You are in information Wolverine: *Ecological theory and browsing behavior*

Originally from PLOS Ecology Community Blog, 2016

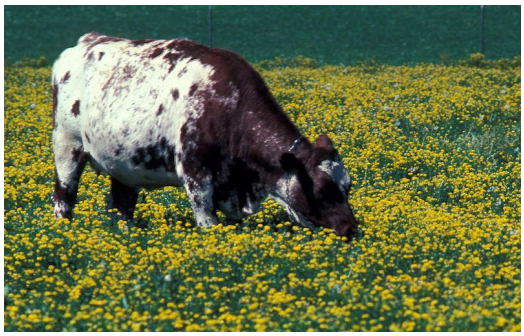
You clicked on this link because your behavior conforms to an ecological theory, and I can prove it.

"What!" you say, "I may be interested in ecology but you're crazy if you think my web browsing can be predicted using ecology. Besides, everyone knows ecology has a hard time with rigorous theory, it's a squishy science."

I'm here to tell you that you are wrong, you are an information wolverine. Your internet browsing can be described using tenets of optimal foraging theory, an ecological framework developed to describe how animals find food in a patchy environment. In fact, the fields of web design and computer science have adopted the theory of information foraging because it does a great job of describing how people look for information…and if you understand how people search for information then you can design your information to be more easily found! (I'll get to the wolverine part a bit later)

This all started when ecologists started asking, 'how do animals find food when food can be so hard to find'? This, it turns out, isn't a simple question to answer. For anyone who has ever decided to try surviving on their wits alone in the wilderness, even with a ton of knowledge it can be very difficult to find food, water, and shelter. How do animals do it, especially specialists who require specific and widely distributed food? Even when resources are plentiful they are patchy and it takes energy to find then, but when they are spread thin across the landscape it can be energetically expensive to go looking, costing energy that animals can't afford to spend frivolously if they plan on surviving the lean periods. How do they balance the energy they must expend to find food with the caloric value of the food they find?

Ecologists answered this question with the marginal value theorem. The marginal value theorem is model that compares the availability of food, the energy expended to look for food, and the energy gained from staying at a food patch, to calculate the optimal time that an animal should leave to look for new food.



Why graze down to bare dirt when there is juicy grass and flowers to be had in every bite. Photo: USDA

Here is an example. A cow could theoretically sit in one place and eat only what their neck lets them reach until they've eaten down to bare dirt, then move a few inches and do it all over again. That would maximize their energy gained and minimize their energy costs. They don't, however, because the energetic costs of looking for food are so low (a pasture is a huge carpet of freely available food) that the marginal value of any given patch is pretty low. The energy expended in eating all the way to bare dirt isn't worth it when grass is everywhere with just a simple bite. Instead, they can expend energy doing other things and know that they will always have food available.

On the other extreme, wolverines are well known for eating their prey bones-teeth-and-all during the mountain winter, leaving these bone hunks rattling around inside them all winter. Because food is incredibly hard to come by, and they expend so much energy to find it (wolverine in the Cascade mountains of Washington State have home ranges as large as 760-square miles), every calorie is precious. For a wolverine the marginal value of each piece of food is huge, it pays to eat every last scrap. If they were a cow their behavior would be the same as eating the grass all the way down to bare dirt because the next patch of grass is miles away through a desert.

"So, what," you say, "aside from the trivia about wolverines eating teeth, this is pretty dry and theoretical. Besides it has nothing to do with my internet browsing habits!"

Hold on for a second, yes it does. How did you know how to click on this link? Why did you leave the last article you were reading? Did it get boring, or maybe it was a bit light on facts…maybe you've stuck around this long because the interest level of this article is higher than average?

What if, in the paragraphs above, you replaced wolverine with *you*, food with *cat video*, and all mentions of the environment with words like *browser*, *computer*, *menu, operating system*, *HTML*, *PHP*, *Java*…you get the idea. The internet is a wilderness, and you are a wolverine in search of the perfect cat video to post on your Facebook wall.

Wolverines eat every bit of the food they find, sometimes even the teeth and bones, because food is rare and every calorie counts. Photo: Jeffery C. Lewis, US Dept of Transportation

This is the basis of information foraging theory. We all make decisions on where to browse based on how easy it is to find the information we want, the quality of information we think we'll find next, and whether our current path is going to take us there. All of this comes directly from the foundational literature on optimal foraging (Stephens & Krebs, 1986 has been cited 6,411 times on Google Scholar! Read it if you haven't).

In 1999 two computer science researchers, Peter Perolli and Stuart Card, made the link between optimal foraging theory and how we humans search for information online in their landmark paper Information Foraging. The idea took off and is still being used, and improved, as a way to describe our browsing behavior.

Discussions of information foraging, especially in web design, are peppered with references to "information scent". It sounds weird, but it's another direct takeoff from ecology. Think of the wolverine, starving while walking over miles of mid-winter snowdrifts, elk teeth rattling in her guts. Suddenly she smells the unmistakable scent of dead animal and takes off at a dead sprint, sniffing excitedly, until she arrives at a recent wolf kill.

Again, you are the wolverine, the web-pages you are navigating are the high-mountain snowdrifts. You can replace "unmistakable scent of dead animal" with the contextual clues and menu structure of the webpages that clue you in to how to navigate to find what you want. That is "information scent," and it smells more like a good cat video than a dead moose (I'm not sure I know what the smell of a good cat video is, but you get the point).

So, now, I'll make my predictions.

You've made it this far so the marginal value of this article must be pretty high. By finishing it you've shown one of two things:

1) your information environment is quite barren (you are a hungry, deep-reading wolverine not an information grazing cow), or

2) The information density of this article is WAY above average.

I'd love to flatter myself with option number two, but my guess is that you are indeed a deep-reading and voraciously hungry wolverine of information. Also, you were led here by the scent of ecology and the environment in your social media or news feed, a scent that must smell better to you than rotting moose. I'm glad you made it, and that you've had a good meal. With any luck, what you've learned here will stick with you like elk teeth rattling in the empty stomach of a wolverine crossing the Continental Divide in the depths of winter.

By: Jens Hegg, 2016 for PLOS Ecology Community Blog