throughout the world. At the same time, many studies, initiatives and projects have sought to improve and update the Outward Bound programs. Some have improved programs, but usually on a unilateral, short-term basis.

Today, Outward Bound has no system that continuously:

- Develops, and delivers to field staff, innovations in experiential education.
- Merges new technologies and socioeconomic changes into its programs.
- Provides an archived resource for curricula and itinerary development.
- Explores the resources in experiential education and adapts them into Outward Bound programming alternatives.
- Delivers new perspectives, concepts and material for marketing advantage.

OBIII is such a system.

OBIII is managed as a Complex Adaptive System, or CAS, which provides the structure and operating principles for the innovation system. A CAS is a simple but formal organizational structure that operates within a minimum set of rules. OBIII has 5 rules:

- It is autonomous.
- It is multidisciplinary
- It focuses on initiatives that can be implemented by field staff
- It is measured only from demonstrated innovative solutions
- It is managed as a Complex Adaptive System (i.e., it follows these five rules).

This proposal consists of five chapters:
Chapter One: This proposal first examines the reasons why an "innovation system" is necessary to insure a constant and relevant flow of field staff initiatives.

Chapter Two: A chronology of Outward Bound initiatives and projects in the US is contrasted with other systems of innovation initiatives to provide a perspective on the OBIII process.

Chapter Three: OBIII is a Complex Adaptive System (CAS). This chapter expands and develops the meaning of a CAS to further clarify how these complex systems work. It then applies CAS thinking to OBIII.

Chapter Four: This chapter provides an anecdotal walking tour of OBIII, reviewing on-going projects, recent products and potential brand extensions.

Chapter Five: A five-year pro forma budget is presented as benchmarks of costs and revenues.

Appendices: Supporting research materials on Complex Adaptive System and Institutes like the Santa Fe Institute and Rocky Mountain Institute as well as a sample list of possible innovations.

Here's to the crazy ones, the misfits, the rebels, the trouble makers. The round pegs in the square holes, the ones who see things differently. They're not fond of rules, and they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them. About the only thing you can't do is ignore them, because they change things, they push the human race forward, and while some may see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world are the ones who do.

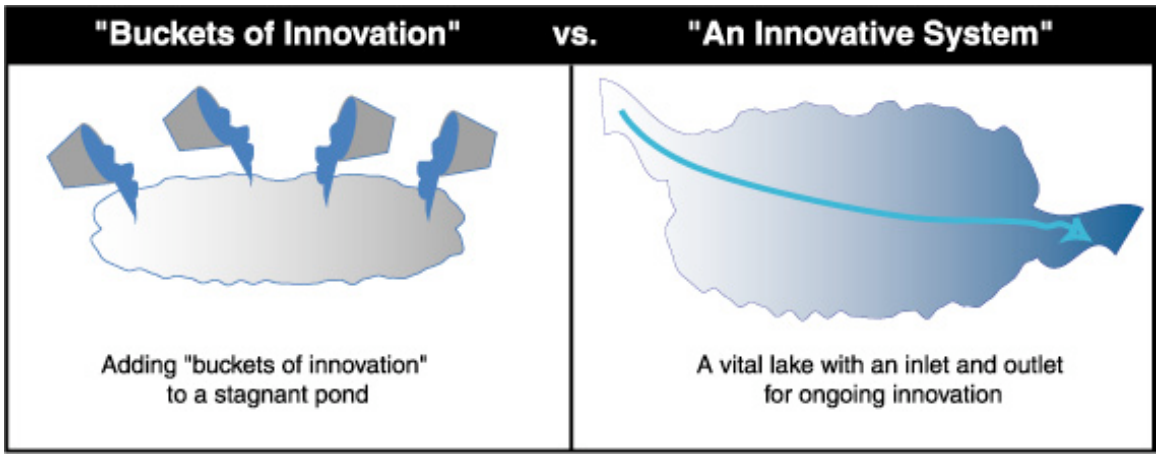
—Apple Computer, Think Different Campaign

CHAPTER 1

The Current State of Affairs

A ship in harbor is safe, but that is not what ships are made for.

Outward Bound is like a stagnant pond that needs to reassert itself as a healthy pond. Past attempts to innovate have been akin to dumping "buckets of fresh water" into the pond. This technique leads to only unilateral and short-lived changes to the pond. OB must commit to more than "buckets of innovation". To reclaim its vitality, OB must commit to an ongoing *innovative system*—an organization that ensures a steady inflow and outflow of innovation to keep Outward Bound vital for the next century.



Innovation at OB has taken many forms over the years. Kurt Hahn's original concept of Outward Bound was an innovative initiative that sparked an entire industry. Since its beginnings, OB schools have developed numerous innovations, which have led to OB's position as an industry leader.

Yet, despite OB's history as an innovator and despite its lead position in the market place, today OB faces problems of low enrollment, branding questions, field staff turn-over, and program efficacy. Enrollment is down system-wide. Brand awareness and identity lacks focus, especially among youth (Market Vision Research, 1998). Autonomous schools, separate boards and financials and cross-purpose product lines often have trouble finding common ground. Staff are short on time and solutions are often difficult to identify. Important decisions are often made, or not made, by committee. Management and authority are dispersed and often site-based. Student experiences range from remarkable and magical to simply, fun.

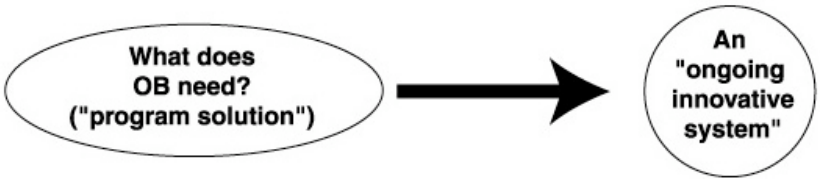
Even with these problems, the power of OB's programming remains intact. Alumni continue to report life-changing experiences. Board members and administrative staff

alike are dedicated to the schools and their students. Field staff continue to envision and deliver the “magic of Outward Bound”.

Underlying these problems and successes there are questions about program and branding. What is Outward Bound? Why is enrollment declining? How can we preserve the core and stimulate innovations? What matters most?

This proposal argues that the OB system must commit to ongoing innovation in order to ensure a vital pond. This analogy is akin to a pond with freshwater inlet and outlet where innovations continuously flow through the OB system and into the industry beyond.

Outward Bound must create the steady flow of rejuvenating ideas and initiatives in order to restore the healthy habitat of the pond. Outward Bound doesn't need "an" innovation to solve its stagnancy; it needs a steady flow of innovation. In other words, Outward Bound needs an "innovative system"—an organization that is responsible for innovating for the long term.



Chapter 2

The Past, Present, and Future of Innovation

Before considering new efforts to design an "innovative system" at OB, a few important questions must be answered:

1. What is OB's history of innovation?
2. What kinds of programs exist today in OB worldwide? Are there any programs that could be called an "innovative system"?
3. What successful innovation initiatives have occurred in other industries?
4. What worked? What didn't work? Why?

OB'S HISTORY OF INNOVATION

Outward Bound has a long history of innovations. Innovations like COBS' Project Center, Expeditionary Learning, Urban programming, the National Outdoor Leadership School, and others that have helped to revitalize Outward Bound along the way.

A review of OB's innovative past and present elucidates some of the problems these innovations have faced, why some innovations no longer exist, and what can be done differently to ensure that ongoing innovations are disseminated and become embedded in the organization.

Kurt Hahn's Outward Bound (c. 1940)

When exploring the relationship between OB and innovation, it makes good sense to begin at the beginning, with innovator, Kurt Hahn. Older men were outlasting their strapping, young counterparts at sea after German U-boats blasted the boats of the Blue Funnel Shipping Lines to smithereens. Hahn was consigned by Sir Lawrence Holt to ascertain what was going on. Sir Holt gave Hahn enough flexibility to be creative and find an innovative solution. Hahn was an innovator and he was given the resources, and a healthy dose of purpose, to succeed in identifying the best solution.

National Outdoor Leadership School (c. 1965)

In the mid-1960s, Paul Petzoldt was an instructor at COBS (the first US OB school, 1961). But, Petzoldt, like so many innovators was an impatient curmudgeon. Soon after

COBS' initial courses, he began to get frustrated with where the organization was going and he noticed that well-trained instructors were increasingly difficult to come by.

Contrary to popular belief, Petzoldt's ability to transform frustration into motivation and opportunity into innovation has been a great service to OB ever since. Petzoldt's frustration turned into the idea of, and then the manifestation in 1965, of the National Outdoor Leadership School (NOLS). So why is what Petzoldt did good for OB and the industry as a whole? Because Petzoldt's NOLS introduced a worthy (of OB) competitor into the outdoor education industry.

COBS' Project Center (c. 1980)
The Project Center at COBS provides an informative case study in innovation at OB. Originally started by Nelson Chase in the early 1980's, the Project Center was created to be the research and development arm of COBS. Most of the initial research and development focused solely on "population" innovations—courses for different populations. Specifically, a foundation was looking for customized programming, corporate-style courses were being considered and Gruffie Cough was developing a teacher practicum curriculum.

Originally, the Project Center focused on population innovations. When a few of these kinds of innovations were successful, it appears the Project Center evolved into managing the new "innovations" of the day, Outward Bound Professional (OBP) and Community Programs (OBC). Today, three successful programs exist because of the Project Center idea (OBC, OBP, and the Teacher Practicum Course).

John Wesley Powell and Life Career Renewal Courses (c. 1980)
In the 1980's, Steve Truitt thought of the idea of a rafting course with an explorer theme. John Wesley Powell is famous for his explorations of the river systems of Utah and Arizona and Truitt envisioned a course that would follow some of Powell's explorations and highlight some of the natural and human history surrounding Powell's journeys. Students would be introduced not only to new curricula but to a genuine sojourn of Powell'esque proportions! (Including no maps on final expedition.) Truitt designed the course through sections of the Green and Colorado Rivers and developed curriculum surrounding the course. The Powell course continues to draw students today.

Another population/program innovation was VOBS' Life Career Renewal (LCR) course. The idea for the LCR course came from VOBS instructor, Dave Lieder, author of Repacking Your Bags. Based on his experience and his book, Lieder developed an extensive curriculum for the LCR program which aided instructors to deliver a powerful course to older adults experiencing major change in their career or relationships. Today, most of the US schools run LCR courses, a testament to the timeliness and brilliance of this innovation.

Today, COBS teaches LCR and Powell courses. Yet, when asked about their recent courses (2000-2001), Course Directors report that they knew of no such curricula nor were any provided. In the case of both the Powell and LCR innovations, the problem was

the long-term *dissemination of the innovation*. Because no central organization took responsibility for these innovations, the core curriculum for these courses has been diluted or lost.

New York City Outward Bound (c.1985)
By making a simple analogy from "OB in the wilderness setting" to "OB in the urban setting", innovators expanded OB's reach into the urban wilderness of New York by starting the New York City Outward Bound Center (NYCOBC).

What started as a scholarship program for NYC youth (HIOBS maintained a storefront-recruiting center in Harlem) evolved into an idea for an OB-style "urban experience". In 1985, at a system-wide planning conference, John Raynolds, then President of Outward Bound USA, and Greg Farrell, then a National Trustee and head of the Fund For the City of New York, raised the idea of creating a new Outward Bound school or other entity in New York City. The following year, at the annual meeting of trustees of Outward Bound USA in New York, a highly successful "urban experience" was designed and implemented for the trustees. That model served as a pilot for what later became the Paired Youth-Adult urban courses, which were an early hallmark of NYCOBC's programming. Today, with its newly launched *Institute for Teaching and Learning*, NYCOBC is poised to make a substantial difference in the way education takes place in New York's public schools.

Expeditionary Learning (c. 1993)
Expeditionary Learning Outward Bound (ELOB) "extends the experience of Outward Bound…into public school" (ELOB Website, 2001). ELOB was an idea whose time was long overdue when its founders started the Program. ELOB was chosen out of 700 applicants for a grant from New American Schools. Extending the power of OB to public schools around the country was simply a good idea. Yet, it hadn't been done yet. Why not? Was this simple repackaging of the OB process overlooked?

Today, ELOB is in partnership with 99 US schools across the nation. It is a prime example of successful innovation at Outward Bound. Today, ELOB has grown to become a significant educational influence nationwide.

In addition to examples like NYCOBC and ELOB, many of the successful adventure and educational programs that exist today have "copied" original OB programming. As one example, the entire Vision Quest® program was developed from a single component of OB—the popular solo activity.

PCOBS, Continuum Project (c.1990s) and Program Innovation Project (c. 2001)
PCOBS Continuum Project was initially started in the 1990s by then-executive director, Paul Dudley Hart. Originally, the Continuum Project intended to look at the possibility of OB courses being "iterative" for customers. However, Hart left PCOBS before he could fully launch the Project; the Project was put on hold and PCOBS returned grant monies to the Meyer Memorial Trust. Current PCOBS executive director, Craig Trames has changed the focus and resubmitted a proposal to the Meyer Memorial Trust under a new name—the Program Innovation Project (PIP). PIP intends to take a 3-year look at

programmatic changes specifically in regard to, "age of students served, length of courses, reiterative courses, course activities, and course structure and content" (PIP Proposal to the Meyer Memorial Trust, 2001). PIP is based within PCOBS, has a specific length (of 3 years), and has a focus.

NCOBS' Kurt Hahn Center

In a conversation with Larry Pitt (NCOBS' Executive Director), "Originally, the Kurt Hahn Center was intended to be a kind of NOLS within Outward Bound, where instructors could receive training to be better instructors." A phone call to staff at NCOBS in 2001 relates that the Kurt Hahn Center is now only a building. If programming exists within the building it was not communicated.

Other Innovations Worldwide (c. 2001)

In an interview with Ian Wade, Executive Director of Outward Bound International, he mentioned numerous "initiatives" which could be called "innovative". None of these initiatives however, are dedicated to pursuing ongoing innovations for the entire Outward Bound Community. Some of the various initiatives include an Expeditionary Learning-style program in Brazil; a Singapore program serving over 9,000, 10-14 year old children; a language instructions program in Japan; urban programming within a bus ride from Hong Kong's central business district; and instructor training initiatives in Australia.

Outward Bound International is in the process of awarding an annual award at the International level for "innovative programming" (e.g., new, unusual, effective programs). The award is a cash prize of $1000, which will encourage schools to disseminate curriculum that is working. Currently the award is called, the Innovative Programming Award. These initiatives (and likely more) underscore the importance of innovation and also offer a glimpse of a few of the innovations that are possible.

OB'S EXISTING PROGRAMS

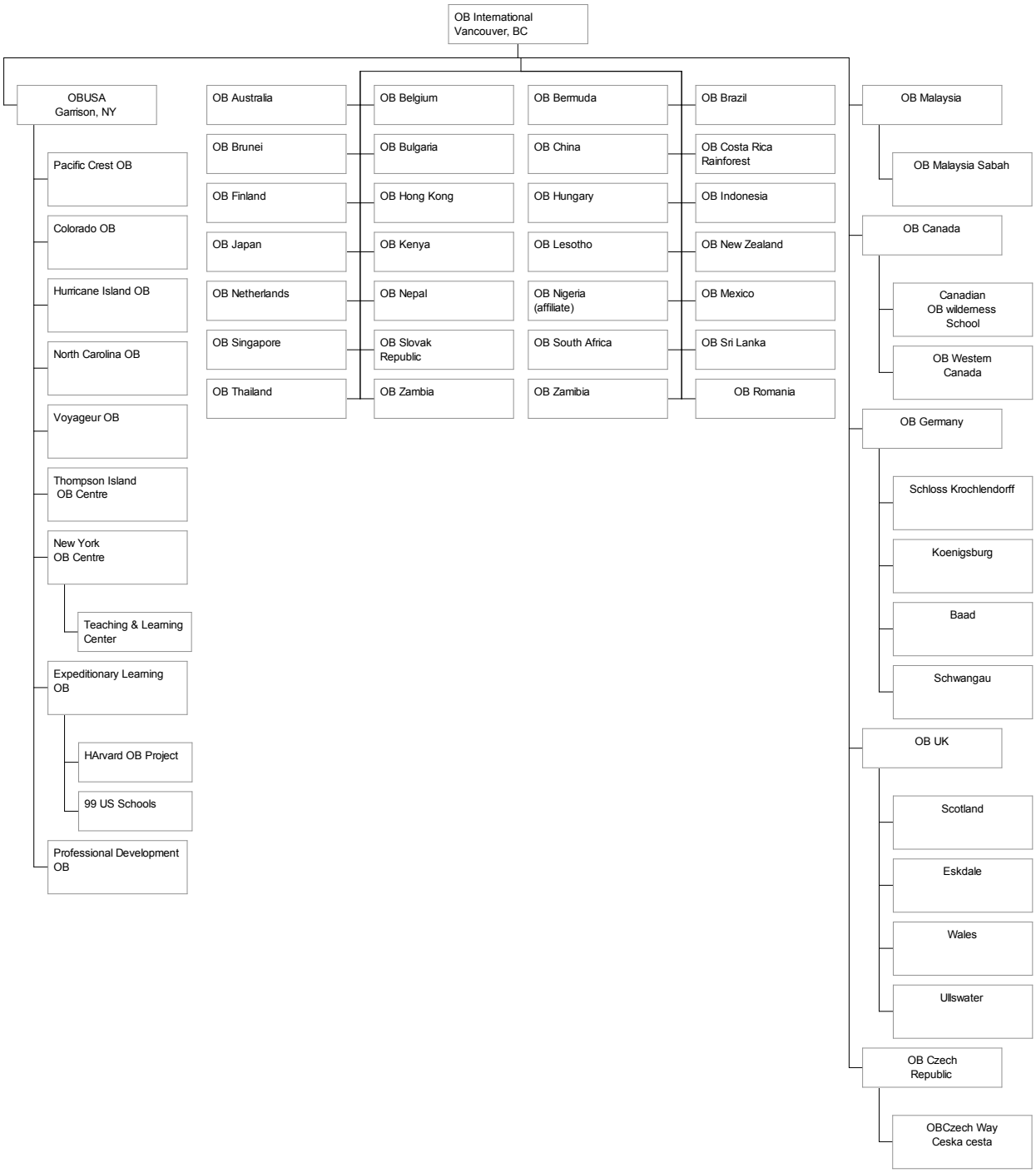
Many of the programs that exist today under the OB banner were, at one time, innovations. Indeed, even Outward Bound's philosophical underpinnings and organizational body were innovative in their time.

Currently OB exists in 33 countries worldwide (see organizational chart below). Four countries, United States (7), United Kingdom (4), Germany (4), and Canada (2) have multiple schools or centers. Most of the OB schools worldwide are wilderness based, while many offer corporate courses and some offer urban experiences or short, ropes-style courses. Two US “Centers” (as opposed to “schools”) exist: New York City OB Center and the Thompson Island OB Center. NYCOBC offers urban experiences and is intimately involved with NY City schools. In addition, the NYCOBC has also developed recently the Teaching and Learning Center, which will assist NYC schools to utilize New York as an Urban experiential playground. Thompson Island OB Center offers numerous courses and focuses primarily on corporate events, conferences and courses. Another OB strain is the Expeditionary Learning project. ELOB fosters expedition-based learning and school reform and boasts a partnership with 99 US schools.

While innovations may occur at any one of these schools at any time, these innovations predominantly fall into the "bucket" category and largely remain at the school of origination, rather than becoming part of the steady flow of an innovative system. None of the existing programs or schools can be called an innovative system because none focus on innovation as an ongoing organizational imperative.

The following chart illustrates the existing OB programs worldwide.

OB: Parts of the Whole



SUCCESSFUL INNOVATIONS IN OTHER INDUSTRIES

Innovations of other industries, such as technology, may seem a distant cousin to those needed in the field at OB. But, common characteristics of innovative systems can be extracted that provide helpful organizational parameters or "rules".

Projects like Xerox's Palo Alto Research Center, the Rocky Mountain Institute, Sun's Java Team, the birth of Netscape and UNIX, the Santa Fe Institute, and the Apollo 13 Disaster are good examples of innovative initiatives and in some cases (Xerox PARC), of innovative systems. These examples, from outside OB's industry, give valuable insight into the design and development of an organization built to innovate and thrive in today's business climate.

Xerox's Palo Alto Research Center (PARC)

Below is an excerpt from the PARC website:

> *In 1970, Xerox Corporation gathered together a team of world class researchers and gave them the mission of creating "the architecture of information." The scientists of the Palo Alto Research Center (PARC) lived up to this challenge by inventing personal distributed computing, graphical user interfaces, the first commercial mouse, bit-mapped displays, Ethernet, client/server architecture, object-oriented programming, laser printing and many of the basic protocols of the Internet. In the years since Xerox established the Palo Alto Research Center, PARC technologies have changed the world. (Xerox PARC website).*

Xerox PARC is perhaps the best example of what can happen when a leading organization invests in ongoing innovation. Hundreds of the innovations that PARC created could have become full-blown corporations in themselves. But, Xerox and Xerox PARC leaders made a commitment early on to the ongoing process of innovation—to create and sustain an innovative system. Their commitment has remained steady through the years and Xerox PARC has almost single handedly placed Xerox [the corporation] at the top of its industry and in the history books for all time. Perhaps more than any organization, Xerox PARC has consistently demonstrated the benefits a company can net when they commit to an ongoing innovative system.

Rocky Mountain Institute (RMI)

The authors of Natural Capitalism (also the founders of RMI) tackled a whopping problem. They knew that corporations had to please their investors, first and foremost. They also knew that pleasing investors often occurred at the expense of the environment that they loved. Instead of becoming *activists*, they became *proactivists* and decided to create the revolutionary ideas of Natural Capitalism. Based on four simple "rules", Natural Capitalism showed developers and environmentalists alike that pleasing the investors and the environment weren't mutually exclusive propositions. They showed the world, through simple ideas, that corporations could serve the bottom line and the environment—better, cheaper, more efficient products that were also more "green friendly". RMI innovators saw a win-win solution and they invested the time to find the simple laws that belie extremely complex systems. Today, RMI (in Snowmass) offers

products, services and knowledge to some of America's biggest corporations—all because of some very simple ideas.

Sun's Java Team

When Kim Polese, a high-level manager and engineer at Sun Microsystems went to Scott McNealy, she knew exactly what she wanted and she wouldn't accept anything less. To Kim, it was a black and white proposition: she wanted to innovate something new, something revolutionary and she knew from experience that such a project would need to follow a few simple, but essential, rules.

First, it should be well funded. Second, it should be totally autonomous, existing outside of the socio-political climate of Sun and even physically separated by the San Francisco Bay. Her next requirement was audacious, she couldn't tell even the Sun executives what she had in mind. Partly because she herself didn't totally know what she had in mind and partly because their "trust" and commitment to innovation was a critical indicator of their buy-in. To Kim, executive buy-in wasn't just for the funding, it was a critical ideological handshake that said as the third rule, " [even if we don't know what it is] innovation is a valuable process in this company."

Once the audacious project was approved, Kim followed some more very simple laws: get the best people, pay them well, create an environment and resources that support innovation, and leave them alone. That is exactly what Sun did. In a little more than a year's time, Kim and her team created not only a new innovation, but a new language that would alter the future of technology for decades and that would immediately affect the web itself and the leaders of the industry. Sun, already a powerhouse, was launched into the limelight as a kind of "bigger David" capable of fighting the Microsoft Goliath that ruled the Net and recently crushed Netscape.

In retrospect, the Sun executives took an amazing risk. They trusted the ideal that smart, motivated people, left to their own devices, will be the source of inspiring innovation. Today, the Java story offers an industry standard for how to "allow innovation to occur" without starting with the end in mind. Sun, Kim, and the Java Team exemplified their confidence in the value of innovation for its own sake. The affects of what they accomplished are likely endless, and Sun is reaping the rewards.

The Birth of Netscape and the Hallmark Hairball

Jim Clarke is known as the guru of innovation in the Silicon Valley. He had another idea based on the tinkering of a young student at the University of Michigan. Clarke knew from experience that innovation requires a quantum leap from the current paradigm. So he purchased a massive sailboat and set sail, with Marc Andreesen (the student) and a team of innovators to create a new company called, Netscape. Netscape would revolutionize life in America. In many ways, the birth of Netscape was the birth of the WWW.

For Clarke and the founders of Netscape, that quantum leap was a physical separation that allowed them to focus on innovation and leave the daily grind behind. Clarke seemed

to understand what creative genius, Gordon McKenzie understood and wrote about in his book, Orbiting the Giant Hairball. McKenzie was the highest ranking innovator at Hallmark, Inc. where he learned the hardest lessons about creativity and innovation inside of an organization large enough to create, like a planet, its own gravitational forces; forces capable of causing innovative initiatives to come crashing into the organization's massive bulk. McKenzie points out that the key to creativity and innovation is a finely tuned *orbit* around what he calls the organizational *hairball*. McKenzie advises to neither crash into the great hairball in a fiery ball of flames nor tangent off into space because of one's exponential velocity. McKenzie advises innovators to strike a balance; an orbit that both benefits from the hairball's resources and that maintains autonomy from the hairball's destructive gravitational pull.

The Birth and Growth of LINUX

Linus Torvold is a computer programmer. He's also an innovative genius. He wrote the initial code that would become LINUX. LINUX is the only computer platform that has ever successfully replaced DOS/WINDOWS in the corporate environment. Despite creating the dagger that could potentially slay Microsoft, Linus is not a billionaire, nor does he even own LINUX. This awkward fact is also the reason why LINUX is such a capable competitor.

Linus understood complex systems, ecological systems, and human nature. His understanding led him to make a critical decision early on in the development of LINUX… it would be an open architecture. In other words, Linus wouldn't protect the code like Microsoft and other firms. Instead, he placed the code in the public domain (under a new legal innovation called, a "CopyLeft") where it could be hacked, created, fixed, and optimized by hundreds (eventually thousands) of hobbyist engineers and computer programmers who were motivated (by narcissism or altruism) to make LINUX better. In the end, this chaotic, decentralized rabble of "coders" created an operating system far more advanced than the platform Microsoft's high-paid programmers developed. Today, LINUX is steadily growing in popularity and quality in one of the most fiercely competitive environments on earth.

Apollo 13

The story of Apollo 13 was made into a movie. Three astronauts, floating somewhat haphazardly in space, trying to get home after a pre-moon landing disaster. The small spaceship is low on oxygen; the men will suffocate on their own CO_2 before they reach the Earth because the CO_2 filter is destroyed. Hundreds of NASA specialists and managers watch, mostly helplessly, thousands of miles away, in Houston.

Somebody has a simple idea. Assemble smart people in a room that contains only the useable items that exist on the spaceship and task them with building a filter that can be replicated in space. The conclusion to this story we know—the engineers design a filter, the astronauts replicate their process and Apollo 13 returns safely home.

Santa Fe Institute

The Santa Fe Institute (SFI) is often called the "Institute Different". It is unlike any organization that exists today in academia. What makes it different? The answer is both simple and complex. SFI studies a thing called a Complex Adaptive System (CAS). CAS's are systems that most people think of as living or dynamic. Economic systems, ant colonies, social groups, and individuals are CAS's. Indeed, the most productive, perplexing, dynamic, robust, living systems on Earth, are likely CASs.

It turns out that CASs, despite their wild complexity and innumerable possibilities, actually follow quite simple laws. Laws of self-regulation, self-creativity, and self-organization. Indeed, these CASs can be described in four terms that all CASs share: simplicity, complexity, adaptation, and evolution. Ironically, SFI, the premier organization that studies CASs, is itself a CAS. SFI manages itself as a CAS with the knowledge it has gained of how CASs work best—how they adapt, evolve and maintain a robust vitality. SFI managers follow simple rules that they have established and found that cause robust, innovative, complexity to emerge. Through understanding the simple rules that lead to complexities of life, SFI successfully manages in a simple way that allows complex innovations to emerge, naturally. Management goals at SFI are dramatically less finite than at other organizations. Instead of setting goals to create a particular innovation, SFI managers focus attention on developing a "space" where "SFI-like interactions occur". The byproducts of these interactions are changing nearly every sector of science.

CONCLUSION

The examples of successes in the world where innovation has become a vibrant and ongoing paradigm indicate some basic principles of innovation and of innovative systems. They are:

- Long-term commitment to innovation
- Use of simple guiding principles
- Combination of the right people and the right culture
- An adequate amount of autonomy (or, orbiting the hairball)
- A multi-disciplinary and open system
- Management as a Complex Adaptive System

CHAPTER 3

Designing An Innovative Complex Adaptive System with Simple Laws

> *If organizations are seen as complex adaptive systems, then awareness of the characteristics of CAS and their implications will change the way of thinking, and this in turn will affect the method of working and the shape of the organization.* (Eve Mitleton-Kelly, London School of Economics)

Analysis of OB's past and present, and the successful initiatives of others, answers questions about the basic properties of innovative systems: How should an innovative system be designed and implemented? How should an innovative system be managed?

The systems that most people consider living, vital, valuable, robust, and innovative are synonymous with the systems scientists call, complex adaptive systems (CAS). CAS's are "self-creative" systems, which is why the CAS model of management is a capable organizational tool for organizations that must continue to deliver evolving, free-form, innovations. Because an innovative system is a CAS by nature, it is best designed, implemented, and managed as a CAS.

The basic premise of designing, implementing, and managing an innovative system as a CAS rests upon a fundamental shift in paradigm. The shift is away from managing an organization toward specific innovations or goals and toward managing a "space" where innovation emerges. For example, at SFI numerous innovations have occurred not because a manager set a goal to create the specific innovation but because management ensured that the right ingredients—the right people, resources, time, space, and CAS rules—where in place to allow innovation to be an emergent property of an innovative system. The CAS model of management does not "drive" innovation but instead, creates an environment where innovation likes to live.

The way in which the CAS model of management creates this environment is as much based on the people, resources and space as it is on the underlying "rules" by which the innovative system lives. These rules are extrapolated from the discussions in the previous chapters of this proposal: Autonomy, Diverse & Multidisciplinary, Field Focus, No Ascribed Power and CAS Model of Management.

The Simple Laws for an Innovative Complex Adaptive System

AUTONOMY

Innovation seems to occur most robustly when it is allowed autonomy from the norm. In the mid 1900's Kurt Lewin introduced Change Theory, which has led to numerous

studies and fields in various sectors of society. Lewin identified three phases through which a change agent must proceed before the change becomes part of the system: Unfreezing [of the status quo], Movement [from the status quo], Refreezing [of a new status quo]. It is important to understand the subtle difference between change and innovation. Where change is a socio-political event (affection of the status quo), innovation is a creative process. Innovation, bogged down by the requirements of change, gets muffled. From Jesus' sojourn into the desert to Thoreau's Walden Pond to Sun's Java Technology, innovation occurs in exile.

DIVERSE & MULTIDISCIPLINARY

Diversity isn't an influential aspect of evolution because it is politically correct. Diversity works because it offers greater opportunities for competition and selection. The biosphere project in Arizona failed in its self-sustaining goal because it lacked the necessary diversity [and balance] that a closed ecosystem requires. In contrast, Earth maintains a perfect balance of diversity. This balance and diversity is what makes the Earth inhabitable. An innovative system is no different than any living system. An important component of these kinds of complex adaptive systems is diversity. (Because innovation is a construct of the cognitive world of ideas, rather than of the living world of diverse organisms, diversity can also be thought of as *multidisciplinary*.)

FIELD FOCUS

Where do innovations have the greatest impact when they become ready to be a part of a change process? (Remember, Lewin identified three phases through which a change agent must proceed before the change becomes part of the system: Unfreezing [of the status quo], Movement [from the status quo], Refreezing [of a new status quo].)

The reason change at the field-staff level is easier than change at other hierarchies of scale is explained by Lewin's phases. At the field-staff level, sole control over the social system underlies the status quo. In other words, a single instructor can alter the status quo (e.g., implement the three stages of a change process) with little or no socio-political requirements.

Of equal importance is this: changes at the instructor level have a direct and immediate correlation to customer experience which is also correlated with word-of-mouth marketing and branding which is correlated with annual enrollment.

In other words, innovation (and change in this case) at the field staff level is not only the *easiest* place for change to occur but it is also the *optimal* place for change to occur. An organizational rule that focuses on innovations that can be implemented by field-staff over other forms of innovation will lead to widespread efficiencies within the innovative system and reach into the change agent and into the organization as a whole.

NO ASCRIBED POWER /AUTHORITY

In order to implement change, organizations and people need power, control, influence and authority. The reverse is true with innovations. The power of innovation is immediate because the idea itself is useful and no additional social or political or

organizational influence is required for the innovation to take root. True innovations don't have the power of presidents, but of pandemic viruses. They catch on and colonize.

The distinction between change and innovation is an important distinction to understand Change is a sociopolitical process that adheres to the various theories and practice of power dynamics. In contrast, innovation interacts objectively with change agents who already posses the power or influence to cause change. The relevance of these distinctions to innovating institutions is that these organizations must not attempt to become change agents. Instead their focus should remain with the innovations themselves and no ascribed authority or influence should be attached to these organizations. In simple terms this means that the only way an innovative institution can gain influence is to continue to develop useful innovations. In this way, innovations, innovators, and innovative institutions only have influence to the degree that their innovation is successful.

CAS MODEL OF MANAGEMENT

An innovative system is a complex adaptive system (CAS) because it is organic and self-creative (self-creativity is a scientific term which means "regenerative"). Innovative systems are complex but they need not be managed by complex means. In other words, management can utilize simple organizational "rules" (or principles) that create an environment where complex interactions lead to emerging innovations. This is the process of a CAS model of management—simple organizational rules that create a complex adaptive environment in which innovation is an emergent property. In effect, by ensuring organizational autonomy, multidisciplinary diversity, a focus on field-based innovations and increasing organizational influence based on demonstrable innovations, management is using a CAS model of management.

In contrast to a CAS model of management, contemporary management wisdom would advocate that innovations "begin with the end in mind". Contemporary wisdom would identify a "target" innovation and then proceed toward that goal. Eventually, a team of innovators will achieve the target innovation. Under the CAS model of management, managers offer *boundaries* to which the innovation must adhere. Then, a team of innovators go about creating and innovating within these liberal boundaries (say, a, b, and c).

While the contemporary approach (scenario #1) is a direct line to the creation of "innovation X", the CAS approach (scenario #2) is more explorative before any assumptions are made about what "innovation X" looks like. The complexity [and robustness] that emerges in Scenario #2 is greater than that of Scenario #1 and this complexity is what causes the robust, vital output that is characteristic of organic and dynamic systems. While Scenario #1 is the best way to achieve exactly what managers had in mind, Scenario #2 is superior in that it will yield greater true innovation. In other words, in Scenario #1, the process is in fact not innovative because it merely creates a physical manifestation of an idea. In Scenario #2, ideas themselves are created and true innovation emerges from these new ideas. A CAS model of management has a higher probability of yielding a truly revolutionary solution, which often exceeds the scope of the initial idea.

CONCLUSION

From these five organizational principles the design, implementation and management of an innovative system (CAS) becomes clear. To begin with a "laundry list" of innovations will not work. Instead, simple principles (Autonomy, Diverse & Multidisciplinary, Field Focus, No Ascribed Power and CAS Model of Management) can be used as boundary markers to create a "space" where innovation emerges.

The next chapter places these generic organizational principles in context and the robust structure of an innovative system—THE OUTWARD BOUND INTERNATIONAL INNOVATION INSTITUTE (OBIII)—begins to emerge.

CHAPTER 4

OBIII: An Innovative System for Outward Bound

The OBIII organizational statement is:

> OBIII is an entrepreneurial, nonprofit organization (501(c) (3) that fosters innovation in the Outward Bound process, primarily for Outward Bound, and secondarily for the industry as a whole. The OBIII focus is to develop ideas and initiatives that can be easily implemented at the field-staff level. OBIII gets its authority from a single source: demonstrated innovative solutions. OBIII is competently managed as a Complex Adaptive System (CAS). OBIII operates under charter from Outward Bound and maintains autonomy through its own Board of Advisors, Staff, Budget and Vision.

OBIII is managed as a CAS, which follows a few simple operational laws:

1. OBIII maintains autonomy from socio-political pressures and climate of schools.
2. OBIII must create a niche where multidisciplinary innovation can flourish.
3. The OBIII focus is on ideas and initiatives that can be implemented at the field staff level.
4. OBIII gets its influence from demonstrated innovative solutions.
5. Competently managed as a Complex Adaptive System (e.g., it follows the above rules).

The [internal] moniker/formula is:

> *"An autonomous, multidisciplinary, field-focused, powerless, ICAS."*

CHAPTER 5

A VISIT TO OBIII

You have a meeting to visit OBIII. You are given directions to the campus and have some time to ask questions of Kurt, an OBIII staff.

OBIII represents the epitome of innovation from “carpet to ideology”. OBIII exists in a 4,000 square foot building, which is passive solar, superinsulated, and semiunderground. There is no heating system in the traditional sense, but utilizes the furnace of an attached greenhouse. The entire building is optimally designed to utilize the sun for natural light and energy during the various seasons. The building’s thermal performance is based on its advanced windows and all of the various materials are designed for utmost efficiency and comfort. The building itself, is an innovative masterpiece, setting the stage and the climate for innovation to root.

The campus is 20 acres of pristine land abutting forest service land, near skiing, fishing, climbing, mountain biking. Already, the complex system that is OBIII is taking form as the building and the campus and surrounding area is an important part of attracting the best in the industry as staff and as visiting innovators and guests. It is estimated the land would cost $300,000 and the building $400,000. The additional costs for the various efficiencies are estimated at $6,000, which would be recouped in three years based on energy savings calculated from the RMI building history. (For more about facilities, based on the RMI campus, see Appendix 3).

Your introduction to OBIII is the campus, the grounds, the building itself, its nooks and vistas, its beautiful lobby, the reception area. You might also sense the energy of the place. The culture manifested by fleeting staff darting from space to space. OBIII is large open spaces, communal gathering rooms of various sizes and themes. Thematic corridors. Everywhere the reminder of innovation. Staff, visiting innovators, and guests are drawn here by the remarkable work being accomplished, the space and resources in which to accomplish it, and ironically, by the critical mass of great people who work at OBIII. Diverse in their backgrounds, OBIII staffers are all innovators. OBIII supports (with lodging and travel) 30 visiting innovators each year (staggered) for one to six months. These innovators come from OB schools around the world and from schools throughout the industry and even from organizations outside of the industry.

Walk through the halls of OBIII, peek into rooms, experience the raw energy of innovation. Whiteboards with scribbles, a development lab with machines and products. A technological lab to incorporate technology innovations in the field. A few small, cluttered offices. What you may not see on campus are OBIII staff in the field, watching, learning, documenting, researching, thinking, creating while on course.

Now it's time for your meeting with Kurt, one of OBIII's staff. You’ll have more time to ask questions now.

YOU: What does OBIII do?
KURT: We innovate. OBIII is less of a place as it is an environment. OBIII has a climate, which dictates culture, which is built for innovation. Namely, we provide a steady stream of innovations for OB schools and programs worldwide. We provide new ideas, initiatives, curriculum and we try to provide it in a way that makes it easy to implement where it counts, at the field staff level. We also offer our products and services to the industry as a whole. We innovated the backcountry Palm Pilot, a handheld computer with downloadable modules from the Internet, and the backcountry whiteboard, a fabric erasable whiteboard for use teaching in the outdoors. We've also reinvented solo with various curriculum additions and symbolic attributes and we developed a metaphorical model for Life & Career Renewal courses based on the environment in which the course occurs. And that's just in the first few months.

Many of our innovations come from having the time and resources to give more thought, research and practice to different components of OB while other innovations come from taking knowledge that exists throughout OB and packaging it in a more useful way for people in the system to duplicate.

YOU: Tell me more about these innovations. Give me some examples.
KURT: Sure. In simple terms, OBIII focuses on two types of innovation for Outward Bound and the outdoor industry:

- New ways to deliver old programming (think VW Beetle)
- New ways to deliver new programming

In other words, OBIII straddles the important paradox between the new and the old, between preserving the "core" that is the foundation of OB and stimulating innovative progress that will propel OB back into its earned role as the leader in the industry. OBIII will develop solutions for the most pressing problems in the industry including:

- Field Staff Resources (big priority—most of focus should go here!)
- Programming Innovations (that can be implemented at field staff level)
- Programming Optimization (efficiency)
- Innovative Safety Standards (non-oppressive)
- Course Specific Resources (field-based)
- Area Specific Resources (field-based)
- Value Added Knowledge (publications that capitalize on OB's wealth of knowledge)
- A Multimedia Library of Best Practices

Some examples of the kinds of innovations and questions that OBIII considers can be found in Appendix 4: Sample List of Possible Innovations.

YOU: How are you licensed?
KURT: OBIII is a private, entrepreneurial, nonprofit (501(c)(3)) organization that maintains a charter directly from Outward Bound. We essentially operate as our own international school even though we are physically within the US. We're a bit like a Switzerland of the Outward Bound Community. OBIII operates under the leadership of a Board of Advisors, a Research and Science Board, and two Co-directors (Strategy and Research and Innovation).

YOU: What are the benefits of involvement with OBIII's Board or governance?
KURT: Contributors to OBIII benefit in numerous ways whether the contribution is through financial investment, as a member of the OBIII Board of Advisors, or both. Contributors are invited on yearly "invitational" courses to exotic course areas such as Costa Rica or Nepal (coordinated with OB Schools). In addition, investments in OBIII are tax deductible. As a member of the OB community, OBIII is a dynamic organization that offers contributors a chance to be a part of the excitement of Outward Bound. Annual board meetings are held at schools around the world where innovation is occurring.

YOU: Whom do you serve?
KURT: Primarily, we serve OB schools worldwide. We view any OB school as a partner in a feedback loop, so our products and services are either "gratis" or at cost. For example, we take implicit knowledge from the OB schools, innovate it, develop it, package it, and make it easier to use and implement and then that knowledge is available free to the schools.

YOU: Is it just for OB schools?
KURT: No. We also serve other OB-style schools and organizations and even public schools and private corporations in totally different fields. Our products and services are available to them as well, only not at discounted rates. Many of today's schools copied OB in the first place. We figure, if they're going to copycat OB, why not help them do it and reinvest those profits back into innovating for OB schools so that the schools can continually gain a competitive advantage, paid for by our competitors (and friends).

YOU: How is your market different than that of the other OB schools?
KURT: The specific market for OBIII is different than the market for OB school programming. OBIII will serve as a primary research and innovation institute for OB schools, both nationally and internationally. However, OBIII will also serve the larger community (adventure, experiential, wilderness, alternative, and standard education) by providing OB approved curriculum, knowledge, and programming. OBIII will be the primary vehicle for a new campaign that parallels the technology industry's "Intel Inside" initiative. The "OB Inside™" initiative will provide off-the-shelf programming to the tens-of-thousands of OB-style programs that exist today (if they're going to copycat OB, why not help them to do it legitimately?)

We can segment the OBIII market into three distinct groups:

- **OB Schools:** Primarily, OBIII serves the OB community. Numerous services, including innovative instructor training and continuing education, instructor research grants, and program consulting will be available.

- **Products:** OBIII will capture OB's knowledge capital and distribute it in the form of newsletters, books, websites, periodicals, tapes, CDs, DVDs and other forms of publication.

- **Consulting:** OBIII will offer outdoor and educational organizations (e.g., from Shackleton Schools, to public schools, to NOLS, to Regis University Outdoor Club) various consulting services such as program design, curriculum design, safety reviews, theory/model development, and staff training and certification.

YOU: How does OBIII get "buy-in" from the schools? Does it have any authority?
KURT: The purpose of OBIII is to research and innovate new and old solutions that will help all OB schools to evolve and thrive. OBIII will gain "buy in" from the various OB schools through a simple strategy: *demonstrate successful innovations*. In other words, the influence OBIII has on OB schools is **solely** based on its ability to demonstrate the value of its innovations, and **not** through hierarchy, politics, or mandate.

YOU: Who can be a visiting innovator?
KURT: The visiting innovator program is very exciting. And, it's much more meaningful and complex than it appears on the surface. On the surface, people apply for one of 30 annual positions (usually 1 month to 6 months long). Selection is based on merit, based on their potential as an innovator, qualifications, the content of their desired research, etc. These are highly sought after positions in the industry. There are several factors, which make it exciting. First, these innovators inject new ideas and styles into the OBIII culture—this means we are always vital. But more, they take our culture—which they had an affect upon—back to their hosting institution! This is exciting because it means that the transmission of ideas is efficient. Instead of marketing ideas and innovations, OBIII creates a win-win-win cycle where OBIII, OB schools, visiting innovators, and their institutions and the industry as a whole get revitalized. This is a kind of biomimicry, where we see total efficiency and optimization of information dissemination, which leads to survival. Something akin to the seed/pollen dispersal apparatus of flowers using wind or animals.

YOU: Where do you get your funding?
KURT: Initially, OBIII was funded through capital raised in and around the OB community. Long term, we will continue to fundraise and build an endowment as well as generating grant and product and services revenues through various projects. We'd be glad to show you our budget and projections (see below).

YOU: What kinds of people are on staff? How many?
KURT: The most intelligent, innovative people in the industry. Our simple staffing model is:

1. hire the best, smartest, and most motivated people

2. give them the right resources and climate/culture and
3. leave them the hell alone!

YOU: Do you have products and services?
KURT: We have numerous products: books, curriculum guides, technology modules, modified palm pilots, manufactured items, logo apparel, DVDs, CDs, newsletters, etc. We also provide online interactive services such as our industry database, multimedia library of best practices, and other innovation services to the schools. We provide consulting for startup and ongoing concerns in OB schools and other organizations throughout the industry. In addition, we are a model Institute for innovation in general. One that corporations worldwide look to for ideas and processes. (A Sample List of Possible Innovations can be found in Appendix 4)

YOU: What kind of consulting do you do? For whom?
KURT: We can go in and help people start a new school by providing expertise in innovative ways to manage risk, budget, create ideological models that guide the school in the future (like Hahn's Pillars). Or, we can help them innovate a single component, a unique course area, or course flow. We extensively serve instructor training needs to help schools develop the intuitive sides of instructors—the hardest stuff to teach, but also the most important in terms of developing great instructors.

YOU: What kinds of innovations do you work on?
KURT: All kinds, but one of our rules is that—for numerous reasons—innovations that can be implemented at the instructor level are the best form of innovation. (A Sample List of Possible Innovations can be found in Appendix 4)

YOU: Why the focus on field staff?
KURT: Primarily because the change effort at that level is more streamlined, less bureaucratic, so the innovation itself will stand a better chance of surviving the socio-political pressures of organizations. Also, because at the instructor level, there is an immediate feedback loop with the customer and the course that allows us to measure the value of the innovation without "interference" [feedback] that may be unrelated to the innovation itself.

YOU: How do you "enforce" your innovations?
KURT: We don't. The beautiful role OBIII plays in the OB community is one of absolutely no power or authority. Precisely because we have absolutely no power or authority, our only avenue for influencing schools is to actually develop worthwhile innovations. That's it. Pretty simple. If the innovation sucks, we have *no* influence—which is good. If the innovation is great, then it will spread itself—*total* influence!

YOU: How did OBIII come about? What is the history that led to OBIII?
KURT: The idea for OBIII actually came from long-time OB staff who still worked in the field. They saw a need for innovation at about the same time that the word innovation was being thrown around in many sectors of OB society. These "lowly" instructor types

met up with some OB bigwigs (the ideal combination of talents) and today we have OBIII.

We exist to promote innovation at OB on an ongoing basis. It may be hard to believe now, but there was a time when OB was like a stagnant pond. It was at this time that many in the OB community understood the need for ongoing efforts in innovation to ensure that the venerable OB would never again be stagnant. OBIII is the culmination of those ideas and efforts. We are the defenders of a *vital* OB process!

Let me give you some history of what was occurring when OBIII was founded. Since 1940, Outward Bound led the outdoor education industry (and its many offshoots) by being an innovator in adventure programming. Since OB's arrival in the US in 1961, it not only led the industry, but defined it. But OB began to suffer from its own successes. Like many legacy organizations, OB relaxed in the comfort of its own pedigreed laurels. Rather than continually innovate and push the edge of the industry, OB continued to do what Kurt Hahn did in 1940 with little in the form of innovation since then. Why not? It worked, right?

But it wasn't working anymore. Numerous organizations (mostly offshoots of OB) overcame barriers-to-entry into the market and won market share (evidenced by steadily declining enrollment in the past two decades combined with an increase in adventure travel spending). OB was in danger of the kind of classic folly to which so many great civilizations have succumbed: getting too comfortable. Like the frog that neglects to leap from a pot of water on slow boil, OB found itself in an increasingly hostile business climate. Yet, OB had to preserve its core. What Hahn did in the 1940's had to remain intact. But, OB also needed to stimulate progress, innovate, and evolve in order to survive in this new market place.

Unfortunately, the system of diversified charters, schools, budgets and boards, created an extremely difficult environment and culture for innovation to take purchase, germinate, grow and survive. The system was unwieldy, product innovations were rare, and bureaucracy was common. Program-wide, OB had become lackluster.

Still, customers remembered a time and an OB that was anything but lackluster. And that kind of customer satisfaction, that kind of branding, that kind of loyalty, doesn't erode quickly. In fact, OB had created such a powerful brand that it may have been our downfall. We became comfortable in the power of our brand. We allowed this comfort to become cultural. A comfort that made us what Hahn most abhorred…sedentary.

It took time for the OB brand to be eroded; for committed customer opinion to catch up with lackluster program quality. We experienced this erosion of the brand not as an exodus. In the raft we call OB, we didn't hear the rush of air as we wrapped around a rapid's rock. Instead, we we're unaware that we had a slow steady leak. It appeared only that the water was rising and that we were falling, sinking. Luckily, we realized what was going on, we made some changes and some of the leadership at Outward Bound

supported the creation of OBIII. All of that is history now, of course. OB is the clear leader and innovator again in the industry it created.

YOU: How big is OBIII? Staff? Budget? Revenues?
KURT: At its inception, OBIII started with a $1.3 million budget, 5 core staff, and 5 visiting innovators. Today we've grown to nearly twice that much. But OBIII won't continue to grow, innovation has a critical limit, and everything we do or decide here at OBIII is grounded in "what's good for Innovation at OB".

YOU: Tell me what a day is like here?
KURT: I have a few major projects that I'm working on. For example, right now I'm working on an "A to Z CD project". A "CD" stands for "Course Director." What that means is that I'm studying and thinking about how to optimize the CD's involvement in a course from the point he or she is contracted, to the point when they submit their final paperwork. For example: How can technology support both the CD and the system by simultaneously gathering information into a database, easing the workload of the CD and others, and transforming that information into knowledge which can be distributed to precisely the right people at the right time? That's a mouthful. It's a complex problem, but by the time I'm done with it, it will be a streamlined flow of processes which optimizes life for the CD and captures valuable knowledge and distributes it for the organization.

My day consists of discussions, debates, tinkering, writing, and eventually testing these ideas on a real course, where I would be the CD. That's just one day and one guy. (A Sample List of Possible Innovations can be found in Appendix 4)

YOU: Why do you call OBIII an ICAS?
KURT: OBIII is an Innovative Complex Adaptive System because a) it just is by nature and b) we manage it as one. This is the coolest part of OBIII, in fact. All of OBIII is managed by very simple laws, yet the complexity and robustness that emerges is staggering! Simple laws, complex results, innovation ensues. A complete cycle. That's really exciting. Let me give you an example:

Ant societies are wildly complex systems. Some call them superorganisms because these thousands of individual ants actually "perform" as one single organism. Ants are amazing. Yet, this entire complex amazing system is founded on remarkably simple laws. Something akin to this: 1) find food and carry it home, 2) when you have food, shoot pheromones out of your butt, 3) if you cross a pheromone trail follow it.

These are laws that are so simple even a small-brained ant can follow them. Yet, these simple laws yield remarkable complex interactions—the entirety of ant society. And, the whole of a well-oiled superorganism. OBIII is a CAS devoted to Innovation—an Innovative Complex Adaptive System. Based on some remarkably simple operational laws, OBIII functions like a well-oiled superorganism committed to innovating for the larger good of OB and an industry.

YOU: What are these operational rules posted everywhere?
KURT: The operational rules are our guiding principles—founding laws that were created on the front end to ensure the success of the Institute. They are: to be an autonomous, multidisciplinary, focused, powerless, CAS. What this means is that: we do not succumb to the internal socio-political pressures of the OB schools (autonomy); we are an institute open to multidisciplinary people, ideas, and industries (diversity leads to overall health and innovation-ability of the organization); we are focused on innovations that can be implemented by field staff (in this way we support innovations and their requisite change efforts); we are powerless over any OB school whatsoever (this law ensures that our innovations are timely and worthwhile, which in turn creates value-based influence rather than hierarchical or political authority); and we are managed as a CAS, which is another way of saying that we follow these simple laws, allow complexity to emerge, and innovate as output.

YOU: How will OBIII deal with Intellectual Capital & Property issues?
KURT: There are numerous forms of intellectual capital that OBIII must deal with—each with their own legal issues surrounding ownership**.**

In-house Intellectual Property (IIP): IIP is knowledge that leads to innovation or product that is developed in-house by staff, contract labor, interns, or volunteers. Normal copyright and employer ownership applies. Unless specified, work done during work with OBIII is owned by OBIII. However, for work that was created prior to employment, ownership usually remains with the originator.

On-premise Intellectual Property (OIP): OIP is structurally similar to IIP but is specifically relevant to visiting innovators (from other organizations or from OB). In general, the question pertains to when the IP was created: prior to, during, or after, the relationship between the visiting innovator and OBIII. OIP ownership will be determined by written agreement prior to entering into a relationship.

Captured Intellectual Property (CIP): CIP is knowledge that leads to innovation or product which was captured by OBIII sanctioned staff in a setting other than OBIII. For example, an OBIII staff member on a COBS course. In this case, CIP is owned by OBIII.

YOU: What is OBIII's relationship with the OB Schools?
KURT: OBIII engages in an intimate relationship with OB schools worldwide. Much of OBIII's work will be developing the ability to "capture" current OB knowledge. This will be accomplished in the field inside of school programs and courses. Each of these interactions will of course be negotiated separately with the schools involved when the time comes. In general though, the schools benefit from OBIII involvement in something akin to a cooperative. When a wilderness school grants OBIII permission to capture knowledge on a school course, OBIII will then develop this knowledge into innovation or product. In turn these products and innovations are available free of charge or in some cases, at cost, to the school and all other OB schools. In this example, the school is giving service to the other schools while OBIII acts as the facilitator of this service. In time then, the school will benefit from the service of other schools. In this way, OBIII will facilitate

the capture, development and transmission of good ideas and innovations throughout the system. This will lead to a stronger OB community and a better overall OB product.

In addition, OBIII will offer products and services to non-OB customers at a premium. The revenue generated from these sales will support more knowledge capture, products and innovations from and for the schools and the cycle continues again. In this way, OBIII will also generate revenue to provide Block Grants to the schools themselves for internal innovation projects managed by the individual school.

CONCLUSION

Like any Institute, the amount of information you can glean from a brief visit is both representative and limited. But, you can get an idea of what goes on inside, what a day is like, its vision and purpose, and how it is managed. OBIII is unique even among the unique institutes of its kind. This is as it should be; OB should expect more of itself as the grandfather and leader of an industry and a movement. OBIII not only represents the best of Outward Bound but also has an explicit goal to make Outward Bound even better.

CHAPTER 6
FUNDING & FINANCES

OBIII is an entrepreneurial nonprofit (501(c)(3)) organization. Year zero (September 2001– May 2002) is included in the below budget as a time to establish itself as an entity, set up processes and staff and derive the first 25 models of innovation. $225,000 is needed to launch OBIII. Year one fundraising must raise $2 million. $1.3 million of which will go to ongoing operation of OBIII, $300,000 will go to the purchase of land near Breckenridge, CO and $400,000 will go towards building the facility.

OBIII will continue to fundraise $500,000 each year and generate revenues of $500,000 each year after year five. These monies will support general operations. Balances at the end of each year will either be gifted to the Innovator Grants Program, reinvested in Product Innovations budgets or secured in the Endowment.

OBIII will be managed by Co-Directors (Director of Strategy and a Director of Research & Innovation) and operate with a small, permanent staff, contract staff, visiting staff, interns, and volunteers. A skeleton start-up crew will comprise the launch period (year zero) from September 1, 2001 through May 31, 2002.

Salary totals for Year 1 through 5 are respectively, $268,750, $418,125, $459,938, $505,931, and $556,524 with 25% salary load and FTE of 4 in Year 1 will grow to 7 in Year 2 and remain at 7 until Year 5.

Actual facility purchase and build out costs are accounted for in the Capital section with overhead accounted for in the Facilities section. Utilities are low due to the architecture of the building (based on RMI estimates). Furniture, technology and communications make up the remainder of the Facilities costs.

Program Costs include start-up costs associated with legal and accounting firms, travel, miscellaneous costs, as well as contract labor costs growing from $10,000 in Year 1 to $75,000 in Year 5. In addition, Innovator Grants Program and Product Development costs are included. Both are estimated at $100,000/per program per year. For the Development costs, we can expect to launch 5 to 8 products each year. Innovator Grants will support 5 to 20 visiting innovators each year.

Initial start up is a critical phase. Launching a non-profit, fundraising, infrastructure ramp up and research into the issues are large projects with predetermined outcomes. Likewise, coming up with innovations that can immediately benefit staff and improve Outward Bound in a short time-frame is critical as well. Both tasks must be accomplished simultaneously. One director will focus entirely on providing the system with innovations that will be ready for production on that date. The other director will focus on the set-up, initiation, research and management of the Institute so that it is fully running and ready for full-bore operation come June 1, 2002 when the total capitalization must occur. The two directors will strike the appropriate balance between innovation and management.

OBII Budget Projections

Start-up to Year5	*start up:* 9/01/01 -- 5/31/02					
Item	*Year 0*	*Year1*	*Year2*	*Year3*	*Year4*	*Year5*
Salaries						
Co-Director (research & innovation)	55,000	80,000	88,000	96,800	106,480	117,128
Co-Director (strategy)	35,000	80,000	88,000	96,800	106,480	117,128
Researcher	0	35,000	38,500	42,350	46,585	51,244
Researcher	0	0	35,000	38,500	42,350	46,585
Field Innovator	0	0	35,000	38,500	42,350	46,585
R&I Assistant	0	0	25,000	27,500	30,250	33,275
R&I Assistant	15,000	20,000	25,000	27,500	30,250	33,275
Sub-total Salary	105,000	215,000	334,500	367,950	404,745	445,220
Salary load (25%)	26,250	53,750	83,625	91,988	101,186	111,305
TOTAL SALARY	**131,250**	**268,750**	**418,125**	**459,938**	**505,931**	**556,524**
Facilities						
Utilities	1,800	2,000	2,000	2,000	2,000	2,000
Furniture & Fixtures	5,000	75,000	20,000	15,000	10,000	10,000
Technology	10,000	25,000	15,000	15,000	10,000	10,000
Telephone	4,000	18,000	15,000	14,000	14,000	14,000
Rent/Lease	10,800	25,000				
TOTAL FACILITIES	**31,600**	**145,000**	**52,000**	**46,000**	**36,000**	**36,000**
Program Costs						
Initial Start Up	15,000	0	0	0	0	0
Accounting	5,000	5,000	5,000	10,000	15,000	20,000
Product/Service Design	10,000	100,000	100,000	100,000	100,000	100,000
Innovator Grant Monies	0	100,000	100,000	100,000	100,000	100,000
Travel	12,000	40,000	40,000	45,000	45,000	45,000
Miscellaneous (office supplies etc.)	3,000	5,000	7,500	10,000	12,500	15,000
Contract labor	15,000	0	10,000	25,000	50,000	75,000
TOTAL PROGRAM	**60,000**	**250,000**	**262,500**	**290,000**	**322,500**	**355,000**
TOTAL EXPENSES	**222,850**	**663,750**	**732,625**	**795,938**	**864,431**	**947,524**
REVENUE						
Products & Services	10,000	20,000	250,000	300,000	400,000	500,000
Fundraising	215,000	1,300,000	500,000	500,000	500,000	500,000
TOTAL REVENUE	**225,000**	**1,320,000**	**750,000**	**800,000**	**900,000**	**1,000,000**
Balance Forward	0	2,150	658,400	675,775	679,838	715,406
YEARLY BALANCE	**2,150**	**658,400**	**675,775**	**679,838**	**715,406**	**767,882**
Capital Campaign						
Capital Fundraising		700,000				
Building Costs		400,000				
Land Purchase		300,000				
Capital Campaign Balance		0				

APPENDICES

APPENDIX 1
CAS: Complex Adaptive Systems

The following two articles provide an entry-level explanation and a more advanced and nominal (established) definition of the science of complexity and complex adaptive systems (CAS). The first article (Article #1) is by Nobel Laureate, Murray Gell-Mann on the study of complexity and simplicity, which he calls, *Plectics*. The article provides a brief and layman's description of the study of complex adaptive systems and their intimate ties to both simplicity and complexity. It is reprinted here to give those without a background in science or CAS a purchase point from which to begin.

The second article (Article #2) explains itself in the introduction and then provides a nominal definition for complex adaptive systems adapted from the writings of today's most respected CAS experts.

Appendix 1: Article #1

LET'S CALL IT PLECTICS

Murray Gell-Mann

A decade ago, when the Santa Fe Institute was being organized, I coined a word for our principal area of research, a broad transdisciplinary subject covering aspects of simplicity and complexity as well as the properties of complex adaptive systems, including composite complex adaptive systems consisting of many adaptive agents. Unfortunately, I became discouraged about using the term after it met with a lukewarm response from a few of my colleagues. I comforted myself with the thought that perhaps a special name was unnecessary.

Perhaps I should have been more forceful. A name seems to be inevitable. Various authors are now toying with such neologisms as "complexology," which has a Latin head and a Greek tail and does not refer to simplicity. In this note, I should like to try to make up for lost time and put forward what I have long considered to be the best name for our area of study, if it has to have one.

It is important, in my opinion, for the name to connect with both simplicity and complexity. What is most exciting about our work is that it illuminates the chain of connections between, on the one hand, the simple underlying laws that govern the behavior of all matter in the universe and, on the other hand, the complex fabric that we see around us, exhibiting diversity, individuality, and evolution. The interplay between simplicity and complexity is the heart of our subject.

It is interesting to note, therefore, that the two words are related. The Indo-European root **plek-* gives rise to the Latin verb *plicare*, to fold, which yields *simplex*, literally once folded, from which our English word "simple" derives. But **plek-* likewise gives the Latin past participle *plexus*, braided or entwined, from which is derived *complexus*, literally braided together, responsible for the English word "complex." The Greek equivalent to *plexus* is (*plektos*), yielding the mathematical term "symplectic," which also has the literal meaning braided together, but comes to English from Greek rather than Latin.

The name that I propose for our subject is "plectics," derived, like mathematics, ethics, politics, economics, and so on, from the Greek. Since *plektos* with no prefix comes from **plek-* , but without any commitment to the notion of "once" as in "simple" or to the notion of "together" as in "complex," the derived word "plectics" can cover both simplicity and complexity.

It is appropriate that plectics refers to entanglement or the lack thereof, since entanglement is a key feature of the way complexity arises out of simplicity, making our subject worth studying. For example, all of us human beings and all the objects with which we deal are essentially bundles of simple quarks and electrons. If each of those

particles had to be in its own independent state, we could not exist and neither could the other objects. It is the entanglement of the states of the particles that is responsible for matter as we know it.

Likewise, if the parts of a complex system or the various aspects of a complex situation, all defined in advance, are studied carefully by experts on those parts or aspects and the results of their work are pooled, an adequate description of the whole system or situation does not usually emerge. The reason, of course, is that these parts or aspects are typically entangled with one another. We have to supplement the partial studies with a transdisciplinary "crude look at the whole," and practitioners of plectics often do just that.

I hope that it is not too late for the name "plectics" to catch on. We seem to need it.

Appendix 1: Article #2

Complex Adaptive Systems : A Nominal Definition
Kevin Dooley
Arizona State University

The complexity paradigm uses systemic inquiry to build fuzzy, multivalent, multi-level and multi-disciplinary representations of reality. Systems can be understood by looking for patterns within their complexity, patterns that describe potential evolutions of the system. Descriptions are indeterminate and complimentary, and observer dependent. Systems transition naturally between equilibrium points through environmental adaptation and self-organization; control and order is emergent rather than predetermined (Dooley, et al. 1995; Lewin, 1992; Waldrop, 1992).

The operational model of the complexity paradigm is a complex adaptive system (CAS). Example of CAS would include economies, ecologies, weather, traffic, social organizations, and cultures, to name but a few. While many writers and researchers have studied CAS, a concise nominal definition does not exist. I have forged theory from the works of Gell-Mann (1994), Holland (1995), Jantsch (1980), Maturna and Varela (1992), and Prigogine and Stengers (1984). The essential principles of CAS have been taken from each of these works and synthesized into a single description. The description is purposefully concise. A more lengthy description, with application to business organizations, is contained in the forthcoming paper "A Complex Adaptive Systems Model of Organizational Change," by myself, to appear in the new journal Nonlinear Dynamics, Psychology, & Life Science.

> A CAS behaves/evolves according to three key principles: order is emergent as opposed to predetermined, the system's history is irreversible, and the system's future is often unpredictable. The basic building blocks of the CAS are agents. Agents are semi-autonomous units that seek to maximize some measure of goodness, or fitness, by evolving over time. Agents scan their environment and develop schema representing interpretive and action rules. These schema are often evolved from smaller, more basic schema. These schema are rational bounded: they are potentially indeterminate because of incomplete and/or biased information; hey are observer dependent because it is often difficult to separate a phenomenon from its context, thereby identifying contingencies; and they can be contradictory. Schema exist in multitudes and compete for survival.
>
> Existing schema can undergo three types of change: first order change, where action is taken in order to adapt the observation to the existing schema; second order change, where there is purposeful change in the schema in order to better fit observations; and third order change, where a schema survives or dies because of the Darwinian survival or death of its corresponding CAS. Schema can change through random or purposeful mutation, and/or combination with other schema. Schema change generally has the effect of making the agent more robust (it can perform in

light of increasing variation or variety), more reliable (it can perform more predictably), or grow in requisite variety (in can adapt to a wider range of conditions).

The fitness of the agent is a complex aggregate of many factors, both local and global. The general health or fitness of the agent determines what the probability of change will be. Optimization of local fitness allows differentiation and novelty/diversity; global optimization enhances the CAS coherence as a system and induces long term memory. In general the probability of second order schema change is a nonlinear function of the fitness value.

Schema define how a given agent interacts with other agents surrounding it. Actions between agents involve the exchange of information and/or resources. These flows may be nonlinear. Information and resources can undergo multiplier effects based on the nature of interconnectedness in the system. Agent tags help identify what other agents are capable of transaction with a given agent; tags also facilitate the formation of aggregates, or meta-agents. Meta-agents help distribute and decentralize functionality, allowing diversity to thrive and specialization to occur. Agents or meta-agents also exist outside the boundaries of the CAS, and schema also determine the rules of interaction concerning how information and resources flow externally.

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APPENDIX 2
A Model for success (Organizational)

Santa Fe institute (SFI)
The following two articles provide background information on the Santa Fe Institute (SFI), which provides an excellent model for designing, developing, and managing a climate that supports dynamic ongoing innovation.

Article #1 is excerpted from the SFI website and describes their organizational structure, vision, mission and focus areas. Article #2 appeared in The Scientist magazine and describes SFI's unique focus and management style.

Appendix 2: Article #1
An Overview of SFI

SFI is a private, independent research institution that provides an environment for multidisciplinary collaborations among visiting and residential scientists from the physical, biological, computational, and social sciences. Over the course of a year it houses over 100 scientists for varying stays (and approximately 800 others as workshop participants), with about 35 in residence at any one time. Of the researchers currently in residence, five hold multi-year appointments, eight are postdoctoral fellows, four are graduate students, and the balance are scientific visitors (generally for periods of weeks or months) predominantly from universities in the U.S. and Europe.

The Institute's research agenda is overseen by a Science Advisory Board that includes Nobel Laureates, MacArthur Foundation Fellows, members of the National Academy of Sciences, and several dozen distinguished scientists from leading universities. SFI's operation is under the direction of Dr. Ellen Goldberg, Ph.D., President of the Santa Fe Institute and formerly Associate Provost and Director of Graduate Research at the University of New Mexico. The overall governance and fiscal responsibility of the Institute resides with a Board of Trustees headed by Robert Galvin, Motorola Inc.

Vision of the Santa Fe Institute
Since its inception, the Santa Fe Institute has devoted itself to the creation of a new kind of scientific research community pursuing emerging syntheses in science. Its broad mission encompasses a number of complementary views and encourages an exploration of previously uncharted domains of science. It is now appropriate for the Institute to define itself more explicitly, based on what has been learned in the first decade.

This expression of a shared vision of SFI contains a Mission Statement defining the reason for the existence of SFI and a Strategy Statement outlining the long-term policies and principles that inform all of the Institute's activities. Mission and strategy together support and strengthen the Institute's resolve to continue to build a unique community of excellence in the world of science and scholarship.

MISSION STATEMENT
The mission of the Santa Fe Institute is to conduct and foster scientific research having four dominant, general properties:

Transdisciplinary--Topics of interest transcend any single scientific discipline and cannot be studied adequately in traditional disciplinary contexts. SFI researchers knit together a variety of scientific approaches enabled by a growing set of tools. In order to nurture research of this kind, SFI must assemble and provide adequate resources for a broad scientific and scholarly community seeking common language and principles.

Excellent--SFI applies rigorous standards of excellence to its program. This means that it will not undertake new research unless: it can attract outstanding, creative and dedicated people; it can contribute, not at the margins, but in setting new directions for science; it

can tackle problems where success will make a major contribution. Thus SFI undertakes high-risk research, often with time horizons of years.

Fresh--SFI, because of its limited resources and because of its desire to remain small enough to permit broad collaboration among those in residence, cannot afford to duplicate what is done elsewhere. Its efforts complement rather than compete with work carried out at other institutions. New work is usually not chosen if it is likely to be done soon at other major institutions. SFI will generally transfer or scale back efforts in areas that become substantially pursued by other major institutions.

Catalytic--SFI desires to spread its ideas and methodologies to influence the way science is done in the next century. It will demonstrate and communicate its views, methods, and successes broadly and, in particular, it will encourage many people from other institutions to experience the SFI atmosphere as visiting researchers.

STRATEGY STATEMENT
The policies and principles defined here guide and inform all aspects of SFI activities. While they are intended to remain stable, they will be reviewed regularly and modified as required.

Research Agenda--The current research agenda of SFI is simplicity, complexity, complex systems, and particularly complex adaptive systems. Even as the concepts involved in the "sciences of complexity" become well established elsewhere, this agenda, because of its breadth and because of the great variety of important scientific problems those concepts comprise, may endure for decades. Research at SFI has three primary attributes. The first is that the work is collaborative. SFI attracts researchers who are eager to interact with people from other fields and willing to go beyond the boundaries of academic disciplines or ideologies. A complementary attribute is that SFI research is accessible and open. That policy requires attitudes of hospitality and willingness to share ideas. In addition, it requires minimizing obstacles to broad participation, such as arcane jargon, rigid ideology, and solitary habits of work. Finally, much of SFI's research is based on computation. The problem of validation of simulations by comparison with relevant data is an important focus.

Educational Focus--SFI's commitment to influence science in other institutions, as well as to ensure the development of the sciences of complexity, encourages it to focus some resources on education. These must be carefully considered, because, apart from those educational activities that are integral to the research program, the educational role must remain modest. SFI does not intend to become a degree-granting institution.

Visiting Institution--SFI is a visiting institution. At any given time, about 60% of resident scientists are on appointments of less than one year, the rest, including the postdoctoral fellows, on appointments of 1-5 years. Turnover of people is constant and will continue, especially as new topics are taken up and mature ones are phased out. This flow of talented individuals is intended to assure freshness of research and vigorous outside criticism and also to contribute to the diffusion of ideas and methods to the scientific

community at large as visitors return to their home institutions or join new ones. SFI will not have tenured positions.

Growth--In order to preserve its character, the Institute will limit the increase in resident population of scientific researchers working at the campus to approximately 20% per year until it reaches a stable average of about 50 to 60 researchers, in addition to administrative staff.

Communications--Because of the geographic dispersion of the SFI research community, the Institute will make intensive use of leading edge communication technologies.

This document was prepared by the Executive Committee of the Board of Trustees with input from other members of the Board, the Steering Committee of the Science Board, and the academic and executive staff (September 1994)

Appendix 2: Article #2

The Institute Different
Researchers at the Santa Fe Institute study what they are: complex adaptive systems

By Steve Bunk

Even its interior design serves the unusual purpose of the Santa Fe Institute (SFI). At the top of a winding drive on the outskirts of the New Mexico capital that calls itself "the city different," SFI occupies a 1950s hacienda defined by three descending "pods." First is reception and administration. Second is a community area, full of comfortable furniture, with big views of the city and mountains. Centerpiece of this second pod is an inner courtyard, where the approximately 200 scientists from throughout the world who visit each year can meet for sumptuous, British-style teas. Around the courtyard are conference rooms. The third pod, in the back, is a warren of small offices. Progress from reception to the offices therefore requires passage through the community pod, where the chances of overhearing a conversation or being waylaid to chat are maximized. This layout encourages the institute to do what it does best: facilitate communication between scientists of different fields, in the belief that ideas worth interdisciplinary pursuit will emerge.

The people that SFI draws together, and the ways in which they collaborate, are at once quite unlike typical scientific investigation and at the forefront of its evolution. The nonprofit organization has only 25 staff, seven residential faculty, a dozen postdoctoral fellows, and five graduate students, but about 60 external faculty visit for up to one month annually. Each is selected after a screening process and the institute pays for transportation and off-campus housing. They aren't salaried, but neither are they required by SFI to publish, teach, or otherwise produce in conventional ways. The institute's $6 million annual budget is derived in approximately equal amounts from research grants, donations from individuals and private foundations, and corporate contributions.

What the scientists study is a broad range of complex adaptive systems (CAS). Basically, this is any system that exhibits random variation and selection, resulting in learning or evolution. A CAS can be microscopic, like the immune system or the central nervous system, it can be an organism that includes those systems, and it can even be a composite of such organisms, like a termite mound, an ecology, or an economy. Exact definitions differ--for example, some SFI researchers contend that a computer-generated program's artificial intelligence makes it a complex adaptive system, while others disagree--but no one disputes that a CAS can self-organize, and that phenomena emerge from it that cannot be fully understood by analyzing parts of the system and then combining them. One example of such phenomena is the emergence of mind from the human brain. Studying a CAS therefore requires a nonlinear approach to supplement conventional reductive methods.

SFI as a Market

The institute itself is a complex adaptive system. "In some ways, SFI is like a market, with a constant flow of participants entering and leaving," comments longtime external faculty member **John H. Holland**, a leader in the field of genetic algorithms, who holds

two professorships at the University of Michigan, in electrical engineering and computer science, and in psychology. "It is also like a market in that the aggregate produces phenomena not directly attributable to the participants. The studies and research that emerge result from interactions that would be unlikely under the 'departmental' system that holds in most university, government, and industrial organizations."

One of SFI's founders, **Kurt A. Cowan**, cautions that the addition of human behavior to such a system brings with it many more constraints than for a nonhuman CAS. "The commonalities are there," he concurs, "but the phenomenology and the dynamics are very, very different." That isn't to say Cowan, now an SFI distinguished fellow, would eschew study of such systems. When he catalyzed the initial meetings that led to the institute's formation in 1984, he had a background in multidisciplinary research as a chemist at Los Alamos National Laboratory (LANL), about 23 miles northwest of Santa Fe. "I was familiar with the good things that happen when you get people from various disciplines that overlap to talk to one another." The founding group discussed interfaces between disciplines, emergent phenomena, complexity, and nonlinear dynamics.

Theoretical physicist **Murray Gell-Mann**, another early instigator of the institute, recalls that he was hoping it would be highly transdisciplinary and could find a grand synthesis on which to work, such as the unified theory of all particles and forces, or biological evolution and genetics. Founding workshops were organized, featuring numerous speakers. "It turned out that just about every speech was somehow related to simplicity, complexity, adaptation, and evolution," he remembers. "And that became our grand synthesis."

The specialties represented today at SFI include mathematics, computer science, physics, chemistry, immunology, population biology, ecology, evolutionary biology, neurobiology, psychology, cultural anthropology, linguistics, archaeology, history, political science, and economics. Cowan believes that SFI's inclusion of physical scientists in questions involving the social sciences has stimulated a new approach to research. He advocates more such collaborations, perhaps combining neuroscience, learning theory, and the behavioral sciences.

Atypical Science

Examples of such transdisciplinary projects widely vary. A political scientist applies the algorithms of a theoretical chemist to describe developments in the economy of medieval Florence. A physicist and two biologists formulate a scaling theory that can make accurate predictions about energy transport networks in numerous biological systems.[1] A linguist employs a geneticist's DNA recombination model to study the evolution of language. The titles from a current list of 180 SFI working papers are revealing: "Physicists Attempt to Scale the Ivory Towers of Finance," "Life and Evolution in Computers," "Cooperative Transport by Ants and Robots," "Power Spectra of Extinction in the Fossil Record," and "The Structure of Scientific Collaboration Networks."

"Science here is a lot of fun, it's much more fun than I've seen it elsewhere," says **Thomas B. Kepler**, who last year resigned his directorship of the biomathematics program at North Carolina State University to become the institute's vice president for academic affairs. "A lot of what goes on here is like improvisation, and it's critical to

maintain that attitude. When jazz is fun, the improvisation really takes off and envelops the listener."

Much of that fun is the intellectual challenge. As Holland notes, "Because most of the participants are not employees of the institute, showing up on a voluntary basis, there is a high premium on offering an environment and ideas that are exceptional. Otherwise, the faculty will simply vote with its feet, ceasing to participate. This is in stark contrast to most think tanks." Kelper adds, "Part of the beauty of SFI, and of interdisciplinary research in general, is that you have to see what you work with every day in a new way, from someone else's perspective." He likens the process to regarding a four-dimensional object from numerous three-dimensional angles. Eventually, a sense of the object emerges. "Once one is able to see it, it's a transformative experience."

Although the work at SFI is largely theoretical--the campus has no labs, and computer modeling is the only onsite research that could be considered experimental--Kepler is eager to develop additional collaborations with other institutions; particularly in biomedicine, where he sees potential for useful contributions of complex adaptive theory to experimentation.

One such SFI triumph was the mathematical analysis in the mid-1990s by theoretical immunologist **Alan S. Perelson** of data from **David D. Ho**, scientific director of the Aaron Diamond Research Center at Rockefeller University. Perelson, theoretical biology and biophysics group leader at LANL, showed with the assistance of former SFI and LANL postdoc **Avidan U. Neumann** that HIV-1 has a rapid turnover, rather than the previously theorized dormant period before AIDS appears.[2] This discovery helped to pave the way for the successful "hit early, hit hard" strategy of combination therapy.

CAS Characteristics

Gell-Mann, a 1969 Nobel laureate in physics for his work on the classification of elementary particles and their interactions, also studies aspects of simplicity and complexity, a transdisciplinary endeavor he calls plectics. The general characteristics of a complex adaptive system, he asserts, include its ability to identify "regularities," as opposed to random data, in the stream of information it receives about itself and its surroundings. These regularities are then compressed into a schema, or internal model, that can supply descriptions of the real world, make predictions about what will happen there, and thus prescribe behavior for the CAS. The results obtained by this schema in the real world feed back into the system, to affect the schema's standing in competition with rivals that have arisen from mutations of various sorts.[3]

In biology, the genotype is a schema. In human society, the schemata can be laws, customs, myths, or institutions. The scientific enterprise also is a CAS, in which regularities are identified from a vast quantity of data and compressed into a theory, which is the schema. In the case of SFI, the schemata are its bylaws, regulations, and traditions that comprise a "cultural DNA." For example, the institute has a rule that limits on-site scientists to 50 at any time. Such schemata sometimes give way to competitors as SFI evolves. For instance, Gell-Mann notes that an original intention was to grant degrees, but this was abandoned with the realization that accreditation probably would require a full set of courses and a huge faculty to teach them.

SFI president **Ellen Goldberg** observes that promotion and tenure in universities occur within departments, and interdisciplinary work accordingly risks failure to find funding or other support. Five years ago, she left the University of New Mexico as associate provost and director of graduate research to lead SFI. She comments that a complex adaptive system is built on relatively simple rules, and she offers an early lesson from Cowan that underscores this point. "He told me, 'Ellen, all you need to do is look for smart people and allow them to do their thing. You don't need an agenda.'"

She continues, "In many ways, I see us as self-organizing," but she adds that the impression that a CAS operates without a central authority is mistaken. Gell-Mann explains that although a model of a CAS might omit a central authority for the sake of mathematical simplicity, most such real systems typically do not function that way. In the case of human society, for example, "One of the most important things such an aggregation can evolve is a government." In addition to Goldberg and Kepler, SFI has a distinguished, widely representative science board that meets annually, a science steering committee that addresses all appointments and projects, and a board of trustees.

A complex adaptive system has a tendency to spawn other such systems, in the way that, perhaps, biological evolution gave rise to human thinking. Although there have been numerous attempts to emulate SFI, its principals do not yet know of another such free-standing campus in the world. "It's not an easy endeavor, and we see our job as trying to help these groups put together SFI-like interactions," Goldberg says. Funded by a private donation, the institute last year began assisting interdisciplinary efforts in China, India, and Russia. In 2001, the project is being extended to Eastern Europe, Africa, and Latin America. In 2002, SFI plans to bring together the leaders of these fledgling collaborations for a workshop in Santa Fe.

As Gell-Mann is fond of noting, "We have a worldwide family." And the family tree continues to branch.

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Complex Social Behavior: What Does 'Hierarchy' Mean?

Among the first things done by an 18-member Social Insects Working Group gathered around a big table at the Santa Fe Institute (SFI) was to subdivide the group. For three days in October 2000, researchers considered issues in the evolution of social organization, and each six-person "breakout group" was required to contain a similar balance of disciplines. Their specialties included genetics, molecular biology, neurobiology, modeling, ecology, and even the philosophy of science. Some scientists worked with honeybees, others with wasps, or ants. Their interests and skills were close enough to allow good communication but different enough to spark new synergies. The scientists traveled from Germany, Belgium, Norway, Costa Rica, and from eight states. Among their goals was the development of research collaborations that would help to explain how complex social behavior, at many levels of life, comes to be.

The three breakout groups repaired to smaller rooms, where they spent much time on terminology. Each subgroup considered a different issue. One was working on the origins

of social organization, and it set about identifying features that mark transitions in the evolution of social insects. But the participants wanted to describe these features in a way that would allow comparisons with non-insect complex systems. The words "solitary," "group living," and "hierarchical groups" were entered on the blackboard, and the trouble started. What was meant by "hierarchy?" Is it characterized by reproductive dominance, is it social, is it behavioral? And does the structural shift from solitary to group infer behavior, or can groups be mere aggregates? This was just the beginning of such questions. For example, shouldn't groups be subdivided into the noncohesive and the cohesive? And isn't "brood tending" a more encompassing term than "brood care?" And is "differentiation" merely morphological, or could it be either flexible or irreversible at different stages of group structure?

After a break, the subgroup decided to identify other entities that could be compared to insects, to consider if the transition from solitary to group living involves similar changes that affect cohesion and differentiation. They produced possible comparisons in multidomain proteins, in ecosystems, and in human populations. Finally, they decide that a tension exists in complex systems between cohesiveness and differentiation (a conclusion well-demonstrated by their own interactions).

The Working Group declared the meeting wonderfully successful. Roughly twice a month, such gatherings are held at SFI, a few leading to major research projects. This group settled on numerous paths for future collaboration, including more work at the institute. It even set up a Web page, **sfi.cyberbee.net**. --*Steve Bunk*

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APPENDIX 3
Model for success (Facility)

Rocky Mountain Institute (RMI)
The following Article provides information on the main building at the Rocky Mountain Institute (RMI). Although this green building was built in 1984 (today's costs would be less expensive and today's materials will be more advanced), RMI is considered a leader in green buildings that blend form, function and efficiency. RMI is located in Snowmass and is available to provide expertise to OBIII's building efforts. RMI provides a model for the kind of space that supports innovation; the kind of space OBIII can be proud of and that will showcase the OB Community worldwide.

Appendix 3: Article #1

RMI's Green Building

The building was created with private funding as a state-of-the-art showcase of efficiency techniques which, far from requiring sacrifice, actually increase comfort and enjoyment while saving money and resources.

Passive Solar Design
The 4,000-square-foot building is passive solar, superinsulated, and semiunderground. It was built back into the hill near the north lot line, then bermed the north wall and earth-sheltered the roof for esthetic and microclimatic reasons. (You wouldn't normally do that to save energy, as soil is a poor insulator and holding up its weight is very expensive.)

Because the building is superinsulated, it has no heating system in the usual sense, but is largely heated by passive solar gain through the windows and the central greenhouse. The greenhouse serves as the building's main "furnace": sunlight entering its vertical and overhead glazings transfers both radiant heat and warm air to the adjacent "wings" of the building and, when the heat is not needed, out the high vents in the back of the greenhouse arch. Extra heat is also stored in the arch, the greenhouse earth, the inner walls, the floor slab, and the soil beneath. Two wood stoves are used for backup heating in especially cold or cloudy weather.

Sunlight entering the greenhouse is blocked by the overhanging side arches from getting far into the wings at high summer sun angles—lest overheating result—but the low winter sun penetrates all the way back to the north wall through the arch's open back and sides. The recurving walls also permit east, southeast, and southwest windows to inject heat and light all the way back to the north wall. Thus heat and light are automatically conveyed to the north zone, not concentrated only near the south façade. This "zone coupling" is the key to the building's brightness and (along with superinsulation) to its fairly uniform warmth.

Insulation
The walls are sixteen inches (40 cm) thick, consisting of two six-inch (15-cm) courses of masonry sandwiching four inches (10 cm) of Freon-filled polyurethane foam (non-CFC foam was not available at the time of construction). Tempered by daytime heat stored in the outer masonry, the R-33 foam effectively insulates to about R-40. The walls curve in and out with a five-foot (1.5-m) radius; we could have used straight walls, but the curves are stronger and look nicer. The slab is four-inch (10-cm) concrete. The walls, slab, and a couple of meters of earth below it total about a million pounds of heat-storing "thermal mass"—so much that in a total solar eclipse in January, we would expect to lose less than 1 F° (0.5 C°) per day.

The ceiling insulation consists of a three-eighths-of-an-inch (1-cm) base layer of Freon-filled polyurethane foam; a polyethylene vapor barrier sealed at its edges to the wall

insulation; and, depending on location, another four to eight inches (10-20 cm) of polyurethane. This yields an insulation value of R-60 to R-80.

Glazings

Much of the building's thermal performance is due to its advanced windows, which were used here commercially for the first time. Virtually all are made of argon-filled Heat Mirror. They lose only 19 percent as much heat as a single pane of glass, but let in three-quarters of the visible light and half of the total solar energy. It is therefore advantageous to use a lot of glass: our building has 28 percent as much glass as floor area, or about twice the normal household ratio. Our windows' insulation levels (center of glass) range from R-5.5 to R-8—efficient enough to capture more solar heat than they lose even if they face due north!

Heat Mirror, a trademark of the Southwall Corporation, is an 0.002-inch-thick (25-micrometer) polyester film with special, almost atomically thin coatings which are transparent to visible light but reflect infrared (heat) rays. It comes in seven "flavors" for different climates; we use Heat Mirror 88, designed to maximize solar heating in cold climates. Suspended in a metal frame between two panes of glass, the invisibly transparent film traps heat inside the house. (By reducing the infrared which enters, it also helps keep the greenhouse from overheating in the summer.)

Economics

Total direct construction cost, excluding land and finance, was slightly over $500,000 (1983-84 US$)—just over $130 per square foot (about $1,425 per square meter), including extensive built-in furniture and counting all labor and donated or discounted equipment at market value. This cost may sound high, but building costs in the Aspen area are nearly twice the national average. The per-square-foot cost of this building is actually *below* the local median for custom buildings of comparable quality.

More important, the net additional cost of the energy-saving features (after subtracting the savings from not needing a furnace and ductwork) was about $6,000, or $1.50 per square foot, or just over one percent extra. Compared with normal local building practice and with the cheapest conventional fuels (firewood and propane), the building produces an average of about $6 worth of saved energy per day—economically equivalent to producing a barrel of oil every three days; but unlike oil, it doesn't pollute, can't be interrupted, and won't run out. Since achieving this savings raised construction costs by only about $6,000, but saves about $2,000 a year, it paid back in about three years with 1983-84 technology. One could do better today.

The technologies and design principles responsible for this performance can be cost-effectively used in tract houses, custom homes, or larger buildings in almost any climate and architectural style.

(SOURCE: RMI website http://www.rmi.org)

APPENDIX 4
Sample List of Possible Innovations

OB Masters Series: Throughout the OB system, there are clearly instructors who have a special gift. The OB Masters Series is a multimedia toolkit that explores various components of the OB process (such as Course Director (CD) Talks, introduction to Solo or Climbing, or Pin Ceremony) from the point of view of the "Masters". Suppose there is a certain CD who gives the most powerful course-start talk in the system. Imagine that all new CDs and instructors will have the chance to see this Master in action by watching a VHS video or a web-based video clip. Now imagine that OBIII assisted that Master to develop notes, curriculum, scripts, and visual aides for his CD talk; all of which are available in a "Master's Series: CD Talk Toolbox".

OBPilot: Technology has affected and will continue to affect every sector of society. How can technology benefit the OB instructor in the field? We will explore possible uses of technology utilizing the Palm Platform which is now widely used by fire fighters for any number of field tasks in an inhospitable environment.

A dynamic, web-enabled knowledgebase that includes specific course-area beta, instructor curriculum notes, searchable instructor manual, and interactive multimedia, will enhance and support the instructor in the field using a modified Palm Pilot. These course area modules are available for easy download from the web onto field-enabled Palm Pilots. Additional programs designed for the Palm Computing Platform will assist logistics and instructional staff with such calculations as student food and fuel ratios.

OBKnowledgebase: OB is the grandfather of outdoor education, yet its mark on the relevant literature is disproportionate to its influence. The knowledge that exists within OB's various schools, basecamps and instructors at any given point in time is likely OB's greatest asset. Yet, how can OB tap into this asset? How can these knowledge assets manifest into saleable products and services? How can OB begin to *know what it knows*?

OBKnowledgebase Products: OBIII will capture OB's knowledge capital and distribute it in the form of newsletters, books, websites, periodicals, tapes, CDs, DVDs and other forms of publication.

- **Newsletters**: imagine a clearinghouse where you could go for all newsletters in the system and could request articles.
- **Books**: imagine a single source for all books written on Outward Bound, but also a place where new books are being generated. Perhaps the Outward Bound Primer would be the next book published.
- **Websites**: imagine a dynamic listing of all Outward Bound websites worldwide and ones related specifically to this innovation institute.
- **Tapes**: imagine a tape library that is growing as Master's Series are completed and all the historical and current documentaries and series are archived.
- **CDs** and **DVDs**: imagine the production of CDs and DVDs to complete the collection of Outward Bound's knowledge capital.

- Now imagine that internal to the Outward Bound system this is free because you sell these products to the public and to the industry, further communicating your message and your dynamic product.

OB@Home: A recent email from a Life Career Renewal Executive to his instructor states:

> *I was visiting with Marina [another student] earlier via email telling her how change sounds so easy when you are 1000 miles away sitting in a canyon. Today was a difficult day for me remembering all the promises I made to myself and facing the reality of being back in the grind.*

Transference of the OB experience is difficult, especially when one's home environment hasn't changed in synch with the student. Well-timed reminders and personal coaching offer an important developmental opportunity for students and an untapped program innovation. But how can OB incorporate "aftercare" into its current offerings: without increased expense? With qualified staff? At an additional cost? Utilizing technology such as email or the web? What "tools" can be delivered on course to facilitate not only transference for the student but for their home network? OBIII is a perfect place to discover these and other answers that would be difficult or costly to determine at the school level.

Product Innovations: "The Impossible River Shoe": The COBS river program in Utah has what seems like an unsolvable safety problem. Actually, two safety problems that seem juxtaposed—that's what makes it (seems) impossible. Open toed sandals such as Tevas are dangerous on course because of piercing or snagging injuries to the toes and foot. The obvious solution is to require closed-toed shoes. But, closed-toed shoes such as sneakers or wet "mocs" cause many students and instructors to contract a form of trenchfoot. Thus, both open-toed and closed-toed shoes present a serious safety problem. OBIII will research and innovate a solution to this juxtaposed problem and design and manufacture the "perfect river-course shoe".

Course-type dilemmas: Many courses suffer with institutional vs. efficient gear problems. There are industry solutions that will work for these issues, but the schools are reticent to partake on any non-institutional solutions. For example, some less comfortable, less adjustable packs are being used because they seem to hold up better over multiple years and multiple students. However, the packs are uncomfortable and provide students with a more painful experience, thus causing less satisfaction (and more early departures) which are terrible for word-of-mouth advertising. Solutions can be found for this problem.

Other product-type innovations: The OB course watch (coordinates course days, dates, other course scheduling, resupply "alarms", etc.), the backcountry whiteboard and other field resources, day packs, and other specialized OB gear. Remember that Chums, Crazy Creek chairs, and French press mugs are product innovations that already came out of the field.

OB in the Year 3000: How will the modern OB course change? It is a question that must be asked. The Hahnian Pillars will remain intact, but what will change? Can an OB course be taught in conjunction with a 7-Habits curriculum? Or based on a book like, The Four Agreements? Can OB really be taught under the kitchen table? Should it? Should "Ascent *by* Outward Bound" be reconsidered? Should we offer more alternative activities or focus on alternative ideas?

Field-staff support: Field staff live a unique, nomadic, fulfilling yet challenging life. Many live in their cars for a season or a year and are challenged by a variety of issues — relationships, communications with loved ones, checking accounts, pro-deals or staff purchases, car repair, etc. Some of these issues cross over squarely with the critical issue faced by the schools of staff shortages. OBIII will research the issues and come up with targeted solutions to address the issues. For instance, would it be valuable to staff to have free email, tied to a support website where staff could one-stop shop for their "pro-deals", download curriculum for their next course, converse with instructors from around the world and arrange their winter-time job?

Jobs clearinghouse: Most, if not all the schools are experiencing staffing shortages. At least two of the schools were on the doorstep of canceling full courses in 2001 and sending students home because of staff shortages. However, staff are almost always desperate to work. By bringing together staffing opportunities and staff who are interested in work both sides can win. Perhaps an OBIII website dedicated to providing OB jobs to OB staff can be created where staff from all schools can be considered for positions, while staffing directors from all schools can enter positions available.

OB360°: 360° Profiling is used heavily in the personal and organizational sphere. Should OB develop 360° Profiling tools for outcomes based in the OB Pillars? How can 360° Profiling be delivered in the field without cumbersome paperwork? For example, with the right structure, could 360° Profiling be used in place of solo "pros and grows"?

Consulting: OBIII will offer outdoor and educational organizations (e.g., from Shackleton Schools, to public schools, to NOLS, to Regis University Outdoor Club) various consulting services such as program design, curriculum design, safety reviews, theory/model development, and staff training and certification.