

A Valentine's Day bouquet for *Temperature* readers: pleasing with prizes, searching for the right words, and keeping things mysterious

Andrej A Romanovsky*

Systemic Inflammation Laboratory (FeverLab); Trauma Research, St. Joseph's Hospital and Medical Center; Phoenix, AZ USA

This editorial tells its readers that the journal *Temperature* awards its first prizes for best papers to Boris Kingma and Assaf Yacobi. It also discusses the use of several thermoregulation-related terms and expressions, including “cold temperature,” “thermoneutral temperature,” and “warm-sensitive” and offers, arguably, better alternatives. The editorial also contains a new puzzle: how can color affect temperature perception?

Valentine's Day

While this issue was in production, people in many countries celebrated St. Valentine's Day on February 14. They sent flowers, candy, and cards (little “valentines”) to their loved ones. In Japan, women presented chocolate to men on that day, but men reciprocated with their gifts (of lingerie and jewelry) on White Day,

Keywords: awards for best papers, color, scientific publishing, thermal biology, thermal illusions, thermal medicine, thermal perception, thermoneutral zone, thermoregulation, warmth sensitivity

Abbreviations: PPTR, physiology and pharmacology of temperature regulation.

*Correspondence to: Andrej A Romanovsky; Email: andrej.romanovsky@dignityhealth.org
URLs: <http://www.TheBarrow.org/FeverLab>; <http://www.feverlab.net/>

Submitted: 02/02/2015

Accepted: 02/02/2015

<http://dx.doi.org/10.1080/23328940.2015.1017089>

This is an Open Access article distributed under the terms of the Creative Commons Attribution-Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited. The moral rights of the named author(s) have been asserted.

March 14. The South Koreans, a romantic bunch, celebrated both Valentine's Day and White Day. In fact, they celebrate the 14th of every month as some sort of a love-related day: Rose Day (May 14), Kiss Day (June 14), Hug Day (December 14)... They even have Wine Day (October 14)! I guess wine can also be a symbol of love, especially if all other love symbols have been exhausted by monthly celebrations.

The Slovenians, the hosts of the next Physiology and Pharmacology of Temperature Regulation (PPTR) Meeting, which will take place in Ljubljana on December 5–9, 2016, are not far behind the South Koreans. They celebrate Valentine's Day on February 14, which is a relatively recent development. They also celebrate St. Gregory's Day, the traditional day of love, on March 12. Do they have Wine Day? Of course they do: Day of St. Vincent, the patron of winegrowers, is celebrated on January 22, usually in vineyards. Slovenian calendars also list June 13 as Day of Saint Anthony, who is more widely known in Portuguese- and Spanish-speaking countries as the patron of marriage. Love cannot have too many patrons! Even the names of the city where the meeting will take place, Ljubljana, and of the river that penetrates the city, Ljubljanica, are likely derived from the root *lyub-* (love).¹ One of the relatively new walking bridges over Ljubljana is becoming an attraction for lovers from all over Europe. In a gesture that symbolizes eternal love, couples place padlocks on the steel wires of the bridge to “lock” in their choice of each other (Fig. 1).

The South Africans, the hosts of the 2014 PPTR meeting (see a report by the meeting organizers in the current issue²), celebrate Valentine's Day on February 14. I have heard that South African girls follow a tradition rooted in the ancient Roman festival of Lupercalia: a girl pins the name of the boy she is interested in to her sleeve on this day.

The Brazilians, hosts of the 2012 PPTR meeting, celebrate their Dia de São Valentim, or Día dos Namorados (Day of the Lovers), on June 12, one day before the Day of Saint Anthony. There is a joke that the Brazilians do not celebrate Valentine's Day in February because this would be too close to the famous Carnival, a love fest of its own!

Dear *Temperature* reader, whichever country you are from, please accept this editorial as my valentine to you.

Awards for Best Papers: First Winners

I am happy to share with you the exciting news: *Temperature* announces the winners of its first award, the Young Investigator Award for the Best Paper on Thermal Physiology in a Changing Thermal World, and the associated monetary prizes. The best papers were selected by the Organizing Committee of the 5th International Symposium on the Physiology and Pharmacology of Temperature Regulation (Skukuza, Kruger National Park, South Africa, September 7–12, 2014). The committee was looking for articles that satisfied two criteria. First, the first author had to be a student or postdoctoral fellow (or hold a similar position, as determined by the committee). Second, the best articles were expected to have the potential of impacting the field of thermal biosciences. The committee has selected two scientists.

The runner-up of this competition is Assaf Yacobi (presently at Geha Medical Center, Petach Tikva, Israel; Fig. 2), the first author of the article entitled “The protective effect of heat acclimation from hypoxic damage in the brain involves changes in the expression of glutamate receptors.”³ Michal Horowitz (The Hebrew University, Jerusalem, Israel), the

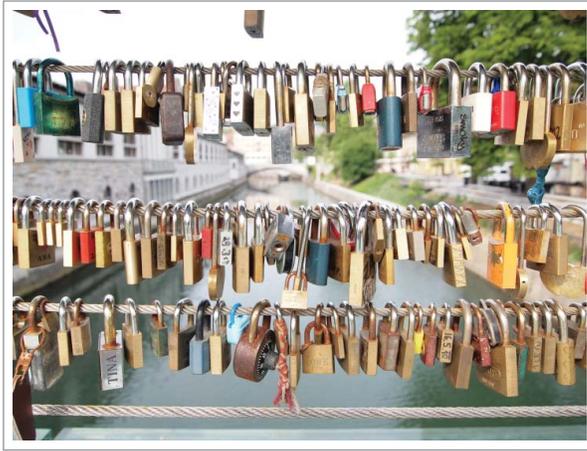


Figure 1. Ljubljana. Lovers' padlocks over Ljubljana. Photo courtesy of Tiia Monto (Kilmalukko), Wikimedia Commons.

senior author on this study, summarizes this work as follows: "Our study demonstrates that long-term heat acclimation confers hypoxia tolerance (cross-tolerance). We investigated the kinetics of glutamate-gated ion channels in the frontal cortex and hippocampus. These channels were found to undergo extensive changes during heat acclimation, both at the mRNA level and the protein level, implying that transcriptional and posttranslational processes, potentially leading to

decreased channel calcium permeability, contribute to the cross-tolerance mechanism." An editorial comment, written by Brett Ely, Vienna Brunt, and Chris Minson (University of Oregon, Eugene), can be found in this issue.⁴ The findings reported by Yacobi et al.³ have been also discussed in a recent review by Ely et al.⁵ on the mechanisms of heat acclimation and cross tolerance to hypoxia.

Assaf Yacobi studied medicine at The Hebrew University, Jerusalem. While



Figure 2. Assaf Yacobi, the runner-up (second-prize winner) of the competition for the *Temperature* Young Investigator Award for the Best Paper on Thermal Physiology in a Changing Thermal World. Photo courtesy of Assaf Yacobi.

obtaining his Doctor of Medicine degree, he simultaneously completed a Master's degree program working in the Michal Horowitz laboratory. He is now specializing in pediatric psychiatry. Although his current research is mostly clinical and focuses on the suicidal ideation and behaviors among adolescents, he hopes to be able to use neurophysiological methods in his psychiatric studies in the future.

And the winner is ...Boris Kingma, Eindhoven University of Technology and Maastricht University Medical Center, The Netherlands (Fig. 3). He is the first author of the article entitled "Beyond the classic thermoneutral zone: Including thermal comfort."⁶ This article struck the hearts of the jurors and journal editors with the fervor of Cupid's gold-tipped arrow. The editors invited a comment on this work.⁷

The winning study does exactly what it says it does in its title: it accounts for thermal comfort while determining the thermoneutral zone. The relationship between the zone of thermal comfort and the zone in "which temperature regulation is achieved only by control of sensible heat loss" (the current definition of the thermoneutral zone⁸) is not trivial. For example, a myth existed in thermal biology for a long time proclaiming that rats were different from other mammals in that they allegedly preferred subneutral temperatures.⁹ This myth was likely based on some early studies where rats were not adapted to the thermogradient setups in which they were studied (for discussion, see Almeida et al.¹⁰). The reported high motor activity of rats in the thermogradients used (exploratory behavior)⁸ resulted in the additional production of heat, which the animals dissipated by preferring lower temperatures. More recently, it has been shown that rats that are well-adapted to experimental conditions prefer neutral temperatures.¹⁰

Another example of an interesting relationship between preferred and neutral temperatures can be found in the recent study by Schlader et al.¹¹ conducted in volunteers. The participants were instructed to "shuttle" from a hot chamber to a cold chamber when they felt "too warm," and in the opposite direction when they felt "too cool." The authors found



Figure 3. Boris Kingma, the first-prize winner of the competition for the *Temperature* Young Investigator Award for the Best Paper on Thermal Physiology in a Changing Thermal World. In the photo, Boris is at the Skukuza Golf Club (Kruger National Park), while attending the 2014 PPTR meeting. The brown objects in the water are actually hippos. “Golf among the hippos” is mentioned in the report on the meeting by Tanya Swanepoel and Anna Haw² in the current issue. Photo courtesy of Boris Kingma.

that thermal shuttling in either direction was triggered not before, but rather shortly after, the appropriate autonomic response (i.e., sweating or shivering). The authors concluded that whereas some perspiring and light tremor may be appropriate on Valentine’s Day, profuse sweating is a no-no. Well, let me revise the last statement: in the authors’ opinion, these data show that the zone of thermal comfort is wider than the traditional thermoneutral zone. This point of view is further explained by Schlader in a recent article in *Temperature*.¹² Personally, I would offer a more cautious interpretation. I would think that behavioral responses, generally, tend to occur before autonomic responses, but that particular conditions of each experiment (e.g., skin temperatures, the mode of cooling or heating, etc.) would slightly move (in either direction) the exact point at which the effector response of interest (whether autonomic or behavioral) is triggered. Interestingly, the two interpretations (Schlader’s and mine) can be tested using both the Kingma et al.⁶ and Schlader et al.¹¹ methodological approaches. I hope both groups will continue their insightful studies.

The senior author on the Kingma et al. study, Wouter van Marken Lichtenbelt, writes about Boris’ work: “This is a good example of what Boris is doing – bringing

the field of thermal physiology further by synergistically combining experiments with mathematical modeling. Boris has a background in artificial intelligence and a passion for physiology. He believes that the full array of temperature regulation effectors (i.e., both autonomic responses and behaviors) has to be taken into account in order to understand the full picture.” In the future, Boris Kingma plans to decipher biological drivers of thermal behaviors. This knowledge can be applied to a wide variety of contexts, e.g., in architecture (to better predict energy consumption of buildings and homes) or in animal ethology (to explain various behavioral patterns).

Temperature congratulates Boris Kingma and Assaf Yacobi and wishes them productive and exciting scientific careers. The authors definitely deserve some warm words.

Warm Words

While writing about the thermoneutral zone, I consulted a few papers on this subject. I noticed a few common expressions that, personally, I did not fancy: “warm temperature,” “cold temperature,” and even “thermoneutral temperature!” I suspect that Cupid shot me with an arrow

with a blunt tip of lead on behalf of each of these expressions! (In contrast to a person wounded by Cupid’s sharp golden arrow, who becomes filled with uncontrollable desire, a person struck by lead feels aversion.) Clearly, “cold” means “having a low temperature,” so “cold temperature” means “having-a-low-temperature temperature.” Similarly, “thermoneutral” means “thermally neutral,” or “temperature-wise neutral,” which equates the phrase “thermoneutral temperature” to the monstrous “temperature-wise neutral temperature?”

A friend of mine, who is a prolific writer and uses such expressions left and right, was fortunate enough to be taken by his Valentine to a balloon ride in Sedona, Arizona, on Valentine’s Day last year; how romantic! This is how he described his experience to me: “At high heights, I myself started to begin feeling a feeling of cold temperature and a northern windy wind from the north. . .” While typing his words, I looked away from the computer for a moment, and my eyes caught the TV screen in the living room. A weatherman – jellied hair and a pink tie – started announcing the forecast for the next week. I could not believe my ears – he was predicting “cold temperatures,” “very cold temperatures!” Oh well, at least he smiled and winked at me while pronouncing his prophecy. If you do not want to sound like my friend on the balloon or like the winking weatherman, here is a table that summarizes my concerns with several popular terms (Table 1).

Two of the terms, “hot-sensitive” and “warm-sensitive,” deserve special attention on Valentine’s Day: everyone must be both warm and sensitive on this occasion, and hot too! You do not have to follow this rule in only one case – if you have just received from your local Supreme Blah-Blah-Blah Science and Research Commission comments from their reviewer and a decision letter on your latest grant application. If this is the case, please try to be as cool and insensitive as you can. No, do not say any of the words you have been screaming for the last half an hour, while jumping back-and-forth across your office – your eyeballs swirling violently, lightning flashing from your red pupils, white fists flying through the charged air. . .

Table 1. Common expressions in the thermoregulation literature that one may consider avoiding

#	Common expression to avoid	Intended meaning(s)	Suggested alternative(s)
1	• Hot (or warm) temperature	• High temperature (of an object)	• High temperature • Hot (or warm) object
2	• Cold (or cool) temperature	• Low temperature (of an object)	• Low temperature • Cold (or cool) object
3	• Thermoneutral temperature	• (Ambient) temperature within the thermoneutral zone	• Neutral temperature • Thermoneutral environment
4	• Warm-sensitive*	• Sensitive to warmth	• Warmth-sensitive
5	• Hot-sensitive*	• Sensitive to heat • Sensitive to warmth	• Heat-sensitive • Warmth-sensitive

*Similar expressions include “warm (hot) sensitivity,” “warm (hot) sensor,” “warm (hot) receptor,” “warm (hot) reception” (I like this one), “warm (hot) seeking” (as in “warm (hot)-seeking behavior”), and other. In all these case, one might consider using “warmth” or “heat” instead of “warm” or “hot.”

And, seriously, no reviewer deserves this particular execution procedure that you have been swearing to deliver upon him!

He is some local doc who treats diseases of the tail. Yes, of the tail. When he was young, he was obsessed with wings, but Cupids and Muses never wanted to be touched by his hairy fingers. So his interests started migrating caudally along the body axis, until one day he became a tail doctor. He then further specialized in diseases of the tail base... He is tired and bored with life. He has an allergy to latex. He has to wear gloves every day, for the entire day, to perform his examinations... His eyes always itch, but, for obvious reasons, he hesitates touching them with his gloves during his procedures. So he cries a lot and – whenever possible – rubs his face over the backs of his assistants . . .

He is a good father and an exemplary citizen, and as for his involvement with your grant, he did not mean any harm. He tried to read it; he fell asleep. Well, he is sure that everyone would fall asleep while attempting to read a grant application, and he is probably right. He made, nevertheless, some clever comments in the report card, like that other organs should be studied too – not just the brain. “Why did the principal investigator propose to study the brain but ignored all the important organs at the opposite end of the body?” he asked.

He agreed to review grants for the Supreme Blah-Blah-Blah Commission because maybe – just maybe – he may himself become the Commissioner one day, who knows? Then he would not even need to wear gloves, and he could scratch his eyes whenever it would please him!

And he would certainly not need to daily examine so many. . . Anyhow, he will continue his service and will review your grant application next year. Be assured the Blah-Blah-Blah Commission will distribute research money efficiently!

Isn’t the peer-review system wonderful? Well, some scientists think that, even at its best implementation (the National Institutes of Health and National Science Foundation in the US), peer-review-based dispersal of funding is not efficient. Alternative systems have been proposed, e.g., a distributed funding system in which any scientist’s funding is determined by all other scientists (no proposals are required) in a way similar to how a webpage receives its Google PageRank.¹³ Do you have ideas on changing research funding (or the world in general)? *Temperature* welcomes outside editorials.

But forget about funding systems and your unfortunate and unfunded grant application palpated by the hairy hands of the tail twister! Just calm down, and let’s talk about physiological terms.

Would you prefer “noise-sensitive” or “noisy-sensitive?” “Touch-sensitive” or “touchy-sensitive?” “Acid-sensitive” or “acidic-sensitive?” Unless you like the “acidic-sensitive” (which may be a good description of the recent divorcee’s personality from your favorite sitcom show), you probably should not use “warm-sensitive” or “hot-sensitive.” You may want to consider breaking the tradition and starting using “warmth-sensitive” and “heat-sensitive.” A tradition is something that any nonsense can grow into after being repeated a sufficient number of times. “Tradition: one of those words

conservative people use as a shortcut to thinking” (Warren Ellis). And, of course, the “less there is to justify a traditional custom, the harder it is to get rid of it” (Mark Twain).

The question arises of course as to where exactly to draw the line. Should we try to use only those terms that make perfect sense? How many will we be left with? Should we also not use the term “thermoregulation?” “Thermo-” stands for “thermal,” attributable to heat or temperature. Hence, thermoregulation is the regulation attributable to heat or temperature, regulation by temperature, temperature dependence. What we call “thermoregulation” is certainly more “temperature regulation” (regulation of temperature) than “thermal regulation” (regulation by temperature). Which illogical and imperfect terms should be allowed to stay, and which should go? I do not have an answer to this question – you will have to find your own, unique solution for every term you use. To be objective, the Commission for Thermal Physiology of the International Union of Physiological Sciences has preserved the term “warm receptor” by transplanting it from the 1987 edition¹⁴ to the 2001 edition of terms for thermal physiology.⁸ But it is also true that several editors and publishers, including highly regarded ones, allowed my coauthors and me to use the term “warmth-sensitive” and other similarly constructed terms (see, e.g., reference 15).

Almost forgot, here is the end of my friend’s story about his balloon ride: “I myself imagined an imagination of falling a fall from the high height and also, in

addition, hitting a hit over upon the earthy ground. I myself realized the realization that my lower low-back behind of mine is very much painful-sensitive!" Perhaps my friend should pay a visit to the Blah-Blah-Blah Commission grant reviewer – to check if the enhanced "painful sensitivity" at the base of his tail could be relieved. . .

Dear reader, you are not listening to me. Please stop thinking about your grant application! This unproductive activity makes your face really red!

Red 'n Blue: A New Puzzle is Due!

Which color can be a better match to the wonderful soap opera of Valentine's Day than full-blooded red – bold in its passion and uncompromising in its devotion? Dear reader, **figure 4** is my Valentine card to you. Well, I will not post the figure – just imagine it! It shows all most powerful symbols: the loving red heart (a symbol of love), the fragrant red rose (a symbol of love), and the red flag (a symbol of the eventual victory of the proletariat over the dark forces of imperialism)! Good things come in red packages. Red. . . How does it make you feel?

In our daily lives, information concerning temperature is often provided by means of color cues, with red typically being associated with a higher temperature, and blue with a lower. Just think about the colors used on the hot and cold taps of a bathroom water faucet or about the warm and cold tones in painting or interior design. This "red = warm, blue = cold" prevailing color-temperature correspondence has been shown to bias people's perception of environmental temperature – red or blue room lighting can make a person feel warmer or cooler. However, when it comes to touch, the effect of color on temperature perception is not as straight-forward. In fact, blue objects feel warmer to the touch than red ones of the same temperature! Furthermore, when the hand in contact with an object is colored red or blue (rather than the object being colored red or blue), the effect is reversed, with red hands making objects feel warmer. How would you explain these

two phenomena observed? And, yes, you are correct, dear reader: this is our new puzzle. It was written by Hsin-Ni Ho, Nippon Telegraph and Telephone Corporation, based on her recent paper.¹⁶ (No, she did not telegraph the puzzle to me – just e-mailed it.)

This is the third puzzle published by *Temperature*. The first one was about rats placed on a low-protein diet: they died when experiments were performed at thermoneutrality, but all rats survived when they were placed in the cold.^{17–19} The second, most recent, puzzle dealt with the so-called Mpemba paradox: why does warm water freeze faster?²⁰ This puzzle received two answers: a letter from Marek Balážovič and Boris Tomášik²¹ and a discovery article by Chang Quing Sun.²² It is further discussed in my reply²³ to Balážovič and Tomášik. All three pieces mentioned are published in the current issue.

As with the previous puzzles, *Temperature* looks forward to receiving your answers and publishing the winning explanation. The format of any front-matter article can be used to report the answer. A letter to the editor seems to work well.^{18,21} This also could be a good task for students in the thermoregulation class you are teaching now.

You Want It Hotter?

After reading the articles with racy titles, such as "Saturday night fever. . ." ²⁴ and "Clubbing with ecstasy," ²⁵ in the previous issue of *Temperature*, you may be disappointed, dear reader, with this editorial. I did make a promising introduction about Valentine's Day, but then I soon deviated into lengthy (and sometimes technical) discussions – boring! The whole piece is – how to put it more politely? – anything-but-exciting. Even when the festival of Lupercalia is mentioned, the only tradition touched upon is the innocent one of pinning a name to a sleeve. Was that the essence of the festival? Ha-ha! Well, we need something really spicy and hot, something like million-Scoville-heat-units-hot! Very well, *Temperature* will deliver on the hotness and spiciness, I

promise – just wait until the next issue. Meanwhile, let the Valentine fever be infectious! And remember, you do not need to wait for the next February 14 to celebrate love!

Disclosure of Potential Conflicts of Interest

The author serves as *Temperature* Editor-in-Chief. The abovementioned monetary prizes were established at his initiative, but he did not have a say in the selection of winners of these prizes.

References

1. Pronk T. *Folia Onomastica Croatica* 2007; 16:185–91.
2. Swanepoel T, et al. *Temperature* 2015; 2:54–8; <http://dx.doi.org/10.1080/23328940.2014.995570>
3. Yacobi A. *Temperature* 2014; 1:57–65; <http://dx.doi.org/10.4161/temp.29719>
4. Ely BR, et al. *Temperature* 2015; 2:51–2; <http://dx.doi.org/10.4161/23328940.2014.992657>
5. Ely RR, et al. *Temperature* 2014; 1:107–14; <http://dx.doi.org/10.4161/temp.29800>
6. Kingma BRM, et al. *Temperature* 2014; 1:142–9; <http://dx.doi.org/10.4161/temp.29702>
7. Schlader ZJ. *Temperature* 2015; 2:47–8; <http://dx.doi.org/10.4161/23328940.2014.983010>
8. IUPS Thermal Commission. *Jpn J Physiol* 2001; 51:245–80.
9. Gordon CJ. *Am J Physiol* 1988; 254: R229–34; PMID:3344833
10. Almeida MC, et al. *Eur J Neurosci* 2006; 23: 3359–67; PMID:16820025; <http://dx.doi.org/10.1111/j.1460-9568.2006.04854.x>
11. Schlader ZJ, et al. *Eur J Appl Physiol* 2013; 113:1291–301; PMID:23179204; <http://dx.doi.org/10.1007/s00421-012-2544-0>
12. Schlader ZJ. *Temperature* 2014; 1:20–1; <http://dx.doi.org/10.4161/temp.29235>
13. Bollen J, et al. *EMBO Rep* 2014; 15:131–2; PMID:24397931; <http://dx.doi.org/10.1002/embr.201438792>
14. IUPS Thermal Commission. *Pflugers Arch* 1987; 410:567–87; PMID:3324054; <http://dx.doi.org/10.1007/BF00586542>
15. Romanovsky AA, et al. *Pharmacol Rev* 2009; 61:228–61; PMID:19749171; <http://dx.doi.org/10.1124/pr.109.001263>
16. Ho HN, et al. *Sci Rep* 2014; 4:5527; PMID:24992559
17. Romanovsky AA. *Temperature* 2014; 1:1–5; <http://dx.doi.org/10.4161/temp.27666>
18. Maloney SK. *Temperature* 2014; 1:97–8; <http://dx.doi.org/10.4161/temp.28661>
19. Székely M, et al. *Temperature* 2014; 1:99–100; <http://dx.doi.org/10.4161/temp.29006>
20. Romanovsky AA. *Temperature* 2014; 1:71–5; <http://dx.doi.org/10.4161/temp.29600>
21. Balážovič M, et al. *Temperature* 2015; 2:61–2; <http://dx.doi.org/10.4161/23328940.2014.975576>
22. Sun CQ. *Temperature* 2015; 2:38–9; <http://dx.doi.org/10.4161/23328940.2014.974441>
23. Romanovsky AA. *Temperature* 2015; 2:17–21; <http://dx.doi.org/10.1080/23328940.2015.1017089>
24. Parrott AC, et al. *Temperature* 2014; 1:214–9; <http://dx.doi.org/10.4161/23328940.2014.977182>
25. Kiyatkin EA, et al. *Temperature* 2014; 1:160–1; <http://dx.doi.org/10.4161/23328940.2014.980137>