Fish Tales*

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Abstract

This talk is about fishing and the friendships that have resulted in its pursuit. It is also about theoretical physics, and the relationship of imagination and fantasy to the establishment of ideas about nature.

1 Introduction

Fishermen, like theoretical physicists, are well known for their inventive imaginations. Perhaps neither are as clever as sailors, who conceived of the mermaid. If one doubts the power of this fantasy, one should remember the ghosts of the many sailors who drowned pursuing these young nymphs. An extraordinary painting by J. Waterhouse is shown as Fig. 1. The enchantment of a mermaid must reflect an extraordinary excess of imagination on the part of the sailor, perhaps together with an impractical turn of mind. A consummated relationship with a mermaid is after all, by its very nature a fantasy incapable of realization. To a theoretical physicist, she is symbolic of many ideas we develop.

There are many truths known to fisherman in which one might also find parallels to the goals of scientists:

- *A fish is the only animal that keeps growing after its death.*
- *Nothing makes a fish bigger than almost being caught.*
- *"...of all the liars among mankind, the fisherman is the most trustworthy." (William Sherwood Fox, in* **Silken Lines and Silver Hooks**
- *Men and fish are alike. They both get into trouble when they open their mouths.*

These quotes may be interpreted as reflecting skepticism regarding the honesty of fisherman, and probably do not reflect adequate admiration for a creative imagination. Is it fair to criticize a person for believing a falsehood that he or she sincerely believes to be true? The fisherman simultaneously invents the lie, and believes in it himself. The parallel with theoretical physics is perhaps only approximate, although we physicists may invent stories that we come to believe, on some rare occasions our ideas actually correspond to a more or less true description of nature. These minor philosophical differences are not really the central issue, however. It is more to the point that both fishermen and scientists enjoy creating a good story, and we also enjoy a story well told. The correct mixture of truth, lie, fantasy and excitement is a witches brew:

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Fillet of a fenny snake,
In the cauldron boil and bake;
Eye of newt and toe of frog,
Wool of bat and tongue of dog,
Adder's fork and blind-worm's sting,
Lizard's leg and owlet's wing

William Shakespeare, in **Macbeth**

Figure 1: The famous painting by J. Waterhouse of The Mermaid.

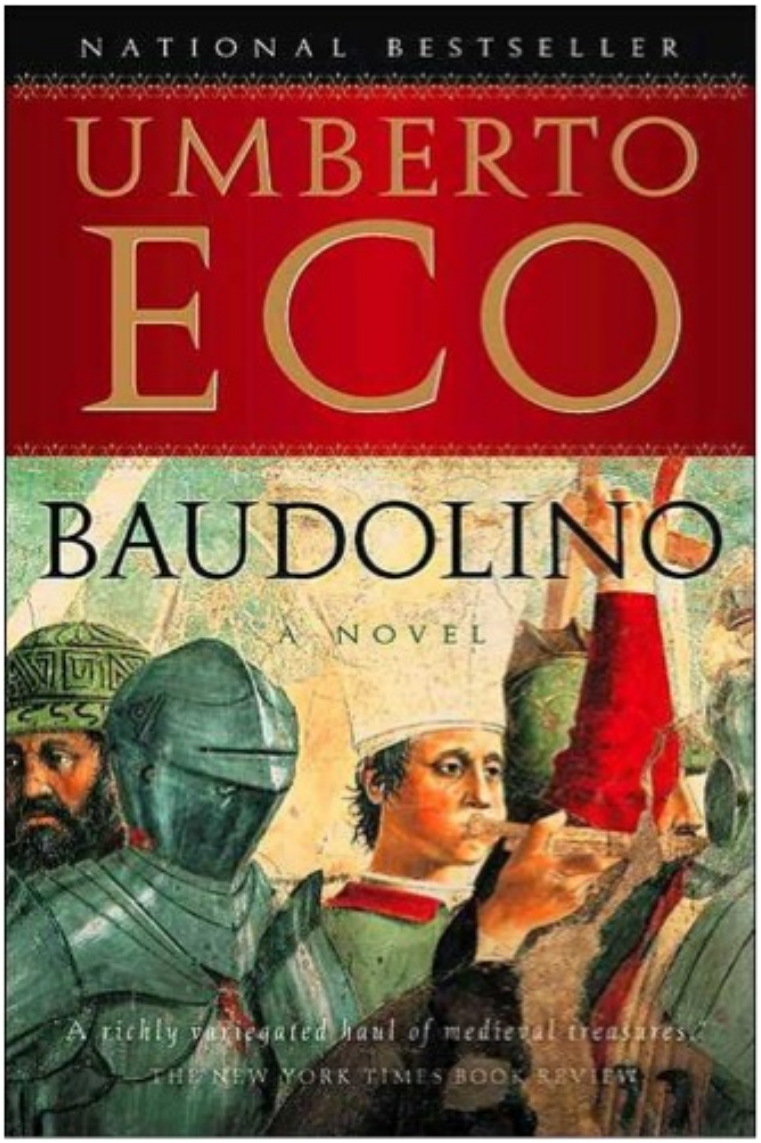

Figure 2: The cover page for Baudolino by Umberto Eco.

Perhaps the difficulty of a total separation between vivid fantasy and a creative insight into reality is best expressed in Umberto Eco's novel Baudolino.

Baudolino, an aging solider is trapped in Constantinople in 1204. The city is being ravaged by crusading knights. Baudolino makes friends with a historian whom he protects from death, and begins his story.

As a youth Baudolino met Emperor Frederick Barbarossa. Frederick adopted him and had him educated in Paris. While a student, he fabricates a story of a mythical kingdom. He forges a Holy Grail as a present to Prester John, the ruler of this imaginary kingdom. He encourages Frederick Barbarossa to search for this kingdom bringing as a gift to Prester John the forged Holy Grail. As he later travels with Frederick on a crusade, the story becomes increasingly vivid fantasy, an account less tied to anything of tangible reality. Baudolino arrives in the dominion of Prester Johns kingdom, one that is populated with many fantastic creatures. Baudolino falls in love with an enchantress: half human and half goat.

As the reader and Baudolino enter the kingdom of Prester John, both understand the story is fantasy. Yet as the story develops, the reader and the teller both can experience it as real and for a short time live within this imaginary world. The story is a mixture of fantasy per se, and an exploration of the borders between reality and the constructs the mind makes of our world.

Good theoretical physics often has a similar genesis. One can perhaps recognize something close to echoes of scientific hubris in certain quotes from Boudolino:

"There are no stories without meaning. And I am one of those men who can find it even when others fail to see it. Afterwards the story becomes the book of the living, like a blaring trumpet that raises from the tomb those who have been dust for centuries...."

"Yes, I know, it's not the truth, but in a great history little truths can be altered so that the greater truth emerges."

Baudolino

Figure 3: Another cover page for Baudolino by Umberto Eco.

Since this is a school and I have now finished the philosophical introduction, it is time for an exam. It consists of one question, one that asks you to consider multiple choices:

How are fisherman, Baudolino, and good theoretical physicists similar?

1. They enthusiastically believe their own lies.
2. They are in pursuit of the Holy Grail.
3. They become bigger after they die.
4. All of the above.

2 Fishing as a Boy

As a young boy, I was introduced to the world of fishing by my father. He and a neighborhood friend took me out camping at the Pot Holes Lakes of Central Washington. This area in the Columbia River basin was formed by the catastrophic flood of Lake Missoula around 100,000 years ago. It is sometimes called the scablands, since the flooding eroded away the soil to depths of nearly a kilometer in many places, and there are gaping areas of exposed rock, sand, and very little soil. I was probably 8 or 9 years old at the time, and was very excited when I caught my first fish.

My father bought some fishing gear for this trip and after the trip I was allowed to use it on expeditions of my own. In the years that followed I would find neighborhood friends and we would tie fishing poles to our bicycles and ride off to nearby lakes and rivers. The first time I caught a river trout was in the Naches River, shown in Fig. 4a. This was during a camping trip arranged by the a local youth organization, and I am afraid I embarrassed myself by being so openly excited about catching the fish. I was the subject of much ridicule by the older boys there, and I learned that sometimes it is best to exercise restraint even though you are proud of what you have done.

Figure 4: (a) The little Naches river. (b) Raindow trout and largemouth bass.

The fish we most wanted to catch were trout and bass shown in Fig. 4b. We were, however, much more likely to catch"junk fish" like carp, sunfish and catfish.

There were some good bass ponds down by the Yakima River. To get there we had to cross an outlet stream from the local sewage treatment facility. To cross this stream we needed to walk across on it on an irrigation water pipe. The pipe was not very wide, and it was suspended

about five feet above the stream. Only once did I slip and have to make the difficult decision of whether to fall in the sewage, or spread my legs and take a very painful drop to the pipe.

I remember once I was walking along a path near the Naches river, and I looked down at my feet and saw a rattlesnake between them. I jumped straight up and then – somehow defying laws of physics – ended up a few feet to the side of the path.

We had many stories of snakes. We would go out camping with sleeping bags. My friends told me that during the day your sleeping bag is warmed by the sun, so that as night falls the sleeping bag is warmer than the surrounding area. Snakes like warmth so they crawl into the bag, making a big surprise when you crawl into your bag for a nights sleep. Once while camping

Figure 5: A skunk.

along the Yakima River with a friend and his dog, the dog came to our tent in the middle of the night and crawled in the bag with me. The next morning I realized that before crawling in, he must have met a skunk, fallen into some disagreement or conflict, and the dog carried with him evidence of the encounter. When I unzipped my bag, I discovered that it and I were now reeking with the smell of skunk, a smell that soon gave me a horrible headache. I had to walk home about 5 km smelling like a skunk – and when I finally arrived there, my mom would not let me in the house. Only after I had scrubbed myself repeatedly, rinsing myself off with cold water from the garden hose, did she finally let me in. We had to throw away the sleeping bag.

I think however that in general my fishing experiences growing up in the US are not at all unique. I was given the picture 6 by Andrei Radchabov in which he, his brother and a friend are holding three okun. Surely Andrei's gesture with his free hand may be interpreted as the universal fisherman's gesture indicating the size of the fish that got away.

3 Fishing as a Young Scientiist

When I was in graduate school studying for my PhD, I had little time to fish. After I got a faculty position, however, I began participating in and organizing scientific meetings and had some responsibility for entertaining visiting colleagues.

Perhaps my most memorable experience was at the first meeting I organized, a conference to discuss the newly emerging ideas about matter at very high temperature and density, the area now normally identified as Quark Gluon Plasma and its ilk. I had invited a number of

Figure 6: Tri rebyati and tri ribkii.

scientists from Eastern Europe, the Soviet Union, and even from Cuba. Of all the scientists from Soviet-Block countries, only the Poles succeeded in getting permission to attend. Among them was Krzysztof Redlich shown in Fig. 7 a.

This was Krzysztof's first visit to the US. After he got permission to attend the meeting in Seattle, he was given an airplane ticket to Montreal, Canada, a city to which LOT flew. He also received a passport and a small amount of cash. He had no ticket to get from Montreal to Canada nor sufficient money to buy it. He arrived in Montreal airport and fortunately met some Polish people in the airport who generously loaned him the money to buy a round trip ticket to Seattle (about the distance of Irkutsk from Moscow). Once at the international airport south of Seattle, he somehow found out how that by using the city bus lines, after a number of transfers and considerable time making them one could get from the airport to the University of Washington. (I did not know myself that this was possible to do, and doubt that most lifetime residents of Seattle at that time knew that it was.) The feat is made even more impressive by the fact that at this time, Krzysztof spoke almost no English.

It was late in the evening when he arrived at the University and somehow was let into the physics building. He met a custodian there who let him into the Physics Department office. Kryzyztof found a phone book there, looked me up in it, and called me up. I drove to the University, picked him up and gave him a room in my home until the meeting began. I had not even known he was coming!

We later went on a long hike of several days to go fishing in the Olympic mountains. (A picture of Mt. Rainier, the most famous mountain near Seattle is shown in Fig. 7b.) The lake we found was full of trout and on every cast Krzysztof caught a fish. He fished for several hours until dark, bringing back a good-sized pailful of fish for us to eat.

Someone had seen a bear that day. I told a story about how almost all bear attacks are on fisherman who have not washed their hands properly; the bears smell the blood of fish on

Figure 7: (a) Krzysztof Redlich in 1983. (b) Mount Rainer near Seattle.

them. Soon after I finished sharing this lore, we all went to sleep. In the morning Krzysztof was surprised to discover that all the other hikers were sleeping at least a hundred meters away from him.

I had enjoyed great adventures in the out-of-doors about a year earlier while on a three month visit to Helsinki, Finland. While lecturing at the Arctic school of physics in Akaslampalo a resort in Finnish Lappland, I met for the first time three Russian scientists: Mitya Diakonov, Yuri Makeenko and Misha Shepkin. Yuri Makeenko and Mitya Diakonov are shown in Fig. 8. This was my first chance to have significate time to get to know any scientist from Russia, and we had days to spend together in this forested setting, not just the hours for scientific discussion but many hours of free time afterwards, in a season when this far north the light never quite faded in the sky.

I discovered that my Russian colleagues and I shared an enthusiasm for the out-of-doors including fishing, and a healthy disrespect for authority. Now that I know many physicists from around the world, I understand that a disrespect for authority is a common characteristic of theoretical physicists. I have come to respect the utility of the trait. I think it is fair to say that for many of us, it seems one that helps us advance the field.

I also met Holga Nielson at this meeting. He was interested in Chaos at the time, and wrote talks that my wife attended and heard – not always grasping the ideas being presented, but fascinated by the energy and drama with which they were presented. Holga's creative presentations are perhaps proof that order at least has a possibility of arising from chaos. Alice was not the only one who found him an interesting and original man. One foggy night I was fishing in the lake, and in the distance I heard Holga's voice,and the sound of several women's laughter. The sound came nearer, and finally through the fog I could begin to make out the boat as it was approaching. Holga was sitting in the front of the boat, while three women were rowing him across the lake.

Figure 8: (a) Mtiya Diakonov from a recent photo. (b) Yuri Makeenko and me playing chess during a visit to the US in the mid 1990's.

One of the weekend excursions planned for this school was a canoe trip along a nearby river; canoes were supplied, and since they were designed for two people we were asked to sign up in pairs. I preferred fishing to canoeing, so my wife and Holga signed up to share a canoe. That morning, Holga met her at the appointed time – wearing his normal three-piece suit with tie, and black leather shoes. Alice explained that less formal attire might work better for paddling on the river, and hastily managed to borrow from another participant not planning to join the canoe trip a sweat suit and a pair of rubber boots that fit Holga. He changed into them, and they set out. They are shown together on this trip in Figure 9.

Holga was excited by the chance to make this expedition. He had been much sheltered in life by his mother, and had enjoyed few opportunities to gain outdoor skills. She had recently died, and although her death was a loss, it also opened to him the chance to try many things he had not been able to try in his youth. Holga had little experience with nature at this time; he did not swim nor did he have experience with any kind of boat; the canoe trip was for him a real adventure. He was an enthusiastic rower and a very strong one, which made for a disorderly trip down the river as keeping a straight course proved difficult. Several times the canoe tipped over in water that was relatively deep. Aware that Holga could not swim, Alice would always reach out her oar for him to grab to help him to shallower water. Although the water was seldom actually over their heads, once they had completed the trip Holga firmly told others that Alice had saved his life more than once. In spite of the mishaps they made it all the way to the end of distance planned for the trip, a real triumph that Alice as well as Holga enjoyed. She still remembers it with pleasure.

This meeting marks my first chance to meet any Russian scientists, and the beginning of my long association with Russian theoretical physics. I learned how to fish for okun and shuka, and how vodka keeps you warm at night and improves your reflexes.

4 Fishing at Aspen

For many years during the time I was on the staff at Fermilab and later at the University of Minnesota, I would spend a couple of weeks in the summer at the Aspen Center for Physics.

Figure 9: (a) Holga Nielson and Alice righting their canoe. (b) Holga and Alice proudly surviving their canoe trip

This is a wonderful place to do physics, high in the Rocky Mountains of Colorado surrounded by beautiful landscapes and chances for hiking. Alice and I would head off on the weekends to backpack up to high mountain lakes. I would often fish in Snowmass lake, Fig. 10a. Our grandsons Matt and Kenny would visit us in Aspen, and it was there that they learned to hike, backpack and to fish. One of the first fishing experiences is shown in Fig. 10b. At the time, they were willing to learn but were not overenthusiastic.

Aspen in the 80s and early 90s was an attractive meeting place for Soviet and American scientists. I fished with Peter Tinyakov, Valery Rubakov, Misha Shaposhnikov and Victor Novikov there many times. We would hike to lakes that were not on established trails and catch native cutthroat trout. Once, after climbing up around 500 meters from a lake we had fished (we were at an altitude of about 3500 meters), Misha Shaposhnikov was breathless and exhausted. Many years later, I discovered that it was on this hike that he decided to stop smoking.

Truro lake is a shelf lake off the established trail, shown and described in Fig. 11. It involves a hike of about 700 meters up a very steep slope. Once with a shy young friend from Korea, we were hiking back down from the lake. He reached this very steep slope and I knew he was frightened since he became very quiet as we went down the challenging descent together. When we got to the bottom, he began to talk, with shifting from his characteristic shyness to a joyous animation we had not earlier seen in him. A more relaxed friendship began to grow, I think, from that time on.

It was at Truro lake that Peter Tinyakov came close to killing himself. Valery Rubakov was at one end of the lake – and he was catching fish. Seeing that, Peter wanted to join him. There was a short way to get to Valery over a very steep slope with boulders, and a long way around

Figure 10: (a) Fishing at Snowmass Lake. (b) Matt and Kenny learning to fish at Grizzly Reservoir.

that was safe. Peter wanted to catch fish – so he took the short route. He triggered a slide as he went across the slope – and barely dodged a large boulder that if it had hit him could indeed have killed him.

Alice and I once hosted at Aspen a group of Soviet scientists who were visiting FNAL. They drove as a group across the US to get there. At one point early in their visit, I was driving the nachalnik of the group back from a fishing visit at a small lake up near the continental drive. I did not realize that the the speed of the car on that narrow and curving mountain road down to Aspen made him truly nervous, and was joking with him, telling him that driving on a mountain road was a bit like skiing. I later learned that for a short time, the nachalnik ordered the scientists not to go on a mountain road with me as driver. The order was changed, however, when his wife – a more relaxed passenger who understood I was not a reckless driver – heard about it. Some photos of their visit to Aspen are shown in Fig. 12.

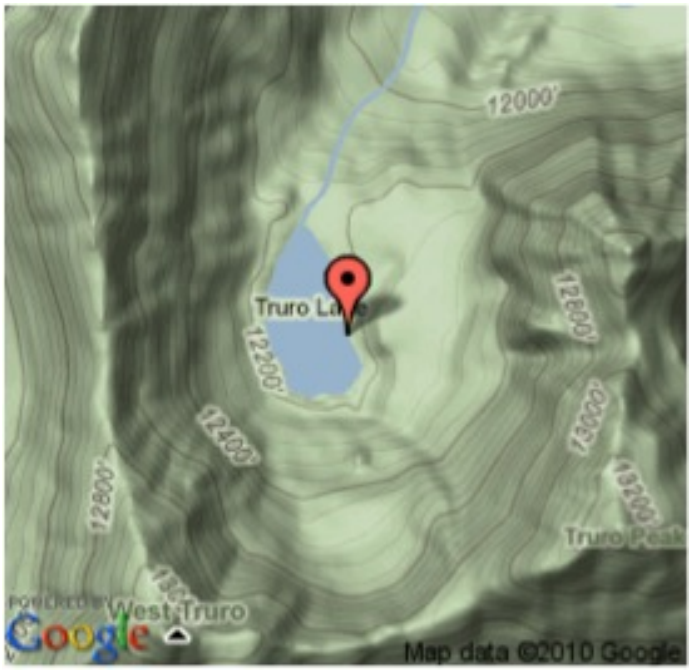

Figure 11: Truro Lake as described in the hiking guide: A challenging day hike following a wilderness route to a high alpine lake. This trail, which is no longer maintained by the White River National Forest, is used primarily by anglers who are seeking a remote fishing experience. The trail is extremely steep and poses significant route-finding challenges at several points along the way. It is recommended for experienced off-trail hikers. Hauling a fully loaded backpack up to this lake is for masochists only.

5 Times in Minnesota and in Brookhaven Laboratory

In 1988 I moved to the University of Minnesota in Minneapolis. I soon became active in planning for the newly funded Theoretical Physics Institute, and became its first director. One of my jobs was to recruit staff. At that time, the Soviet Union was beginning to fall apart, and many of my Soviet colleagues needed safe places to land. There were many more excellent scientists than there were positions available around the world. I tried to make the Theoretical Physics Institute (now the Fine Theoretical Physics Institute) a friendly place for my Soviet colleagues to visit. Eventually some of them joined the University of Minnesota as permanent faculty members, and Alice and I enjoyed friendships with them and their families. A couple of pictures from that era are shown in Fig. 13

While in Minnesota, I learned the story of the Minnesota Catfish, and with enthusiasm shared this story with others. In spite of its name, this legendary creature is a mammal. It in fact has warm blood and fur. It is believed to have been originally discovered by French trappers around 1740, and misnamed a fish because its primary habitat is the Mississippi river. My good friend Victor Novikov while visiting Minnesota would sometimes go off for a weekend, or so he assured me, in search of this elusive creature, a picture of which is shown in Fig. 14.

I discovered that my friend Misha Voloshin was also fond of fishing. He liked ice house fishing, which is a custom found both in Russia and in Minnesota. A temporary house is built on a frozen lake. Through the ice a hole is drilled. Inside the house there is enough heat so that it is comfortable to fish through the hole in the ice. At times one catches few fish but can always drink vodka while waiting for one to bite.

This recreational activity is so popular in Minnesota that it has created a service industry

Figure 12: (a) Sergei Nurushev, one of the outstanding experimenters visiting FNAL in the mid 1980's with the Tsaratenko children. (b) Together in the hot tub with the visiting Russian experimentalists

Figure 13: (a) The Shklovskiis, Alice, The Gribovs, Nelya Vainshtein and Natasha Voloshina at our house in the early 1990's. (b) The family Voloshin, Alice, Natasha Novikova and our neighbor Pam.

associated with it that made newspaper headlines. While I was there a woman was arrested because she was going around from ice house to ice house on her snowmobile, offering her personal services to the lonely fisherman who inhabited them.

In 1999, I moved to Brookhaven National Laboratory to help in rebuilding the nuclear theory effort; the RHIC accelerator was starting up at that time. I had always thought of Long Island

Figure 14: The Minnesota Catfish

as very urban, but discovered that it also has good fishing and kayaking. Alice and I bought sea kayaks when we moved there, and I quickly learned how to fly fish from a sea kayak. The sport fish you catch are primarily bluefish and striped bass.

Bluefish are very interesting. They grow to be several feet long, and when you catch one they jump like a trout or a salmon. They have very sharp teeth, and you need either steel leader or very heavy nylon leader to avoid having the bluefish bite through your line. They have been known to sever tendons on the hands fishermen foolish enough to reach into a bluefish's jaw.

It is difficult to keep them if you catch them from a kayak. If you put them into the boat you can orient them one of two ways. The first is with their head forward. Then their mouth is close to your feet, and they can start attacking your ankles. If you orient them the other way, their head is in your lap and that is even worse. When I catch a bluefish, I release him unharmed. That seems the best for both of us.

I most of all like to catch striped bass. This fish need to be 72 centimeters long in order to be kept; any smaller specimen must be returned to the water. You can see me with my first "keeper" caught in the bay near our home in Fig. 15a, and me fishing out fishing just at dawn in my kayak in Fig. 15 b. The picture Fig. 15b was taken by my best fishing buddy, Kenji Fukushima. Kenji and I have spent many hours in the bays of Long Island paddling in kayaks, trolling for stripers. It is hard work. You can paddle sometimes for 5 or 6 hours, and when you are done of course you are exhausted. This extreme exhaustion combined with the occasional excitement of catching a big fish seems to be a remarkably effective bonding experience.

Happily, wherever we physicists may form our friendships we can usually hope to continue to meet good friends in new settings in other places around the globe. Fig. 16 shows Kenji at a recent meeting in Bad Honeff. In the background is Krzysztof Redlich, the young man who visited me from Poland many years ago while I was in Seattle.

Kenji and I have caught many big bluefish together. Kenji's goal is to catch a big striper. Over a year ago, he came very close. He had a really big fish on – so big that it bent his hook straight. Now given that Kenji is a fisherman, and that I was not there when he was trying to bring in the fish one might be a little suspicious. Perhaps he caught his hook on a rock, and the

Figure 15: (a) A keeper striper (b) Kayak fishing in the early morning.

tidal current caused the boat to drift, and the hook to become bent? But to be truthful, I think he had a really big fish on. It apparently ran his line out a number of times, and a fish of the size he had is not possible to confuse with a rock. One might argue about the size of the fish of course, but at the very least, this fish had mighty Chi, as our Chinese colleagues would say, to bend his hook that way. I certainly would not want to be in the same boat with it had it been a bluefish.

There are of course many famous stories about fishing off the East Coast. My favorite is about Dave Lamoreux as excerpted from the New York Times:

Dave Lamoureuxs kayak, named Fortitude must be the only one in Massachusetts registered as a motor vessel. That's because a powerboat registration is required to get a permit to fish for tuna here. Apparently, it never occurred to the authorities that someone might be crazy enough to want to catch a bluefin tuna while sitting in what amounts to a floating plastic chair and enjoying what Melville called a Nantucket sleigh ride.

Since the end of July, Lamoureaux has caught three bluefins this way, paddling a couple of miles offshore, hooking a tuna and holding on, the rod clipped to a harness on his chest, while being towed at speeds of up to 20 kilometers an hour before the fish exhausted itself.

When Lamoureaux first showed up in their fishing grounds, commercial tuna fishermen figured he was lost or in distress. Now he has befriended several of them, and he will turn over a fish too big for him to manage. In August, he reluctantly did this with a bluefin that eventually escaped but that on the fishing boats sonar looked to be about 350 Kg. "That just broke my spirit", he said. "They told me, 'That fish is so big, it doesn't even know you are there.' "

Figure 16: Kenji Fukushima, Alice, Krzysztof Redlich, Hana Saito, Chihiro Sasaki, Maria Paola Lombardo

6 The Song

The song we are going to sing tonight is not a song about fishing. It is a song about discovery and adventure. It is done from the perspective of a fish. It is a famous song written by Kay Kyser in 1939:

Three Little Fishes

Down in the meadow in a little bitty pool
Swam three little fishies and a mama fishie too
"Swim" said the mama fishie, "Swim if you can"
And they swam and they swam all over the dam
Boop boop dit-tem dat-tem what-tem Chu!
Boop boop dit-tem dat-tem what-tem Chu!
Boop boop dit-tem dat-tem what-tem Chu!
And they swam and they swam all over the dam

"Stop" said the mama fishie,"or you will get lost"
The three little fishies didn't wanna be bossed
The three little fishies went off on a spree
And they swam and they swam right out to the sea
Boop boop dit-tem dat-tem what-tem Chu!
Boop boop dit-tem dat-tem what-tem Chu!
Boop boop dit-tem dat-tem what-tem Chu!

Figure 17: (a) Dave Lamoreux and kayak (b) A tuna that he caught..

And they swam and they swam right out to the sea

"Whee!" yelled the little fishies, "Here's a lot of fun
We'll swim in the sea till the day is done"
They swam and they swam, and it was a lark
Till all of a sudden they saw a shark!
Boop boop dit-tem dat-tem what-tem Chu!
Boop boop dit-tem dat-tem what-tem Chu!
Boop boop dit-tem dat-tem what-tem Chu!
Till all of a sudden they saw a shark!

"Help!" cried the little fishies, "Gee! look at all the whales!"
And quick as they could, they turned on their tails
And back to the pool in the meadow they swam
And they swam and they swam back over the dam
Boop boop dit-tem dat-tem what-tem Chu!
Boop boop dit-tem dat-tem what-tem Chu!
Boop boop dit-tem dat-tem what-tem Chu!
And they swam and they swam back over the dam

7 Fishing and Theoretical Physics

There are some similarities in fishing and doing theoretical physics. Both involve an enthusiasm to grasp phenomena that are both within and outside our imagination This enthusiasm is perhaps the strongest for things that we do not quite understand, but about which we have well-defined opinions. There is a construction of the world around us enmeshed in that enthusiasm.

Both fishing and doing theoretical physics require great effort, perhaps out of scale with the tangible reward we acquire. Once in a while one catches a big fish. Truth often arises from enthusiasm and imagination. That truth has an existence which transcends its origination, and not only describes but predicts as yet unknown features of nature. In this there is magic.

People who do do a great deal of fishing and/or physics together can develop a strong sense of comradeship that transcends backgrounds and local parochial interests. That is perhaps as important as anything else in these shared activity.

8 Acknowledgements

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