Genesis of a new research field and how I met Ulrich Heinz

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Ulrich's scientific career coincides with the genesis, expansion and maturing of a new branch of science: physics of hot and dense QCD. ~1975-

Many of us have been very fortunate in living through this period.

First a surprise: Young UH and gravity

UH + Greiner, A. Müller, B.Müller, Schmidt 1977-1980

$$\int d^4x\sqrt{-g}\left[\frac{1}{16\pi G}R - \beta\phi^2 R - \tfrac{1}{2}(\partial\phi)^2 - \tfrac{1}{2}\mu^2\phi^2\right] + S_{\text{matter}}$$

Can this scalar-tensor gravity prevent a star from collapsing to a BH? No!

Compare Higgs Inflation 2008- :

$$\int d^4x\sqrt{-g}\left[\frac{1}{16\pi G}R + \xi\phi^2 R - \tfrac{1}{2}(\partial\phi)^2 - \tfrac{1}{4}\lambda(\phi^2 - v^2)^2\right] + S_{\text{SM}}$$

Is Higgs the inflaton?

So Ulrich was well prepared to do cosmo or holography, but did not!

UH visited Helsinki 14.6. – 13.7.1986 – he was 30a and that was just 30a ago!

In my letter of 2 Dec 1985 to BNL authorities I wrote:

There are here several people who are interested in your work on color kinetic theory and I believe that a joint project on color kinetic approach to equilibration in ultra-relativistic heavy ion collisions could be started and even successfully completed while you are here.

Well, that was a bit optimistic!

But how did we get there?

Genesis of a research field

(from my narrow point of view)

Helmut organises ”Many dofs in particle theory”, Bielefeld, Aug 1976

After 15a of Regge poles, jet physics, I realise this and cosmology is what I will do

Helmut organises ”Stat mech of Qs and Hs”, Bielefeld, Aug 1980 QM80
(Baym, Hagedorn, Kapusta, Lee, Linde, Migdal, McLerran, Rafelski,...)

Larry visits Helsinki, Apr - Aug 1982 Eats Gyromitra esculenta

Helmut organises ”Quark Matter Formation and HIC, May 1982 QM82

Larry organises a Summer 83 meeting in Seattle. NSAC supports RHIC.
Interest explodes also in the US, QM83 in Brookhaven

QM84 in Helsinki

Enviable situation: a large number of relevant problems immediately apparent:

Do lattice Monte Carlo for SU(3) March 81, Work out dimuon emission from plasma March 81

Joe Kapusta Dec 81 Resummations of pert theory

Larry April-Aug 82- Hydrodynamics, $\partial_\mu T^{\mu\nu} = \Sigma^\nu$ Ehtamo-Lindfors-McLerran Jan 83 basically contains McL-V-model!

Autumn 82 I lectured on numerics of hydro, audience Raitio, Ruuskanen, Toimela, Montonen, Miettinen, Lindfors

QUARK GLUON PLASMA IN ULTRARELATIVISTIC NUCLEUS–NUCLEUS COLLISIONS

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Received 9 November 1982

The space–time region in which quark gluon plasma is likely to appear in ultrarelativistic nucleus–nucleus collisions, is explicitly calculated by numerically integrating relativistic hydrodynamic equations appropriate for the process.

Vesa Ruuskanen, 1940-2011

Professor in Jyväskylä 1974-2006 (Eskola 2006-)

Big hydro group ín Jyväskylä:
Ruuskanen, Eskola
Kataja 86-
Huovinen 96-
Räsänen 01-
Niemi 02-
Holopainen 11-

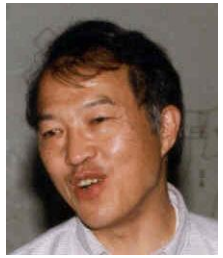
Lots of amply cited hydro work with Ulrich 2001- !

One fight Vesa had with Ulrich in ~ 1990, on p^- production out of chemical equilibrium. (I cannot find Vesa's letter to UH)

Further visits to Helsinki and topics:

Miklos Gyulassy May 83 — Deflagrations and detonations — Too bad transition is not 1st order!

Akio Hosoya April 84 — Shear and bulk viscosity in hot QCD — Classical kinetic theory



Rudy Hwa Aug 84 — Multiplicity and entropy — n ~ s

Tetsuo Matsui July 85 — Classical field model — No dynamical model for the field!

1986 was a period of transition:

E-mail arrives:

In my letter of 24 April 1986 from LBL I write to Ulrich at BNL:

My bitnet address is kajantie@finuhcb. Hopefully you get one soon, too!

Tex arrives:

The 1st equation I ever wrote with (plain) tex, Summer 86

Donald Knuth, TeXbook, 1983

$$k_i\{\ \}_{0i} = -(p_0 - q_0)[\alpha_p \alpha_q(\mathbf{q}^2 - \mathbf{p}^2)(1 + c^2)$$
$$- [\alpha_p \beta_q \mathbf{p}^2(1 - c^2) + (p \leftrightarrow q)]]$$

Ulrich's visit to Helsinki 14.6. – 13.7.1986

We (with Toimela) tried to compute damping of gluonic plasma waves:

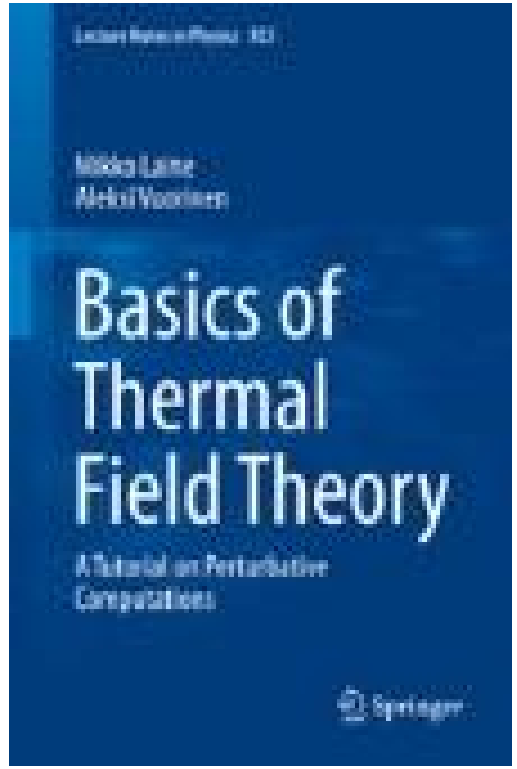
$$\gamma = a\,\frac{g^2 N_c T}{24\pi}$$

a = ? stable or unstable?

Became great specialists in computing gluon self energy in various gauges

Saw problems in the infrared – solved by Braaten-Pisarski in 1990
Need all terms of leading order in g for gauge inv of pole position

Nowadays the techniques required are in textbooks like this new one by Laine-Vuorinen (just out):



My visit from CERN to Ulrich@Regensburg in Oct 1992:

Minijets and Thermalisation in Nucleus Collisions*

Keijo Kajantie
Theory Division, CERN

Contents

*Lectures given at the Universität Erlangen–Regensburg Graduiertenkolleg, Oktober, 21th & 28th, 1992 ; Lecture notes prepared by G. Böhm and J. Sollfrank, Institut für Theoretische Physik, Universität Regensburg

Oct 1992 was a period of transition for Ulrich also on a personal level

Being ostensibly more experienced I offered words of advice, which were later proven correct:

Dear Keijo -

you were right!

Please give my regards to your two families

Ulrich

Euch mitteilen zu dürfen, daß wir ab 17. September 1994 unseren Lebensweg gemeinsam gehen.

Christiana Neidhart
5218 Vallecito Court
Carpinteria, California 93013

Ulrich Heinz
Schlüsselackerstraße 10
93161 Eilsbrunn

Ulrich acts very fast!

QCD matter pheno staff at CERN/TH (thanks to experimentalists!)

Big s physics was not always appreciated. ”Junk”

Hagedorn 1919 – 2003, at CERN from Oct 54

Satz 1989 – 1995

Kajantie 1995 – 1998

Heinz 1998 – 2000

Wiedemann 1999 – 2001 - …

Kurkela 2015-

SPS HI Exp 1989-2003

CERN/Heinz Feb 00: ”A new state of matter created at CERN”
Public statement before first RHIC data in June 00!

RHIC, LHC era

Since 2000 Ulrich is a valuable addition to the US community, but it is appropriate to celebrate his 60a at CERN!