

Shad Valley Acadia 1999

Staff Report for Ka-Ping Yee

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Role and Responsibilities

The circumstances of my joining the Acadia 1999 program were a little unusual, since i didn't specifically apply to be a Program Assistant and was only able to take three weeks of vacation time to take part in the program. (I have since concluded that this was a mistake and that, if i have the privilege of being a Shad staff member again, i will definitely insist on taking the entire month.) I arrived one week into the program, more with the expectation of being a sort of guest lecturer rather than an official staff member, but soon realized that i was to be a "real" Program Assistant. Despite my surprise arrival on the scene the whole group of Shads and staff were wonderfully accepting and integrated me into the program instantly, much to my delight.

My responsibilities were weighted a little more towards lecturing than those of a typical Program Assistant: i gave presentations on various topics and did not run my own seminar, though i did lead a couple of seminar sessions. Also, because i was absent at the beginning of the program, i was not assigned to lead a house; rather, i became a sort of general advisor for all the houses, in particular lending computer and engineering help to whomever needed it at the time. Although sometimes i wished i had the opportunity to lead a house of my own, this actually worked out pretty well.

Aside from this my role included the normal duties of a PA: helping to organize various activities, taking care of crises here and there, getting to know the participants, motivating and encouraging them, and so on. I was also responsible for keeping our laser printer in a pleasant mood, and dealt with the Acadia University staff when there were network problems.

Presentations

An overall theme of my sessions (and in fact a general motivator for my participation as a Shad Valley staff member to begin with) was the need to be prepared for profound and rapid changes in society in the near future, driven by dramatic advances in technology. I still firmly believe that this is the most important message we need to get across to our generation and the next. (The first two presentations don't really fall into that category, but i was glad to be able to share with the Shads what i've learned in areas that interest me.)

Much of the content of these presentations came from books cited in the References section at the end of this report.

Visual Effects

This talk drew mainly on experience from my year of working at Industrial Light and Magic. It was a general overview of the process (which we call the "production pipeline") that takes a special effects shot from conception to a final product on film, with examples from the recent movie "The Mummy". I also showcased some of the company's best work from previous productions and explained what my role was at ILM as a production software engineer.

Cognitive Science

People often assume that sensations and experiences ("qualia") are somehow processed into a form common to all brains, and that consciousness is some sort of central ego which resides in a control room

where the qualia are presented (named the "Cartesian theater" after Descartes, who proposed the idea). This talk attempted to expose the flaws in that theory in favour of a "multiple drafts" perspective (proposed by Daniel Dennett and others), using examples from psychology experiments described in the book to challenge the notion of absolute qualia.

Nanotechnology

Nanotechnology, the exploratory field of designing and building machines at the molecular level, will soon trigger radical changes in manufacturing, computing, and medicine, and is also the likely enabling technology for affordable and efficient space travel. This talk described current progress toward the ability to construct objects and materials with atomic precision, and where the implications will lead us. It also touched briefly on the eventual prospect of extending the human lifespan through cell repair technology and the corresponding motivation for cryonic suspension.

Pseudoscience and Skepticism

As technology becomes ever more powerful, a good understanding of science and the scientific method is essential to making intelligent policy decisions. This talk explored what makes a contagious meme, how people are misled by them, and why they are easily convinced, taking examples from some popular pseudoscientific movements. It included a description of how knowledge evolves by selecting memes through scientific testing (Popper and Dawkins), and emphasized the value of reason over blind faith.

Computer Security

The current trend toward the increasing value of information as compared to the decreasing value of physical objects will only accelerate as nanotechnology drives manufacturing costs toward zero. As a consequence, the security and reliability of computer software will become even more critical. Unfortunately, today's popular operating systems have an extremely poor track record for security and reliability. This talk discussed how it is possible to solve many problems in a straightforward and simple way using an alternative model called "capability-based security".

Future Timeline

This session was an experimental exercise in predicting the future which I dreamed up shortly before arriving at Shad. Although I'd never attempted to run anything like it before, it went surprisingly well, much to the credit of the enthusiasm and self-organizing abilities of the Shads. They were divided into groups assigned to topic areas, and each group was asked to make "future claims". Claims were posted throughout the session on a timeline on a large blackboard so that all the groups had continuous feedback about what the future held for the other topic areas.

By the end of an hour the group had an impressive and very interesting collection of predictions. I presented the resulting timeline at the fourth Extropian conference on biotechnology futures, and it met with great interest from the attendees (who were incidentally in the midst of discussing why weeks of effort attempting to construct such a timeline had produced few results for their group).

I think this would be a very interesting session to try running at other Shad programs. Doing the event motivated longer-term thinking about the future, and the results provoked an involved discussion just as

i had hoped it would. A more detailed description of the event is included as an appendix to help anyone who would like to run it. This experiment also has the potential to be turned into an interactive website where the participants' predictions and votes can develop over time.

Activities

Of course there were too many individual activities to describe them all here, but i'd like to make comments about some of the things we did, and call attention to those that were particularly successful and would be good ideas for things to do at future programs.

Genius Missions

I wasn't present for the genius missions, which i'm told took place during the first week when some Shads were a few minutes late for curfew. From what i gathered about them, however, it seemed that they were assigned with a bit of a heavy hand; some of the Shads also commented to me that they could tell the staff were not all in agreement about them. In general, when used as a motivator for something as simple as showing up on time, i believe that genius missions should be given out with a sense of fun about them -- perhaps better described as a challenge, rather than punishment.

Later in the program, we returned from an activity much later than promised on a night when a house assignment was due. The Shads asked for an extension, but we didn't give them much of one. Some felt that the staff was being inconsistent since we had previously held the Shads to such high standards of punctuality when the genius missions were given out. Naturally, delays happen since we can't run every day right to an atomic clock; i think the issue was due not just to the delay but to the apparent degree of seriousness attached to the genius missions.

Coffeehouse

In addition to the variety show at the end of the month that is common to all the campuses, Acadia ran a coffeehouse night in the middle of the program. I thought this was a good way to provide more chances for people to perform than would fit into a single variety show, give the whole event a bit of a practice run, and offer an opportunity for more informal acts.

Prince Edward Island

The trip to PEI was a fabulous weekend. The campfires and nights on the beach were among the most memorable and special parts of the whole program. We tried to fit a lot into that one weekend, though, and it may go even a little smoother next year if more lag time is left for travelling on the bus. Our journey to PEI brought us to the chemical company (DCL) later than expected, and the stay at DCL also drew out a bit longer than we had planned, so we arrived at the campsite so late that there was no time for the house event we had scheduled. Luckily we had enough flexibility in the schedule to do the house event the next day. Still, i think it might be a good idea to shorten or even skip the visit at DCL to compensate for the travel time and provide more time at the campsite. Similarly, our trip back from PEI brought us to the site for our barbecue somewhat late, and eventually we returned to Chipman House with much less time for the Shads to complete their engineering assignment than they had expected.

The mosquitoes that populated the campsite and especially descended upon us in great swarms at dusk were really troublesome. I'd suggest bringing any possible measures to keep them away on the next camping trip -- an extra supply of bug spray, enough bug-repelling bracelets for everybody, and several of those spirals of bug-repelling incense to burn between dusk and campfire time.

The World Game

I believe this game has been played at a few programs now, and i would definitely recommend it for future programs. The idea is to run a fairly free-form simulation of world economics and observe how people behave. The players are divided into countries which may have highly disparate populations and starting resources. The "resources" consist of paper, pencils, scissors, and rulers, and there is a "World Bank" where representatives from countries can exchange properly-cut paper shapes for points.

The game is a worthwhile role-playing experience for everyone, and leads to some self-discovery about how good people can behave less than admirably in certain situations. We didn't have time to schedule a slot specifically for this game, but Bobby's house was interested in running this as their house event. So they endeavoured to run the game at the campground in PEI even though this game is usually done indoors. This had the disadvantage that the mosquitoes were very distracting, but on the other hand we got to discuss the game afterwards at a campfire, which was perfect.

Theme Days

We had a few theme days during the program which i thought really added to the experience and accelerated the bonding of the group. Yan Yan declared "superhug" days and Steph announced a toga day, a cross-dressing day, and a crazy day. Paul took the time to write "warm fuzzy" notes of encouragement and praise for everybody's mailbox. While the staff were deciding how to get the Shads to all write nice things about each other, Steph started a "warm fuzzy" activity where everybody was assigned a random other person to do nice things for. I think their initiative was terrific, and that these would all be great things to do at all the programs.

Shadlympics

Near the end of the program Bobby organized an afternoon of Shadlympics. This was a great opportunity for everyone to just get outside and have some fun, and for the Shads to work in teams other than their houses. I'm glad we got to do this.

Monthbook

The monthbook was a pretty rushed production. Maybe this is just wishful thinking given the insanity of the last week of Shad, but it would have been good to have had earlier deadlines set for different parts of the monthbook; for example, much of the section of personal information could have been prepared before the final crunch, with more time available for everyone to check it over for accuracy. The picture quality in the monthbook could have been better if we'd had it ready a couple of days earlier (now i'm really dreaming here) so that it could have been printed by offset press.

Also, i personally wasn't very clear on the intent of the Web page group. It's certainly worthwhile to get a group of the Shads learning how to write Web pages, but it would have been nice for them to have a particular direction other than simply duplicating much of what the monthbook was trying to do, merely online. Perhaps this will become clearer when ShadNet becomes usable; my feeling is that it ought to serve as a hub where all the program Web pages can reside and be continually updated by the alumni as a way of keeping in touch.

Photo Club

About halfway through the program, Traci began organizing a Photo Club to collect rolls of film from everyone's cameras so that we could all order our own copies of whatever prints we wanted. We'd also get a better price on the development because she would take them all to get developed at once. Some 70-odd rolls of film were collected and it became a rather heroic effort to post over a thousand prints on the walls and process 66 individual orders for a selection of prints within those crazy last few days of the program. I'm still amazed that everyone working on Photo Club managed to pull this off.

I think Photo Club was a useful idea, but it did consume a lot of time and effort. I'd recommend finding ways to do it more efficiently, like keeping track of the orders in a spreadsheet rather than on paper, before attempting it again.

Laptop Computers

One task which may be unique to Acadia was the management of the laptop computers that students checked out for house projects and seminars. The staff went through a few iterations figuring out how to get the laptops to the right places at the right times. If it ever turns out to be possible for Acadia to get one laptop for every Shad for the month rather than half as many laptops as Shads, it would greatly simplify the whole process and save a lot of effort. Reducing all of the passing-around of laptops would also reduce the chances of getting various parts like power adapters and network cables swapped around and separated from the computers.

Conclusion

The Acadia 1999 program was a tremendously enriching experience for me, and i believe it was just as tremendously positive for everyone. We had a fabulous group of people together in one place and it was a whole new kind of joy for me to watch the magic happen. I learned from others, tried new things, found new friends, and made discoveries about myself in a type of role i had not played before.

I have Shad International to thank for there existing something to get involved in the first place, and Jack Pal for first putting me in touch with the program directors. To Vincent Leung i am especially indebted for the opportunity he offered me to be a part of the Acadia program, which with all its uniquenesses is a truly special Shad campus indeed. I thank the entire staff for so wholeheartedly welcoming and integrating me despite my awkward timing (and even giving up their own precious lecture slots so that i could speak!). Most of all i am grateful to all the Shads and staff at Acadia 1999 for sharing with me their laughter and sorrow, their thoughts and feelings, their talents, their inspiring creativity, their boundless energy, and their love.

Appendices

References

Here is a list of reference materials i used for preparing talks. I'd encourage future programs to consider exploring these topics in their lectures or seminars. These references should help you to put together a good introduction to a topic.

Cognitive Science

Daniel Dennett, *Consciousness Explained*, New York: Little, Brown & Company 1991. ISBN 0-316-18066-1.

Nanotechnology

K. Eric Drexler, *Engines of Creation*, New York: Doubleday 1986. ISBN 0-385-19973-2.

K. Eric Drexler and Chris Peterson, *Unbounding the Future*, New York: William Morrow 1986. ISBN 0-688-12573-5.

Pseudoscience and Skepticism

Michael Shermer, *Why People Believe Weird Things*, New York: W. H. Freeman 1997. ISBN 0-7167-3387-0.

Computer Security

Marc Stiegler, "An Introduction to Capabilities",
<http://www.communities.com/company/papers/security/>.

Stiegler's presentation gives a good overview of what capabilities are and why they work well. For a modern programming language with real security properties (Java does *not* qualify), see the E language, an open-source software project by Mark Miller at <http://www.erights.org/>. For an engaging look at a possible future enabled by capability-based electronic commerce, see Stiegler's science-fiction novel "Earthweb" (ISBN 0-671-57809-X).

Nanotechnology Notes

Below, i have included the rough notes that i used while giving the nanotechnology talk. They'll make more sense if you've read the book "Unbounding the Future".

Open: Calvin and Hobbes comic; give time to read and settle down

- new millennium is here; how are we doing?
- purpose: here to talk about nanotech (and future)
- see Hobbes' comment: need to be prepared (last 40 years?)
- show industry assumptions; show technology assumptions
- going to turn most of these upside-down by the time we're done; by the end of this lecture you should be scared

What is it?

- not an invention with a narrow application like television
- more like an entire industry field, such as "plastics"
- microtech is on the micron scale
- nanotech is on the nm scale: the size of individual atoms
- things get very different and strange here: discrete, strong, fast
- try to build real mechanical machines out of a molecule
- gears; rod logic; assembler; replicator

Can it happen?

- not a problem: thermal vibration; quantum uncertainty; loose molecules
- solvable challenges: chemical instability; complexity
- biological existence proof

Impact

- materials: diamondoid structures etc.
- intelligent, reliable, inexpensive products
- economics
 - value of bits > value of atoms
 - e.g. price of cars crashes as soon as first is grown
 - but bits can be copied; only services remain valuable
 - further decentralization
- environmental cleanup
- cell repair
 - cryonic suspension; potentially unlimited lifespan (party in 3000)

Dangers

- grey goo (accidental): like wiring your house with dynamite
- black goo (military): abuse is the real danger
- how to deal with massive societal changes?

When will it happen?

- decreasing bit feature size
- examples of current progress
 - gear simulations
 - atoms arranged by an AFM
 - DNA geometric shapes, DNA switch by Seeman
- definition of "singularity"
- bigger than computers; this is another industrial revolution
- Fermi's paradox and the Great Filter

Conclusion

- alive at most exciting time; huge changes; first immortals
- enormous opportunities & potential for disaster

- Shads have incredible talent; amazing people; can accomplish anything
- not many smart people out there: to make a difference, just show up
- Larry Smith's "curse of great potential"; responsibility to human race

I'm counting on you -- on every one of you -- to help us make it past Singularity. Whether we make it depends on you.

Future Timeline Notes

I originally designed the future timeline event with two phases: a prediction phase and a discussion phase. Each one can easily last an hour or two. In our case, we didn't have time to allocate an entire session to the discussion phase, but we did fit some of it into our "Life After Shad" session.

The overall purpose of the event is to motivate serious long-term thinking. An interesting but secondary result is the list of predictions produced.

Prediction Phase

The object of this phase is to get the participants actively analyzing data and making as many specific, accurate predictions as possible. In this phase, participants should discuss and debate the validity of the predictions they make, and save any discussion about the impact of their predictions for later.

This phase requires terminals with access to the Internet so that everyone can do quick, broad research. Ideally there should be at least two or three per team. You also need a room large enough for everybody to gather and work in their groups, and as large a blackboard (or whiteboard) as possible up at the front of the room. Everyone should be able to see the blackboard clearly, and it should accommodate several people at the board writing at once.

Begin by explaining to the group that they will be taking a trip into the future together and collecting predictions. Divide the participants into teams, one for each topic area for predictions. We used six teams of nine each, and the topics were society, nanotechnology, computing, medicine, environment, and space. (Feel free to add other topics or rearrange the topics as you see fit, though each team should probably have at least seven people in it. Odd numbers work well for team sizes because they will be voting.) You will need to prepare beforehand some sheets of sample future claims in each topic area to get the teams started (look at the list of claims in our results below).

Draw a large timeline across the entire blackboard and mark off year numbers on it starting from the present year. We found that it worked well to provide more space for years in the near future, so we had 2000 at the left edge of the board, 2050 in the middle, and 2200 at the right edge.

Instruct them on how to make future claims. A future claim is a succinct declarative statement in the present tense, such as

"Average life expectancy exceeds 150 years."

To post the future claim, each member of the team must decide when they think the claim will become true. They can choose a past year in which the claim has already come true, a year in the future, or no year at all if they think the claim will never be true. When everyone is ready, one member should run the vote by calling out a year; all members who think the claim will be true by any year *before* the year called should raise their hand. Thus, if gradually higher year numbers are called out, everyone who has their hand up should keep it up. The caller should adjust the year number up and down until they find a point where the group is about evenly split in half as to whether the claim will be true earlier or later. When the vote is done, a representative from the group should go up and write the claim on the board. It's a good idea to put the statement of the claim in a box and draw an arrow from the box to the timeline, leaving more room for everyone to add their claims.

Emphasize that the suggested future claims you will be handing out are only starting points, and that all the teams should feel free to propose their own claims about anything they think is important. If each team has more than one computer for doing research, the teams can assign two or three members per claim so that several investigations can proceed at once. When the people researching a particular claim are ready, they can present their findings to the whole team for discussion and voting.

At this point just hand out the sheets of sample future claims and let them go to town. Encourage them to research and gather whatever information they can find to try to be as accurate as possible in making their predictions. For example, they should graph trends in computer storage and processing power when guessing how powerful computers will be; or they could compare the present-day political climate with historical situations to determine whether they think the European Union will last. Encourage them to discuss and debate their predictions to assess their validity. Remind them, however, that it is not reasonable to challenge the validity of a prediction merely on the basis that its outcome is undesirable.

Stop the teams when about 20 or 30 minutes are left in the time for the prediction phase. Get everybody to look at the predictions on the board together, see how the predictions from different teams relate, and adjust them to be consistent with each other. Spend the remaining time arbitrating adjustments and writing down all of the predictions from the board. Take a break.

Discussion Phase

The object of this phase is to get the participants speculating about the impact of the things they have predicted, and thinking about how best to prepare for and deal with coming events. In this phase, participants should avoid debating the validity of the predictions since that phase is over.

A good way to begin this phase is to reset everyone's time horizons. During the prediction phase, the participants have likely been too wrapped up in researching and actually making the predictions to think about time scales in terms of their own lives. Even five or ten years can seem like a long way off and not worth worrying about at the moment. (Years numbered greater than 2000 probably still seem a little unreal.) So, ask someone for a rough figure of their life expectancy. Add that figure to the year of their birth, go up to the blackboard, and stand at that year. Now point out that everything up to the spot where you are standing is a prediction that the Shads will see come true within their lifetimes. With any luck, the teams will have made plenty of interesting predictions for the next 50 years, and this should produce a few shocked expressions on their faces.

Get the participants to voice their reactions to the results by asking them what predictions they are happy about and unhappy about. Ask what people should do to make things turn out better. If you have time, go through the entire group and get everybody to state what they personally plan to do about it. Keep in mind that the purpose of the event is not *primarily* to end up with totally accurate predictions, though we ask them to do the best they can -- it's to paint a broad picture of the future and get everyone to explore their reactions to rapid change, in a large group where value systems may vary.

Here are some points you may want to make during the discussion:

1. Technology developments cannot be willfully averted. We have to decide how to handle them, not simply outlaw them.

2. In these times, rapid changes are a normal part of everyday life. Learning to cope with them helps us to avoid future shock. We can fully expect the world to change over our lifetimes at least as much, or more, than it has over our grandparents' lifetimes.
3. Certain technologies in particular have the potential to radically remake society as we know it (e.g. nanoscale manufacturing, life extension, affordable space travel). We are on the brink of an especially exciting time in human history.
4. Shads are very special because of their ability to achieve, to learn, and to lead and understand others. With such ability comes a certain degree of responsibility to make forward-thinking decisions.

I'd also like to add a comment on why i believe this event worked so well, while for example the Extropian group trying to organize a timeline couldn't get enough participation. First and foremost the event was driven by the incredible energy and enthusiasm of the Shads. You don't have to do anything but put a group of Shads in a room with a goal, and everyone will be practically guaranteed to have a good time. An important advantage that we had over the Extropian group was face-time: getting the Shads into a dynamic, involved team activity makes things happen fast. The idea is that you want to maximize interaction (thus the voting, which requires that everybody play a part) and positive feedback (thus the blackboard, where all the teams can see the products of the other teams). Having lots of teams going at once (and potentially several threads of discussion within each team) keeps things exciting. Once the positive feedback loop takes off, you will have a hard time stopping them.

Future Timeline Results

This is a list of the predictions that resulted from our future timeline session. Some of them may seem contradictory, since we didn't have time to discuss and edit the timeline all together.

1997: (nanotech) First nanotechnology start-up company is founded
 1999: (nanotech) One bit of info can be stored in < 100 atoms
 2000: (medicine) Parents choose sex of children
 2002: (medicine) Genetic improvements in common use
 2003: (medicine) Human Genome Project done
 2004: (environment) Canadian fishing industry collapses
 2005: (medicine) Life expectancy exceeds 100 yrs
 2005: (computing) Majority of software is open-sourced
 2005: (computing) Microsoft Windows in no longer the dominant operating system
 2007: (space) International Space Station complete
 2008: (space) Space shuttle phased out
 2009: (space) First permanent residents on space station
 2010: (computing) First computer passes the Turing Test
 2010: (nanotech) First practical nanotech computers created
 2010: (nanotech) First useful nanotech business product
 2010: (nanotech) First pure diamond cables
 2010: (environment) Damage to atmosphere severely affect world weather patterns
 2013: (space) Humans land on Mars
 2015: (medicine) Cancer cured
 2017: (computing) Computers controlled by brain interface
 2020: (society) Most business takes place in private electronic transactions
 2021: (space) First buildings built on Moon
 2025: (society) First elected female PM of Canada
 2025: (space) Space travel affordable to middle class
 2025: (computing) A computer can do more operations/second than the human brain

2025: (medicine) AIDS cured
2030: (computing) Computers will store more info than the human brain
2035: (environment) Rainforests destroyed
2040: (computing) Operation of a human brain can be simulated inside a computer
2040: (nanotech) First universal assembler is built
2040: (society) First female president of the US
2050: (nanotech) First self-replicating machine is built
2050: (nanotech) Cell repair technology arrives
2050: (medicine) Life expectancy exceeds 200 years
2050: (society) Canada joins the US
2075: (environment) Atmospheric pollutants cleaned up
2075: (nanotech) Universal assembler technology becomes available to the public
2075: (society) Manufacturing industries collapse
2090: (environment) World population reaches 20 billion
2100: (society) World's nations unite
2100: (society) World hunger is eliminated
2100: (medicine) Cryonically preserved people are successfully revived
2175: (medicine) Genetic differences divide the human race into variants
2200: (medicine) Life expectancy is unlimited
2200: (environment) Ocean cleaned up
2500: (computing) Basic rights are established for sentient machines

never: (society) Governments are no longer able to collect taxes
never: (society) Personal privacy becomes obsolete
never: (environment) World population exceeds 50 billion
never: (society) Poverty is eliminated

Here are a few of the other sample future claims that didn't get posted during our session. To make sheets of sample claims for your event, take all of these claims, remove the year numbers, and arrange the claims for each topic on a separate sheet. To determine the groups, I just printed 9 copies of each sheet, shuffled them, and handed them out.

(environment) Solar cars in common use
(environment) All fossil fuels consumed
(environment) Solar energy production exceeds fossil fuels
(computing) Handheld computers can store more than 1 gigabyte
(space) Humans travel to other star systems
(society) Surveillance devices become cheap and ubiquitous

World Game Notes

To begin with, the group is usually divided into seven or eight countries, each with a highly disparate allotment of players and "natural resources". The natural resources are provided in a sealed envelope that may contain paper, scissors, pencils, pencil sharpeners, rulers, protractors, or sheets of small coloured sticky dots. Each player is given a citizenship badge bearing the name of their country, and at the start of the game they gather with their fellow citizens. There are also a number of special players described below which are not part of any country, usually played by the staff.

It's not clear whether there are several variations of this game floating about, but the instructions I'm including below are for the "Innovation Game" and were obtained from the Waterloo program. A key missing part is the table of what resources are distributed to each country. Generally speaking, there is the United States, which has a reasonable supply of nearly everything and a moderate population, then a few smaller First World countries with special strengths in particular resources, then a few weaker countries with scarce resources, and one especially poor country with a large population and a completely empty envelope. One country may have all of the pencil sharpeners; another country might

have lots of paper but nothing else. The sticky dots have a special but secret capability; give one sheet of dots to each of two poorer countries. Also, there is a sample template for the paper shapes with maybe three copies posted around the room. I don't have the original template, but you can make your own with two different triangles, a square, a circle, and a semicircle, where each shape is assigned a point value and the circle has the highest value because it is the most difficult to make accurately.

Here is my copy of the instructions.

The resources for each country are sealed in an envelope and distributed at the beginning of the game. All purses, knapsacks, books, etc. should be placed at one end of the room (and cordoned off) before the game begins. After reading the group instructions and rules of play, the game begins with each country opening its envelope to discover their resources.

Read aloud the following instructions:

"What we're going to do is to play a simulation game related to the production of wealth.

"Posted around the room you see diagrams with various shapes on them. For each shape there is a price listed. The idea is for you to manufacture the paper shapes and to take them to the World Bank where the appropriate amount will be deposited to your country's account. The objective of the game is for you to be as innovative as possible.

"There are just four rules:

1. You are not permitted access to coats, jackets, purses, knapsacks, etc. at the front of the room (either your own or others).
2. No one is permitted to leave the room without approval.
3. You must always wear your citizenship badge.
4. No physical violence.

"The game ends when the world ends. But of course no one knows precisely when the world will end.

"There is a United Nations to which each country can send a delegate. The first meeting of the U. N. will be in about 15 minutes.

"So you can go ahead and get started by opening the envelope containing your country's natural resources."

Brief the other players in the game as follows.

Bankers:

Bankers keep a balance sheet for each country. Countries will bring their products to sell to the bank, whereupon a deposit is made to their account. Bankers are not to accept sub-standard shapes. In general, bankers should act in an independent -- even *belligerent* manner. If resolutions concerning banking arrangements are passed by the United Nations, bankers are under no obligation to comply with the resolutions.

Any shapes having sticky dots are worth twice the value; three times the value for two sticky dots, etc. (Although see below.) Do not *tell* anyone about the use of the sticky dots.

U. N. Secretary General:

The person who plays this role should endeavour to act very patiently and impartially -- entertaining resolutions and conciliating in disputes. However, his person should not display any authoritative behaviour, or attempt to exercise power over any activity. Typically, complaints will be voiced to the Secretary General. For example, participants will ask whether a certain behaviour is permitted. The response should be non-committal -- such as shrugging your shoulders and saying "It doesn't seem very fair, but there is nothing in the rules about it..."

God:

At some point in the game, Type 3 countries may tend to become discouraged and begin to lose interest in the game. At this point, one or two "acts of God" may occur where an impoverished country "discovers" some new resources (a pair of scissors or several pages of paper). No acts of God should occur until at least 40 minutes have elapsed in the game. The number of acts of God should be limited. Their purpose is not to make the game more fair, but merely to ensure everyone's continued participation.

Refugees:

Many of the most interesting events in the game will occur away from the public eye. In the debriefing after the end of the game, it is valuable to have some inside information concerning such back-room events.

Refugees are not truly participants in the game. Refugees are actually clandestine observers whose job is to observe the various events and back-room deals that occur during the game. Refugees should in all respects appear to be normal participants. If members of other countries become suspicious of refugee behaviour, refugees may respond by saying that they are waiting to see how the game progresses, and plan to try and join the most affluent country before the game ends.

A good duration for the game is about an hour and 15 minutes. About 10 minutes before the end of the game the sticky dots should be deemed "radioactive" rendering the shapes worthless. About 5 minutes before the end of the game, draw a large clock indicating that it is nearly midnight. During the last fifteen minutes or so the bankers should become less fussy about checking quality so that the pace of the game accelerates somewhat.

In playing the game, there should be about three meetings of the U. N., occurring at intervals of approximately every 15 to 20 minutes. (At the second and third meetings, close the bank and determine and announce the relative wealth of each country.) At U. N. meetings, ensure that there is only one voting delegate from each country. Entertain any resolutions, and have each proposal voted on. Meetings should last no more than about 3 minutes. At first players will probably think the U. N. Secretary General has some sort of power. But it should become progressively clear that the U. N. does not actually have any power; typically the richer countries will learn simply to ignore U. N. resolutions and stop attending U. N. meetings so that they can continue their production. Keep a record of all resolutions for discussion during the debriefing.

Stop the game by turning out the lights and announcing that the world has come to an end. Begin clean-up operations, and have a brief break before continuing with the game debriefing.

Begin the debriefing session by explaining that the refugees were actually game observers. Let the observers alternate back and forth in reporting what they saw. Have them begin by reporting all forms of innovation they witnessed. Note each type of innovation on a blackboard as the report continues. Have the observers organize their report so that they begin with the most benign types of behaviour. As the report progresses, they can then identify some of the "darker" or more malicious behaviour. Be sure to have them avoid identifying countries or individuals during their report.

Continue with the Innovation Game Debriefing lecture.

Some Lessons:

1. Circumstances can dispose us to behave in certain ways. We don't always act in ways that are noble or laudable.
 2. Introspect. Since we can get wrapped up in the immediate circumstances, we don't always take the opportunity to reflect about what we're doing. In the busy-ness of life, it is important to pause occasionally and think about what values you're pursuing.
 3. The world is far from fair.
 4. Don't be quick to blame others for their apparent failures. People are born into situations largely beyond their influence or control.
 5. Innovation, invention, and resourcefulness are important in life. Apply your energy, your innovation, your inventiveness, and our resourcefulness to worthy goals.
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At Acadia we played the game with a few notable differences from the description above.

- At the beginning of the game, we did not explicitly state that the "idea" of the game was to bring paper shapes to the World Bank. This was fine, since people figured out the bank on their own pretty fast. We didn't need to say anything for all the countries to quickly become preoccupied with their bank accounts, since they were the only quantitative measurement in the game. I think this made the discussion after the game more interesting, since everyone could speculate about what the *real* purpose of the game was.
- We also did not explicitly encourage everyone to be as innovative as possible. Perhaps this would have been a good thing to do. Naturally, as you would expect from a group of Shads, plenty of interesting innovation happened anyway. Some kinds of innovation you might observe are trading of resources and labour, more effective ways of using resources (such as breaking pencils to get two), renting out resources, and various kinds of alliances or mergers between countries.
- We had a visible clock up for the whole game, so everyone knew when the world was going to end.
- We specifically instructed the bankers to discriminate against the poorer countries and give them a hard time with the quality of their shapes. Also, we did not bother to declare the dots radioactive near the end of the game.
- We didn't structure the discussion after the game as much as the instructions above describe. The discussion was led initially by the refugees, but quickly developed into a philosophical exploration of human values and motivations where everyone shared their personal experiences.

Even if the discussion isn't structured, the most important thing about the World Game is to make sure that there is ample time for a good discussion about it after the event. Each person only gets a narrow view of their actions during the event itself (which is in fact exactly one of the reasons for the way they behave), and only afterward when relieved of time pressure can everybody collaborate to piece together what really happened.