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Letter of Recommendation for
Dr Vesna Manojlovic

Dr Vesna Manojlović, has requested me to write a letter of reference on her behalf. I can do no better than include my earlier letter and, after that, augment a few additional remarks about my Balkan connection and Vesna's role in it.

Matti Vuorinen
Matti Vuorinen, Professor of Mathematics

2010-11-17

Letter of Recommendation for
Dr Vesna Manojlovic

TO WHOM IT MAY CONCERN*

Dr Vesna Manojlović, born December 26, 1974, has requested me to write a letter of reference on her behalf. She is presently employed as docent by the Faculty of Organizational Sciences at the University of Belgrade. It is a pleasure for me to fulfill this request, because I consider her a very talented mathematician as well as a culturally sophisticated and gifted person in many ways.

Background. I will first describe how I became acquainted with Vesna and how she became my PhD student. In December 2006 Prof M. Mateljević had invited me to give a series of lectures on my recent research at the University of Belgrade and introduced me to Vesna, who was attending my lectures and was at that time looking for a research topic for both Master's Thesis and PhD thesis, having completed her other studies. She asked me to be her mentor and supervisor. This looked like a very challenging situation both for the student and for the mentor and I was hesitant about what to do.

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After I had explained to Vesna what the obstacles in my opinion were and why it would be better for her to have a local supervisor from Belgrade rather than a remote supervisor from Finland, she replied that Prof Mateljević supports the arrangement and that she indeed wants me to supervise her. That being said, I eventually gave my consent. We agreed then about the plan for the work: weekly progress reports by email, deadlines etc. To my surprise Vesna managed to work according to our plans and write her MSc thesis very fast, in ca four months. Her PhD thesis was direct continuation from the MSc thesis and consisted of two parts: the second part was based on collaboration with her Belgrade colleagues and the first part was mainly supervised by me. The first part consisted of one paper by Vesna as the only author (paper A) and two joint papers with me and my student Riku Klén (papers B and C). (Vesna was my PhD student number 8 and Riku number 9.) Vesna's determination to work on the thesis project made an impression on me.

Main merits. Vesna's PhD thesis deals with harmonic maps and quasiconformal maps in the Euclidean n -space and it uses the quasihyperbolic metric as a tool. As far as I know, she is the first person in Serbia to study quasihyperbolic metric and conformal invariants, which both are important tools of modern geometric theory of mappings. In paper A she gave a survey of some well-known relations among conformal invariants, with many significant new results and observations—this was a fairly challenging task. In fact, this topic still offers numerous open problems for later studies. Paper B was joint work with me about a problem which was previously considered by Teichmüller in the plane case and by Anderson and Vamanamurthy in the space under a restrictive symmetry hypothesis. In paper B we were able to show that the symmetry hypothesis is not needed and the paper was accepted by Trans. Amer. Math. Soc. for publication. In paper C, with Klén also as coauthor, we were able obtain asymptotically sharp distortion results for the quasihyperbolic metric under K -quasiconformal maps when $K \rightarrow 1$. The paper is presently being processed by a journal. We spent some time polishing the asymptotic sharpness statements of the paper.

Vesna has also some work on harmonic mappings, with her Belgrade colleagues Profs Mateljević, Pavlović, Arsenović and with Dr V. Božin. With Prof Pavlović she has a short paper published in J. Math. Anal. Appl. Perhaps the best known paper is a short paper [D] that has been cited several times by the Finnish mathematician J. Riihenta. Part of this was done in the second part of the PhD thesis, and the most part after the PhD thesis. One of the papers written after PhD thesis is accepted by Potential analysis, a well-known journal and two published papers in Ann. Acad. Sci. Fenn.

Most of her career, Vesna has held various teaching positions, working occasionally at two different workplaces. After she was appointed to a docent

position in 2009, her teaching duties have included more responsibilities. She is a coauthor of a problem book and also a coauthor of a textbook. Prof Mateljević has also asked her to supervise some foreign PhD students in mathematics.

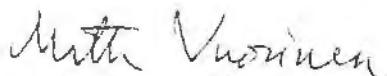
Conclusions. Vesna's main merits are many years experience in various teaching positions as well her scientific achievements during the past two years. I am not familiar with the details of her teaching activity so I will not say more on it. Instead I would like to point out that her scientific progress during the past two years has been remarkable and, given opportunity to concentrate on research only, I believe that she has the potential to become a very succesful researcher. Vesna's publication record shows that she has exceptionally good ability to collaborate with other mathematicians, which is very important in today's world.

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[B] V. MANOJLOVIĆ, M. VUORINEN: *Quasiconformal maps with identity boundary values*, Transactions of AMS, 363, 2467–2479, 2011.

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[D] V. KOJIĆ: *Quasi-nearly subharmonic functions and conformal mappings*, Filomat. 21/2, 243–249, 2007.



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MY BALKAN CONNECTION

It was in Kozubnik 1979, Poland and Arandjelovac 1984, former Yugoslavia, where I first met Prof. Miodrag Mateljević. For many years I did not hear from him until in ca 1999-2000 when he invited me to contribute a paper to a volume he was editing. This paper was published in 2004 [E]. Soon thereafter Prof. Mateljević invited me to give a series of lectures at the University of Belgrade which materialized in December 2006. Soon thereafter he came to Turku which lead to our joint paper [F], and also to the Romanian-Finnish Seminar in 2009. During one of the Turku visits, I introduced him to my good friends Prof. T. Sugawa, Tohoku University Japan and Prof. S. Ponnusamy, IIT-Madras, India, hoping thus to establish mutually fruitful connections between people from far-away countries working in nearby fields. Subsequently this lead to Prof. Mateljević' visits to these countries.

In December 2006 Prof. Mateljević invited me to be Vesna's supervisor first for the Master Thesis and later, as the Dean of the faculty, he officially nominated me to supervise also her PhD thesis—these events are described above.

After Vesna's maternity leave 2008-2009 she started her mathematical work again and we have met several times in Turku, Belgrade, and conferences abroad. She has introduced me to other Prof. Mateljević' former students: David Kalaj and Vladimir Božin. Most recently she acquainted me with Prof. Slavko Simić from SANU. The results of our collaboration appear in [G]-[L].

All this interaction has turned out to be very useful to me, and I dare to say, also to these Balkan area mathematicians. During the past thirty years my research network has grown and presently includes more than 50 coauthors from every corner of the world. Vesna's role was very crucial in getting this Balkan subdivision of my research network started and I am looking forward to continued collaboration with her and other Balkan colleagues.

I would say that this kind of international collaboration is an "added value" of the network in the best sense of the word, to use a fashionable expression. Persons like Vesna are extremely valuable for any network which seeks to further and maintain international collaboration.

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[G] B. A. BHAYO, V. BOŽIN, D. KALAJ, AND M. VUORINEN: *Norm inequalities for vector functions.* - J. Math. Anal. Appl. 380 (2011), 768–781.

[H] D. KALAJ AND M. VUORINEN: *On harmonic functions and Schwarz' lemma.* - Proc. Amer. Math. Soc. 140 (2012), 161–165.

[I] M. ARSENOVIĆ, V. MANOJLOVIĆ, AND M. VUORINEN: *Hölder Continuity of Harmonic Quasiconformal Mappings.* - J. Ineq. Appl. 2011, 2011:37

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[K] S. SIMIĆ AND M. VUORINEN: *On quotients and differences of hypergeometric functions.* J. Ineq. Appl. 2011:141 . 10pp.,

[L] S. SIMIĆ AND M. VUORINEN: *Landen inequalities for zero-balanced hypergeometric functions.* Manuscript, 9 pp., arXiv:1110.6619 math.CA

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