

The Normal Vector

(perpendicular to the plane)

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Advanced Philosophy of Hair:

A philosophical treatise with variations
by Maciek Smuga-Otto

The pain of reality penetrated my dulled senses when I beheld my changed form in the mirror. Cruel murder cried the innocent victim! Truth reflected is truth noticed, the state of the world now, not then. The sharp dividing line between past and present is that of sanity, and clarity of vision rests upon dispelling mists of fancy. Yet somehow, my vision of things as they should be is not as they are. Is it my fault, or theirs? If I must adjust my view to fit that of an objective uncaring world, then what should anybody care what my opinions are? On the other hand, If nothing but my perception matters, then why don't things adjust upon my bidding? Ever since the beginning of thought, people have tried to devise a formal link between their desires and the state of things observed. Thus sprang into existence such arcane fields of jealously guarded knowledge as magick, physics, numerology, mathematics, and library science. By waiving their wands about, magicians hoped to influence the course of things - to impose their hazy dreams on the strict fabric of spacetime. By cutting his hair off, so tell us the ancient tomes, Delilah drained Samson's seemingly unwavering strength. The crucial link here, as in other cases, is that which crowns the man's head - his stately mane. Turning to the modern world, we see eager apprentices of the mathematical art clumsily imposing their sincere wishes for a proof to form on the still stricter fabric of formal logic. Yet is there no connection between my ultimate sacrifice of recent and the almost miraculous disappearance of facial hair upon the visage of my friend, Daryle? Or is it once more my slipstream of delusions which guides me to false comfort, to seek out causality where coincidence reins supreme? However, if I was to accept Lord Coincidence as monarch of this domain, then how can I explain the existence of a self whose sole intellectual tactic of survival lies exactly in forming causal connections?

(Cont'd, p.4)

Jason Colwell's

Lunch-hour problem

Problem:

What is the probability that a 10cm \times 9cm piece of bread, 1.4cm thick, with jam on top, will land right side up if dropped on the floor of the lounge?

Solution:

We assume the piece of bread is perfectly rectangular. A piece of bread of the given size weighed in at 30g. The jam would be spread (assume evenly) 0.1cm thick on one side of the bread. The density of jam is $2.0\text{g}/\text{cm}^3$.

We refer to the large face of the bread without jam on it as the "bottom face" or "bottom". The face with jam on it is the "top face".

First, we locate the centre of mass of the jam&bread system. Place one corner of the bottom at the origin in \mathbb{R}^3 (with distances in cm), so that the bread and jam occupy the intervals $(0,10.0) \cdot (0,9.0) \cdot (0,1.4)$ and $(0,10) \cdot (0,9.0) \cdot (1.4,1.5)$ respectively.

The centre of mass of the bread is $(5.0,4.5,0.7)$ and that of the jam is $(5.0,4.5,1.45)$. The mass of the bread is 30g and the jam weighs

$(10.0\text{cm})(0.1\text{cm})(9.0\text{cm})(2.0\text{g}/\text{cm}^3)=18\text{g}$. To get the combined centre of mass, we take the weighed mean of the two centres of mass:

$M =$

$$\frac{(5.0,4.5,0.7) 30\text{g} + (5.0,4.5,1.45) 18\text{g}}{30\text{g} + 18\text{g}}$$

$(5.0,4.5,0.9813)$

As the bread rolls to the floor, it rotates about M . Let \mathbf{m} be the (variable) unit vector perpendicular to the bottom of the piece of bread and directed from the bread towards the jam. Let \mathbf{n} be the unit normal vector to the floor (pointing upwards). (Cont'd, p.2)

Jason's Lunch-time Problem, cont'd:

We assume the value of m where the bread hits the floor. Hence it is equally likely that $m \cdot n > 0$ or $m \cdot n < 0$ (The probability that $m \cdot n = 0$ is negligible). If $m \cdot n > 0$ then the angle ϕ between m and n is acute, and the bread will land on one of its bottom corners. If $m \cdot n < 0$ then $\pi < \phi < 2\pi$ and the bread will land on a corner of the layer of jam (once more, the probability that the bread lands on a corner edge is negligible).

Now we take a cross-section of the bread, jam, and floor as the bread hits the floor; it passes through M , the corner touching the floor, and the corresponding corner on the other large base of the bread.

We assume that the corner which lands on the floor does not slide. (This is because the bread falls on the carpet, making the problem mathematically neater yet experimentally messier.) We also disregard any rotational velocity and assume the bread - and jam! - are rigid.

The projection of the vector n onto our cross-section will lie within $\alpha + \beta$ in both cases 1 and 2. If this projection lies within α in each case, the centre of mass M will fall rotating about L , bringing the bread and jam to rest right side up. If, however, the projection of n lies within β , the momentum of M will cause the bread to fall jam-side down on the carpet.

The probability that the projection of n will fall within α in each case is $\alpha/(\alpha+\beta) = 2\alpha/\pi$.

$$\text{In case 1, } 2\alpha/\pi =$$

$$(\arctan(0.5187\text{cm}/6.727\text{cm})) / (\pi/2) = 0.04899.$$

$$\text{In case 2, } 2\alpha/\pi =$$

$$(\arctan(6.727\text{cm}/0.9813\text{cm})) / (\pi/2) = 0.9078.$$

Since cases 1 and 2 are equally likely, the total probability that the bread will land right side up is

$$\frac{0.04899 + 0.9078}{2} = 0.4784 \sim 0.48$$

Note: This result may seem optimistic in the light of past experience. If you wish to test the result experimentally, please DO NOT do so in the lounge. \square

Proposed Problems

Compiled by Maciek Smuga-Otto

1. Johnny B. Mathgeek is standing in a room on the sixth floor of CAB which is on the north side of the northern "chimney". Johnny is right after a very frustrating exam. As a matter of fact, he is contemplating the mindwrenching of jumping FROM their present position, clearing BOTH corner of the third - floor roof on the south part of the chimney, AND the 2-3 floor stairwell on the north side, landing right SMACK on the floor of CAB cafeteria. Well, Now, assuming the window of the sixth floor room is removed (by arbitrary means), calculate

a) the initial horizontal velocity, V_0 , which will allow Johnny to finish his existence gracefully (assume initial vertical velocity = 0)

b) the set of possible impact points, U , for Johnny on the floor of CAB.

2. Devise the most irritating possible variant of chess. Convince someone to play it with you.

3. Imagine a graph $G = (V, E)$ representing some system of hallways and/or streets and their intersections (which might be, for example, rooms). Take two people, p_1 and p_2 , and place them at vertices v_1 and v_2 . Suppose these two individuals were to meet at time $t = t_1$. It is now time $t = t_2 < t_1$. You are the person p_1 . You have forgotten where (in the graph) the meeting was to take place. Now suppose you define "meeting" by the state where at some $t = t_n$, both p_1 and p_2 occupy the same corridor (street) or room (intersection), devise a strategy of action most likely to guarantee a meeting for different graphs G .

(Note: you may experiment with leaving messages in rooms and other fancy stuff like that. This is a very real problem and solutions would greatly ease the life of many miserable people.)

4. Understand differential forms. Explain to everyone else

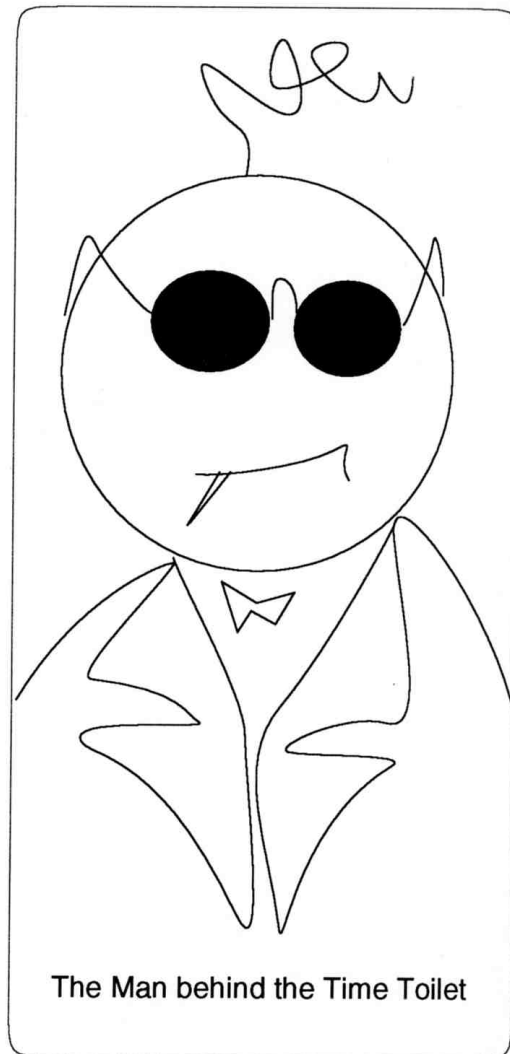
by Jason Kosowan

(To be read with soft jazz playing in the background)

Big Daddy U gave a nod and the music started groovin'. The sky got dark and the moose wailed a bluesy note on his harmonica. "Get down, daddy-o," the moose said softly and he pulled his black hat down lower over his eyes. The rain started to come down but then stopped, took a listen, and then walked right into that club. The night was coming around the corner and the gangs suddenly hushed. A blade struck out of the darkness and a gang member fell. Oh yea, it was one of those nights, you had to dig it. A night like any other, a night where the pool hall was buzzing into the scene like a bowl full of jelly and Santa Claus came jiving into town. Oh yea. The horn squealed along and Big Daddy just jived. A subset swayed and fell against the bar with a crash. And the moose still wailed on his harp until the cats came home and the moon jumped over the candlestick. The grapefruit screamed its mournful cry to the gods. No reply. The gods aren't home right, but if you leave your number they'll get back to you... after the beep. Well, if that wasn't enough, the faces started a'shakin' and a'screamin' like they wuz blowin' a horn. We all just sat back and laughed.

and then...

nothing. nuthin. silence... the band took a lickin' and kept on tickin' but the soul of the city was gone. The music drifted down the street gutters and came to the edge of the enchanted forest. Yea, you know which one I mean. I know you dig it. So this is the end of our tale, and to think that the snow only falls in summer.



Streetwalk

by Maciek Smuga-Otto

bustle bustle bustle the busy street intones
as voices of merchants mix with traffic's drone
the butcher waves meat so fresh that pedestrians stop
and blood falls on the pavement in front of his shop
the librarian waves arms in gestures of despair
as a fruit cart tips over the display he patiently prepared
upstairs the cry of mothers echoes down the halls
as they see their children playing in the mud on the street below
pidgeons, wings all ruffled, fly from roof to roof
dropping down on peoples' heads their existence proof
the cats that weave among the legs and tires of trucks and men
with scraps in mouth return to feed the kittens in their den

among the crowd squeezed in to fit dimensions of the street
the clatter clank and bustle of mouths, of carts and feet
I walk alone, with head hung down I cast off the social art
I talk to no one, hear nothing, save the freedom in my heart.

Conclusion of Phil of Hair.

by Maciek Smuga-Otto (from p.1)

What was once an integral part of myself is now severed, left to its own means without even a self-awareness to guide it in the treacherous pathways of the material universe. Do I alone remain, while that which was once so close now dissolves in the uncertainty of the world driven by the madcap logic of quantum mechanics bound within the confines of an impersonal light cone? Or does it gain an independent existence, a more objective essence granted only to objects material and not those spawned by feverish thought? As thin strands of self spread ever further into the world, I have to reflect on Dave's question: Where do I end? How far will I identify with that which was once me but is no more? Not only is the material mine, but the structure is perfectly preserved, now existing only within the realm of impressions that I can receive from the confusing world around me.

Such are the thoughts that cloud my mind in the expanse of the dark cathedral of boundless dreams and ravenous hairdressers' scythes.

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The Insect of the Month

by Amir Husain

As a special supplement to the Normal Vector, I, Amir Husain, shall quote a passage describing a specific order of the Class Insecta each month. As a bonus, this month, I will include a brief description about the Class in general.

Many people have negative thoughts when insects are mentioned in discussion, but with over a million known species in existence, Insecta is the largest class of animals. Insects, as members of this distinguished Class are often called, have certain characteristics, in general, that separate them from you and I. Their bodies are divided into three parts: the head, the thorax, and the abdomen. They usually have a pair of antennae, four wings and six legs (as opposed to humans, who possess but two). Insects play a wide variety of roles in their ecosystems. Some niches that insects fill are that of the decomposer and also as a source of food for many animals (including humans). Whereas some insects, such as the moth and the grasshopper, can cause damage to clothing and crops, others provide valuable products such as silk and honey. Other insects, such as the mosquito and the house fly are regarded as pests (although I don't suppose they have a very good opinion of humans either).

Now that you all have a brief knowledge of the Class Insecta, I can proceed with the featured insects.

*Order Ephemeroptera (mayflies).
Soft-bodies with short setaceous (bristle-like) antennae and vestigial mouthparts; wings held vertically at rest, hind pair much reduced; intercalary veins and many crossveins present; abdomen with long cerci, and with or without a medial caudal filament; larvae (nymphs) aquatic, campodeiform (elongated and flattened) with tracheal gills of varied form; true adult preceded by a subimago (winged instar).*

-taken from the Encyclopaedia Britannica, volume 21, p. 597.

An interview with Grunt the Bridge Troll

by David Adams

I recently had a chance to interview Grunt - an eight foot high, 500 pound (ie. average sized) bridge troll. I was concerned with the survival of his species in the modern world, and what follows is a transcript of our meeting:

David Adams: Greetings, Mr. Grunt. It certainly is a pleasure to be speaking with you this evening.

Grunt: Me no "MISTER" Grunt. (Points a large callused thumb in his own direction) Me Grunt.

D A: Well... yes, of course. You are Grunt, I am...

G: DINNER. Me tired of this babble. Ask question NOW!

D A: Ok... Is it true that your native habitats are shrinking under constant human pressure?

G: WHAT?

D A:(patiently) Are there too many people out there for trolls to survive?

G: No. Troll LOVE human. Your question make me hungry.

D A: Oh. But are humans crowding you out?

G: No! No!..... YES! Not enough bridges.

D A: Do you mean to say that it's the lack of bridges to live under, and not the overabundance of humans, which is a threat to troll survival?

G: Yes.... Yes. YES!

D A: So do you feel that humans should build more bridges?

G: No need. Troll build bridge.

D A: Oh really?

G: Yes. Is necessary. Troll build nice bridge. Human like nice troll bridge.

Human go on bridge. Troll have good dinner for wife and kids.

D A: Well, in theory, that all works out quite nice, but, pray tell, just how would the trolls go about learning to build such "nice" bridges?

G: Easy. Troll go to University. Troll learn there. Troll look like weeeird human. Troll blend in.

D A: How do trolls manage in University?

G: If troll not hungry, if troll not bored, if troll no see lady troll, troll go to class, troll go to lab, troll do homework. Dumb troll become smart troll.

(And there you have it. Trolls attend University to learn the art of bridge-making in order to build homes for their own besieged kind. Just one question remained in my mind: How exactly do trolls disguise themselves as students (even weird ones)? I asked Grunt this question and got the following response:)

G:Troll drink lots beer. Troll attend geerfest. Troll become engineering student. Why you ask?

D A: Oh, just curious.

Yes, this IS the diatribes page.

If you wish to publish a diatribe,
write it up and submit it to:

Maciek Smuga-Otto,

Editor, Normal Vector.