A colloquial overture on two birthdays

Davide Fioravanti (INFN-BO, though not on my research activity:
THIS IS NOT A TALK)

Some calembours

Professional historians studied the beginning of the birthday/ anniversary celebration: ‘The invention of anniversary’ by J-C Schmidt, famous french historian: rather modern invention for which we need to wait for the 53 candles of Goethe’s birthday (1802). Complicated motivations: the importance of remembering.

Whose birthdays?

Nuclear Physics B241 (1984) 333–380

INFINITE CONFORMAL SYMMETRY IN TWO-DIMENSIONAL QUANTUM FIELD THEORY

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- Francesco made me notice that the seminal paper by BPZ on 2d CFTs, although publish in 1984, was actually granted release by the authors in November **1983**

- Already 40 years: *tempus fugit*, and this might generate a light feeling of sadness. Yet, fortunately there are many young generations which are also here around working on and interested in the topic. This made very happy yesterday!

- In fact, 2D CFTs represent a still very active field of research as we already appreciated in previous talks and will rediscover in subsequent ones.

- No need to illustrate the very long list of different fields where CFTs give crucial and fundamental outcomes!

- BPZ paper was on the stream of *illo tempore* investigations on **arbitrary dimension CFT**, but it stated the miracle of **2D: conformal symmetry** (emphasised by Polyakov's theorem) is **infinite dimensional**. Some clues from Virasoro calculation on string theory? Virasoro in Turin: no central charge, but apparently corrected by Gliozzi!

- Infinite symmetries stimulated research activity on **Quantum Integrable Theories**: for instance as perturbed CFTs, massive and massless flows.

- Moreover, BPZ stimulated higher dimensional CFTs investigations, also in some modern times: AdS/CFT duality (integrability!!), conformal bootstrap, etc.

- From 2D to higher D non-holographically, e.g. AGT correspondence: Liouville/4D gauge

Second birthday: **Francesco’s**

My pleasure and honour to have this ‘chat’ with you on some Francesco’s activity

How to characterise it?

A sort of phase diagram

1. F. Ravanini **Big Bang or birth of a star: baby Ravanini** (1982)

2. F. Gliozzi, F. Ravanini, S. Sciuto
   Precocious scaling in lattice gauge theories
   Phys. Lett. **118B** (1982) 402-406

3. M. Caselle, F. Gliozzi, R. Megna, F. Ravanini, S. Sciuto
   Improved lattice actions for $SU(N) \otimes SU(N)$ chiral models
   Phys. Lett. **130B** (1983) 81-86

Gauge or *confined* phase with two masters in Turin: Sciuto and Gliozzi

Towards liberation

with the help of Nico (joke, of course)

4. N. Magnoli, F. Ravanini
   Two-loop coupling constant renormalization in lattice $SU(N) \otimes SU(N)$ 2D chiral models
   Zeit. Phys. **C31** (1986) 567-575

Still 'lattice', but with more emphasis on 2D models!!

5. N. Magnoli, F. Ravanini
   Phase transitions in lattice 2D $O(N)$ σ-models with mixed action in the large N limit
   Zeit. Phys. **C34** (1987) 43-48

Liberation was already in the Big Bang!

1. F. Ravanini
   Some considerations about local conservation laws in two-dimensional field theories
   Lett. Nuovo Cim. **33** (1982) 493-498

Leitmotiv of Francesco's research was already in there: almost all the relevant and dear topics in his elegant view of physics!!

And notice the date: we may immagine that baby Ravanini was very close to BPZ looking at titles!

INFINITE CONFORMAL SYMMETRY IN TWO-DIMENSIONAL QUANTUM FIELD THEORY

But not quite……

Yet, in very good company…..

Covariant expansion of the conformal four-point function

S. Ferrara (Frascati), A.F. Grillo (Frascati), G. Parisi (Frascati), Raoul Gatto (Rome U.) (1972)

Published in: *Nucl.Phys.B* 49 (1972) 77-98, *Nucl.Phys.B* 53 (1973) 643-643 (erratum)

Analyticity properties and asymptotic expansions of conformal covariant green's functions

S. Ferrara (Frascati), A.F. Grillo (Frascati), R. Gatto (Rome U.), G. Parisi (CERN and Rome U.) (1974)

Published in: *Nuovo Cim.A* 19 (1974) 667-695

Then, Francesco meets 2D CFT

2D Conformal life of Francesco

Ask him about his approach to BPZ by another master: Di Vecchia

6. F. Ravanini, S.-K. Yang
   Modular invariance in $N = 2$ superconformal Field Theories
   Phys. Lett. **195B** (1987) 202-208

7. F. Ravanini, S.-K. Yang
   C-disorder fields and $\Gamma(2)$-invariant partition functions in parafermionic Conformal Field Theories
   Nucl. Phys. **B295 [FS21]** (1988) 262-276

8. F. Ravanini
   Modular invariance in S_3 symmetric 2D conformal field theories
   Mod. Phys. Lett. **A3** (1988) 271-282

9. F. Ravanini
   An infinite class of new conformal field theories with extended algebras
   Mod. Phys. Lett. **A3** (1988) 397-412

10. P. Christe, F. Ravanini
    $G_N \otimes G_L / G_{N+L}$ conformal field theories and their modular invariant partition functions
    Int. Journ. Mod. Phys. **A4** (1989) 897-920

Nordita time

Continuation on CFTs

11. P.Christe, F.Ravanini
A new tool in the classification of Rational Conformal Field Theories
Phys. Lett. **B217** (1989) 252-258

12. F.Ravanini
Informal introduction to Extended Algebras and Conformal Field Theories with $c \geq 1$
NORDITA report 89/21 P (1989)
based on invited lectures delivered at the 1989 Program on String and Conformal Field Theory - NORDITA, Copenhagen

13. F.Ravanini
Fusion algebras and differential equations approach to Rational Conformal Field Theories
Invited talk published in Proceedings of the 1989 Trieste Conference on *Recent Developments in Conformal Field Theories*
S.Randjbar-Daemi, E.Sezgin and J.B.Zuber Eds.
World Scientific (1990)

14. M.Caselle, G.Ponzano, F.Ravanini
Orthogonal Polynomial Structures in Fusion Algebras of Rational Conformal Field Theories
Phys. Lett. **B251** (1990) 260

15. F.Ravanini
On the Possibility of Z_N-exotic supersymmetry in two-dimensional Conformal Field Theory
Int. J. Mod. Phys. **A7** (1992) – hep-th/9109057

Beginning in Bologna

The Age of Integrability

or Francesco's massive life

16. F.Ravanini
RG Flows of nondiagonal Minimal Models perturbed by $\phi_{1,3}$
Phys. Lett. **B274** (1992) 345 – hep-th/9110018

Perturbed CFTs but still integrable

17. M.Caselle, G.Ponzano, F.Ravanini
Towards a Classification of Fusion Rule algebras in Rational Conformal Field Theories
Int. J. Mod. Phys. **B6** (1992) 2075 – hep-th/9111027

18. F.Ravanini
Thermodynamic Bethe Ansatz for $\mathcal{G}_k \times \mathcal{G}_l / \mathcal{G}_{k+l}$ coset models perturbed by their $\phi_{1,1,Adj}$ operator
Phys. Lett. **B282** (1992) 73 – hep-th/9202020

19. P.E.Dorey, F.Ravanini
Staircase models from affine Toda Field Theory
Int. J. Mod. Phys. **A8** (1993) 873 – hep-th/9206052

Beginning of the collaboration with Patrick and Roberto

20. F.Ravanini, R.Tateo, A.Valleriani
Dynkin TBA's
Int. J. Mod. Phys. **A8** (1993) 1707 – hep-th/9207040

Continued collaboration with Patrick and Roberto

21. F.Ravanini, R.Tateo, A.Valleriani
A new family of diagonal $A-D-E$ related Scattering Theories
Phys. Lett. **B293** (1992) 361 – hep-th/9207069

22. P.E.Dorey, F.Ravanini
Generalizing the Staircase Model
Nucl. Phys. **B406** (1993) 708 – hep-th/9211115

23. E.Quattrini, F.Ravanini, R.Tateo
Integrable QFT in two dimensions encoded on products of Dynkin diagrams
Talk published in Proceedings of the 1993 Cargese Meeting *New developments in String Theory, Conformal Models and Topological Field Theory*
L.Baulieu, V.Dotsenko, V.Kazakov and P.Windey Eds.
Plenum Publishing Corporation (1994) – hep-th/9311116

24. F.Ravanini, M.Stanishkov, R.Tateo
Integrable perturbations of CFT with complex parameter: the $M_{3,5}$ model and its generalizations
Int.J.Mod.Phys. **A11** (1996) 677 – hep-th/9411085

Marian, a common dear friend with unusual style

Colliding personalities

Francesco:

1) **appointments for research discussions;**
2) **punctuality;**
3) **scientific life starts in the morning and ends in the evening;**
4) **2/3 cups of coffee per day;**
5) **no smoking;**

Marian:

Appearing at around 12.30: “Ohi, let’s go for lunch”…..

But, still physics did work: Francesco’s extensive knowledge of integrable perturbations, Marian’s (and mine) understanding of Drienfeld-Sokolov classical KdV classifications

25. D.Fioravanti, M.Stanishkov and F.Ravanini
Generalized KdV and Quantum Inverse Scattering description of Conformal Minimal Models
Phys. Lett. **B367** (1996) 113 – hep-th/9510047

resulted in a intriguing correpondence (missed by BLZ)

Thanks Francesco and everybody!