

**From:** "jeffrey E." <jeevacation@gmail.com>  
**To:** "slloyd@mit.edu" <[REDACTED]>  
**Subject:** Re:  
**Date:** Wed, 10 Aug 2016 01:29:13 +0000

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Regards to danny

On Tuesday, August 9, 2016, Seth Lloyd <[REDACTED]> wrote:

Dear Jeffrey,

In fact, our conversation also has something important to do with the generous gifts you have given for my research.

The ordinary government grant comes attached with large amounts of highly specific information about how it can be spent. These restrictions make the grant money significantly harder to take advantage of in a productive way. I foresee a time in the not so distant future when government grants will be so restrictive as to be not worth applying for.

Murray once told me that running a theory research group is like owning a small family grocery store: you have around 5-7 mouths to feed, and the produce has to be grown and displayed, and the customers have to come into the store to buy it. Because it's a small business, you're always at the mercy of fluctuations in the number of customers, no matter how high the quality of the produce.

My annual expenditures on research from government grants are around \$500K, plus or minus \$200K according to whether my proposals are going through or not. This can make things pretty tricky, as there is a minimum 2 year timescale for hiring postdocs and 4 years for graduate students.

Since 2012, you have given my research group \$100K, in two increments of \$50K. This is about 5% of my total expenditures. However, because it is unrestricted by junk information, it has been tremendously useful.

If you look at the attached accounting sheet (which is not very informative overall), you will see that the great majority of the money has gone for travel (primarily foreign travel) for my postdocs, graduate students, and for me. This is really essential, as the US grant money doesn't support it, and it is key for the postdocs and graduate students to get full international exposure. It is also very important for me, as I have significant collaborations in Japan, Italy, and the UK -- these make up about half of my research collaborations -- and the money allows me to go visit and work with my colleagues there, and for them to come and visit me.

A significant part of the money has gone to support long-term (e.g., one year) visits from foreign graduate students who work with my group. This money goes for travel and housing for the students. Again, it couldn't happen under other funding.

Because of the fluctuations in my ordinary grant budget, I have used funds from your gift on a temporary basis to tide over students and postdocs who were unsupported for several months before another grant came in. This ability to 'borrow' from your gift fund and to pay it back later is a godsend, dramatically reducing stress for them and for me. This is not possible on government grants.

May I also say personally that it makes my travel life significantly more comfortable.

Government rates for hotels are around \$100 a night (I just had to stay at the Lamplighter Inn on Cerrillos road in Santa Fe because Los Alamos was paying: not recommended). Your gift allows me to live a little easier. In principle it also allows me to fly business class for trips over 6 hours, but I don't do that because \$5K for business class to Japan, however tempting, is better spent paying a foreign grad student's housing for a year.

So if you decide to continue to support my research, I will be grateful.

Yours,  
Seth

P.S. I attach the actual report sheet from MIT, although it is not very informative.

On Tue, Aug 9, 2016 at 8:08 PM, Seth Lloyd <[REDACTED]> wrote:

Dear Jeffrey,

It was very fun talking with you the weekend before last. I have downloaded The Improvement of the Mind and am reading. I feel my mind improving already ;-)

The conversation and your ideas fit in closely with work I've been doing and am proposing to do. Maybe this is not surprising because we've been talking about these topics for years. I've been traveling around (Santa Fe, now in San Francisco, soon to be in Banff) and so have had time to think more about what we discussed.

Here is a succinct summary of my own take. I know yours is somewhat different.

Information is a fundamental quantity, measured in bits.

Information can be random, like the typical string of bits one gets by flipping a coin 0101110110101000011 (I just flipped a coin and let heads = 1 and tails = 0), or it can be ordered, like the bit string 0000000000000000.

There is a technical definition of order and randomness: a bit string is ordered if there is a succinctly describable method, e.g., a short computer program, for producing it. By contrast, a string is random if the shortest program for producing it is the same length as the string itself. For example, the string consisting of a billion 0's can be produced by a short program: Print '0'  $10^9$  times. By contrast, the shortest program to produce the string 0101110110101000011 is something like: Print 0101110110101000011. This way of defining order/randomness is called algorithmic information.

The interesting thing about algorithmic information is that the short program can be hard to find. A string can look very random and still have a short program. For example, the first billion bits of pi, written in binary, have a short program, but if I just give you those bits, they would look statistically random.

This means that so far as we or any other information processing system is concerned, order/randomness is subjective: some information can be ordered and non-random, but we may not be able to recognize the underlying order, so we treat it as random. That is, the order is cryptic: we don't know how to decode it. This crypticity is the key feature for looking at both physical systems and human/social systems.

#### Physical systems:

In physical systems such as a gas of molecules, entropy is the amount of information that is required to describe the underlying motions of those molecules. Because the molecules are bouncing off each other in an essentially random way, entropy is assumed to be random information.

Heat is energy that is encumbered by entropy/randomness. The randomness makes it harder to take advantage of that energy.

By contrast, free energy is energy where the information required to describe how that energy is arranged is ordered, not random. Free energy is energy we can take advantage of.

Now comes the kicker: suppose that a system is actually ordered, but that order is cryptic. If we can't decipher the order, we can't take advantage of it.

So whether energy is free or not depends on our ability to detect its underlying order. That is, the availability of energy depends on the computational/decrypting ability of whatever system (molecule, microbe, human) is trying to take advantage of that energy.

#### Social/human interactions:

Human interactions are about the exchange of information, plus other stuff (goods, services, money, etc.). Everything that is exchanged brings with it the information that describes what is exchanged, what can be done with it, etc. So for example, a US Treasury bond comes with the specification of its price and its future interest payments. A complex option comes with the specification of what can be bought and sold when.

As a result, human interactions are awash in information. Different people are capable of decoding/decyphering that information in different ways. The ability to detect a pattern or order in information translates into the ability to take advantage of a social situation. For example, the efficient market hypothesis states that fluctuations in the prices of a given stock should be essentially random. But if you happen to possess some information that allows you to predict the future fluctuations of the stock, then you can make money.

Similarly, to play into your ideas about deception, when two

actors enter into a transaction, each presents the other with information about their obligations under the transaction. Each actor looks at that information and judges whether the transaction will turn out to their own advantage. But because each actor perceives different patterns in the information, they can come up with different evaluations of the future worth of the transaction.

Deception arises because one actor may hide a pattern in the revealed information, a pattern that the other actor doesn't perceive, but that makes the transaction more advantageous to the first actor. I've been told that this is called, doing business.

Talk some more?

Yours,  
Seth

P.S. I'm sending more on this plus information on how your gifts to my work over the last four years have been used.

On Sun, Jul 31, 2016 at 11:26 AM, jeffrey E. <[jeevacation@gmail.com](mailto:jeevacation@gmail.com)> wrote:

Power, financial , physical , and its signaling  
Deception  
Probability  
music  
money  
distributions . derivation of the power law  
OBJECTS

On Sun, Jul 31, 2016 at 11:10 AM, Seth Lloyd <[REDACTED]> wrote:

Absolutely: call me on my cell [REDACTED]

Seth

On Sun, Jul 31, 2016 at 11:02 AM, jeffrey E. <[jeevacation@gmail.com](mailto:jeevacation@gmail.com)> wrote:

is now a good time to speak?

On Sun, Jul 31, 2016 at 10:57 AM, Seth Lloyd <[REDACTED]> wrote:

Dear Jeffrey,

You have generously supported my research the last few years. The most recent \$100K you donated two years ago was supremely useful: because of the lack of restrictions on the gift, I was able to support visitors, students, and activities that can't be supported by government grants.

I'm writing to see if you are interested in continuing the support. If you could support the research, that would be great.

In addition to looking for research support, I'm also looking for ways to support a sabbatical for the academic year 2017-2018 (MIT only pays half my salary for the year).

We have also talked about me checking out MIT's willingness to accept additional donations from you: would you like me to ask around?

Once again, thank you so much for your support: as noted, it is exceptionally effective, and it means a lot to me. Please give me a ring if you'd like to discuss this: [REDACTED]

I hope that you are well and that our paths cross soon. Any plans to show up in Cambridge? The last time was very fun.

Yours,  
Seth

On Sun, Feb 7, 2016 at 11:22 AM, jeffrey E. <[jeevacation@gmail.com](mailto:jeevacation@gmail.com)> wrote:  
greatgreat

On Sun, Feb 7, 2016 at 11:21 AM, Seth Lloyd <[REDACTED]> wrote:  
That would be great! I can make it.

Seth

On Sun, Feb 7, 2016 at 10:10 AM, Joscha Bach <[REDACTED]> wrote:  
yes!

Am 07.02.2016 um 10:08 schrieb jeffrey E. <[jeevacation@gmail.com](mailto:jeevacation@gmail.com)>:

I can be at the insitute at 3 today if that works for you all  
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