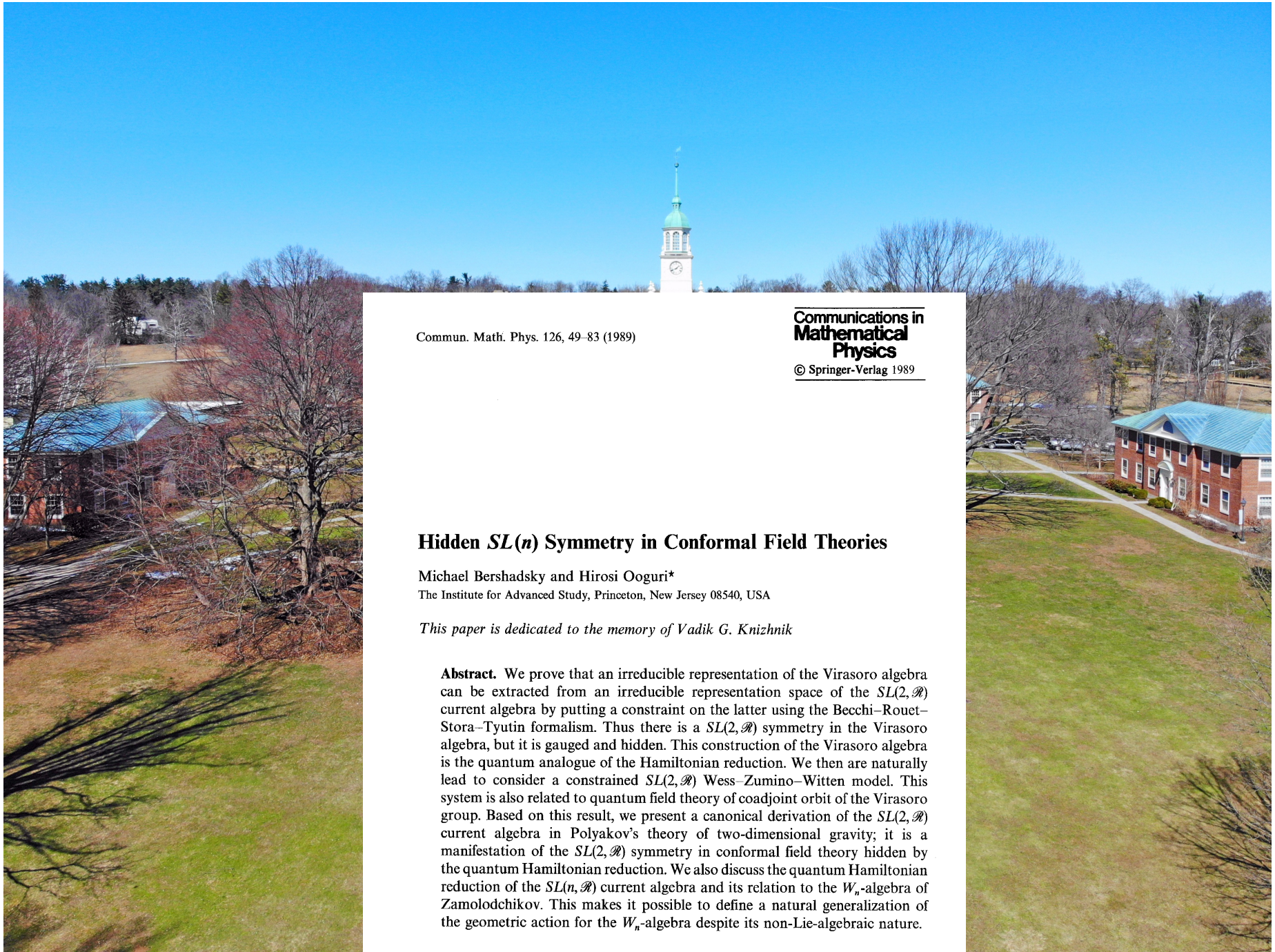
Some memories of my journey with Hirosi

It started at IAS in September 1988

Hirosi Fest@Caltech, 28/10/22



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Communications in Mathematical Physics

Hidden $SL(n)$ Symmetry in Conformal Field Theories

Michael Bershadsky and Hirosi Ooguri*

The Institute for Advanced Study, Princeton, New Jersey 08540, USA

This paper is dedicated to the memory of Vadik G. Knizhnik

Abstract. We prove that an irreducible representation of the Virasoro algebra can be extracted from an irreducible representation space of the $SL(2,\mathbb{R})$ current algebra by putting a constraint on the latter using the Becchi–Rouet–Stora–Tyutin formalism. Thus there is a $SL(2,\mathbb{R})$ symmetry in the Virasoro algebra, but it is gauged and hidden. This construction of the Virasoro algebra is the quantum analogue of the Hamiltonian reduction. We then are naturally lead to consider a constrained $SL(2,\mathbb{R})$ Wess–Zumino–Witten model. This system is also related to quantum field theory of coadjoint orbit of the Virasoro group. Based on this result, we present a canonical derivation of the $SL(2,\mathbb{R})$ current algebra in Polyakov's theory of two-dimensional gravity; it is a manifestation of the $SL(2,\mathbb{R})$ symmetry in conformal field theory hidden by the quantum Hamiltonian reduction. We also discuss the quantum Hamiltonian reduction of the $SL(n,\mathbb{R})$ current algebra and its relation to the W_n-algebra of Zamolodchikov. This makes it possible to define a natural generalization of the geometric action for the W_n-algebra despite its non-Lie-algebraic nature.

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CONFORMAL FIELD THEORY, TWO-DIMENSIONAL QUANTUM GRAVITY AND QUANTIZATION OF TEICHMÜLLER SPACE

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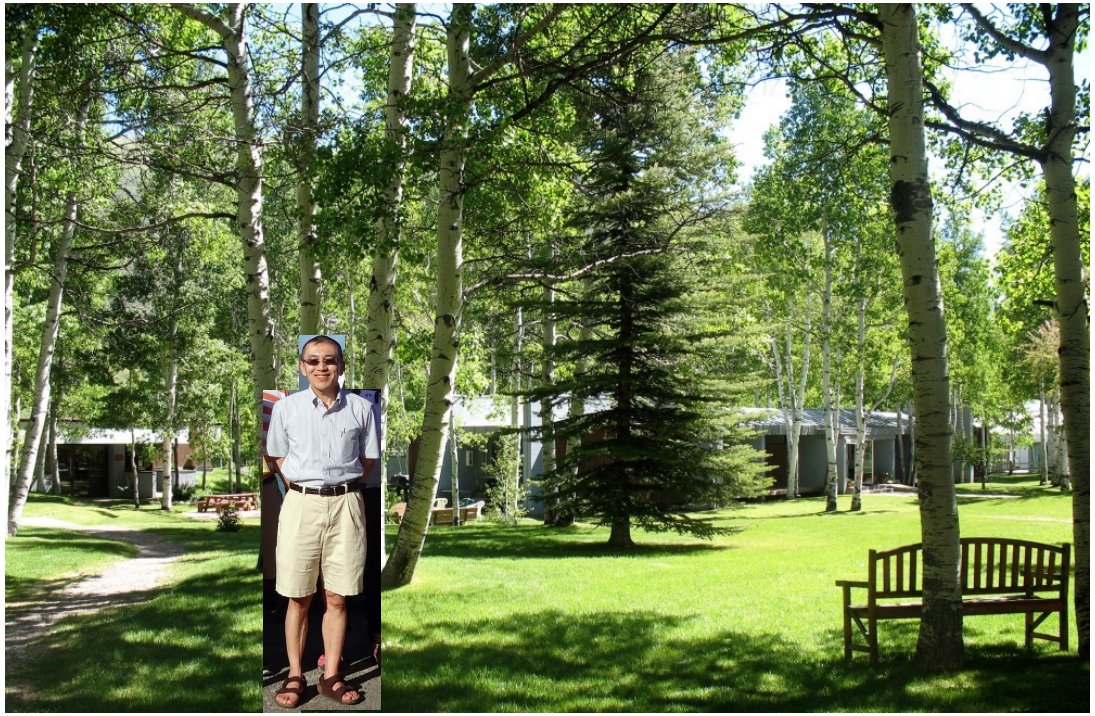
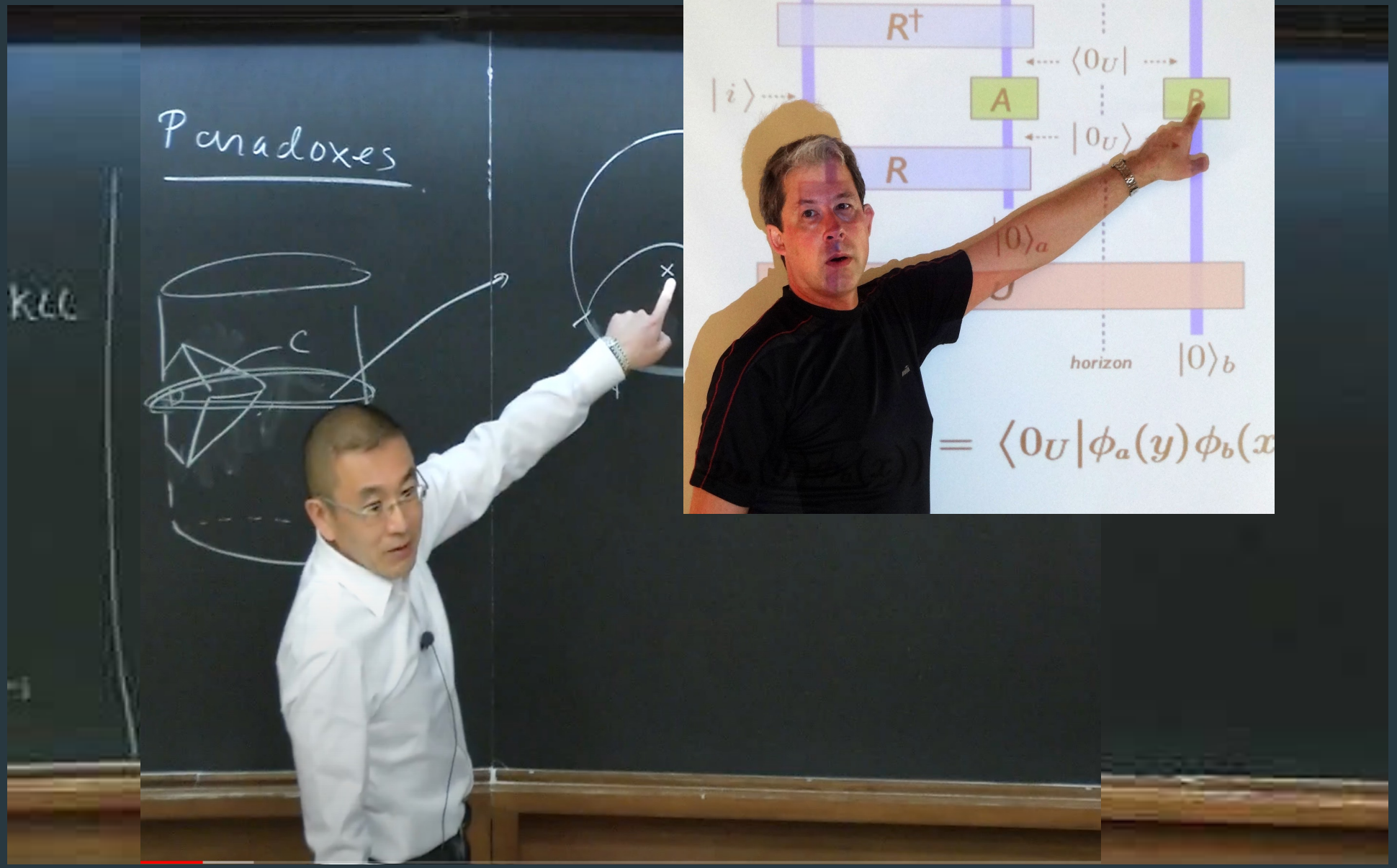
Received 26 September 1989

We formulate the geometric quantization of Teichmüller space by using its relation with $SL(2,\mathbb{R})$ Chern–Simons gauge theory and show that the physical state conditions arising in this formalism are equivalent to the Virasoro Ward identities satisfied by the conformal blocks in CFT. We further show that transition amplitudes between the physical states of this quantum system have a direct correspondence with covariant amplitudes of two-dimensional induced quantum gravity. Possible applications of these results to Virasoro modular geometry and $(2+1)$-dimensional quantum gravity are indicated.




Paradoxes
C
$_a\langle 0|$
$R^\dagger$
$\langle 0_U|$
$|i\rangle$
A
B
$|0_U\rangle$
R
$|0\rangle_a$
horizon
$|0\rangle_b$
$= \langle 0_U|\phi_a(y)\phi_b(x$