

4-1-2021

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Olga Kosheleva

The University of Texas at El Paso, olgak@utep.edu

Vladik Kreinovich

The University of Texas at El Paso, vladik@utep.edu

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Technical Report: UTEP-CS-21-37

Recommended Citation

Kosheleva, Olga and Kreinovich, Vladik, "Lev Landau's Marital Advice Explained" (2021). *Departmental Technical Reports (CS)*. 1570.

https://scholarworks.utep.edu/cs_techrep/1570

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Lev Landau's Marital Advice Explained

Olga Kosheleva and Vladik Kreinovich

Abstract Nobelist physicist Lev Landau was known for applying mathematical and physical reasoning to human relations. His advices may have been somewhat controversial, but they were usually well motivated. However, there was one advice for which no explanation remains – that a person should not marry his/her first and second true loves, and only start thinking about marriage starting with the third true love. In this paper, we provide a possible Landau-style motivation for this advice.

1 Formulation of the Problem

Who was Lev Landau. Lev Landau was a Nobelist physicist.

In addition to his physics discoveries – and to a popular physics textbook he co-authored [3] – he was also well known for applying reasoning from mathematics and physics to human relations.

Sometimes, his advice made perfect sense. In some cases, Landau's advice about human relations made perfect sense – and if the audience did not understand the reason for this advice, he was always ready to provide reasonably convincing explanations.

For example, he claimed that there is an optimal distance at which a beautiful woman's face is the most beautiful. A similar statement about enjoying paintings is a known fact – for each painting, there is usually an optimal distance at which this painting looks the best. Because of this phenomenon, in an art museum, true connoisseurs follow a strange-looking trajectory: e.g., staying closer to smaller paint-

Olga Kosheleva

Department of Teacher Education, University of Texas at El Paso, 500 W. University
El Paso, TX 79968, USA, e-mail: olgak@utep.edu

Vladik Kreinovich

Department of Computer Science, University of Texas at El Paso, 500 W. University
El Paso, TX 79968, USA, e-mail: vladik@utep.edu

ings while moving further away when a painting is larger, staying further away from impressionist painting but closer to realistic ones, etc.

However, for women's faces, the same conclusion sounded unusual. Landau's explanation for this advice was very simple:

- when you too far away, you cannot see anything but a blur, and
- when you are too close, you only see one feature and not the whole face, and thus, you cannot appreciate the full beauty.

Thus, there must be a distance at which the beauty is the most visible.

Strange marital advice. While most of Landau's non-physics advices were explained – usually, by Landau himself – one of Landau's advices remains unexplained. The advice was very straightforward – although shocking at the time when the usual advice was marrying your true love and live happily ever after. The advice was *not* to marry your first true love, and *not* to marry your second true love, and only start considering marriage starting with the third true love; see, e.g., [7].

A possible reason why this advice remains unexplained is that he gave this advice to his teenage niece. She was so shocked by this advice that she did not even ask for the reason. As she writes in her memoirs, she even pretended to experience her first true love with some imaginary person, so that her uncle would be happy that she followed his advice.

What is the reason for this advice? Knowing Landau, he was a very rational person: whatever he said was usually well justified. So this unusual marital advice puzzled us for some time.

Now we finally came up with a reasonable explanation, an explanation that we are describing in this paper.

2 Our Explanation

Main idea. Every person has some criteria – formal or informal – for selecting a spouse. The person wants to select someone who is the best according to this criterion. This sounds straightforward, but the problem is that to really understand the person, to check compatibility, one needs to get close to this person, spend some time with him/her. It is usually not possible to try it with several people at the same time, but if you spend some time with one person, and then decide to try someone else – that first person whom you ditched will be, in general, reluctant to re-start the relation.

So, we encounter a known problem known as a secretary problem, or as a fussy princess problem; see, e.g., [2, 4, 8]. Let us describe this problem in its princess form.

Fuzzy princess problem: formulation. Suppose that n princes seek the hand of a beautiful princess. They come to her and propose one by one. She needs to select the best prince to marry.

In the ideal-for-the-princess world, she would consider all of them, and then select the one that she likes the best (or, if she is a patriotic princess, the one that will bring the most beneficial alliance to her country). But the problem is that once a prince makes a proposal, he expects an immediate (or almost immediate) answer. If this answer is No, the prince's pride does not allow him to come back if the princess changes her mind.

Provided that the princes arrive in random order, what is the best strategy for the princess that will, on average, leads to the best possible choice?

Fuzzy princess problem: solution. The solution to this problem is known, and it is somewhat non-intuitive: for reasonably large values n (and actually already for moderate values n), the best strategy is:

- to say No to the first n/e suitors, and then
- to select the first one who is better than the first n/e candidates (and if none is better, and if there is a need for a princess to marry, marry the last one).

Conclusion for Landau's advice. From this viewpoint, if we know how many true loves a person will encounter in her (or his) life, then a reasonable idea is indeed:

- to just enjoy the first n/e true loves (without thinking of marriage) and
- to only start considering marriage after that.

But how can we know this number n ?

Where do we get the number n . A princess may select one of the hundred princes whom she meets for the first time, this is how princesses do it in fairy tales.

For example, she may be motivated by the desire to bring a good alliance to her country. After all, at some point, the notorious Russian tsar Ivan the Terrible made a marriage proposal to none else but the great British Queen Elizabeth – not because he was in love with her (they never met, and I am not sure if even ever saw a picture of her), but because he believed – and there was some reason for that – that by combining their empires, they could easily defeat their enemies; see, e.g., [1].

With us common folks, the situation is different. We want a spouse that will be an important part of our lives, we do not usually want to marry an unknown stranger. So, in contrast to the princess, we only want to marry someone whom we know very well. And how many people can we know well?

In psychology, there is a known “several plus minus two” law, according to which a person can only simultaneously be seriously thinking about several plus minus two objects, i.e., between five and nine, on average seven (how many is different for different individuals); see, e.g., [5, 6].

Realistically, when you have been close to a person for some time, when he or she was your true love, the memories of that person stays in your heart forever. So, during the lifetime, we can only have seven plus minus two true loves – on average, seven. In other words, $n = 7 \pm 2$.

This explains Landau's marital advice. For $n = 7$, the value n/e is between 2 and 3. Moreover, if we dismiss the rarer extreme cases $n = 5$ and $n = 9$, for all three intermediate values $n = 6$, $n = 7$, and $n = 8$, the ratio n/e is between 2 and 3.

For all these values n , the advice to start thinking of marriage only after n/e true loves means indeed to start thinking about marriage only starting with the third true love. (And actually, the value $n = 9$ for which n/e is between 3 and 4 also kinds of fits into the same advice, since here also we skip the first two true loves – the only difference is that for $n = 9$, we skip the third true love as well.)

So, we have indeed explained Landau’s advice.

Acknowledgments

This work was supported in part by the National Science Foundation grants 1623190 (A Model of Change for Preparing a New Generation for Professional Practice in Computer Science), and HRD-1834620 and HRD-2034030 (CAHSI Includes).

It was also supported by the program of the development of the Scientific-Educational Mathematical Center of Volga Federal District No. 075-02-2020-1478.

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