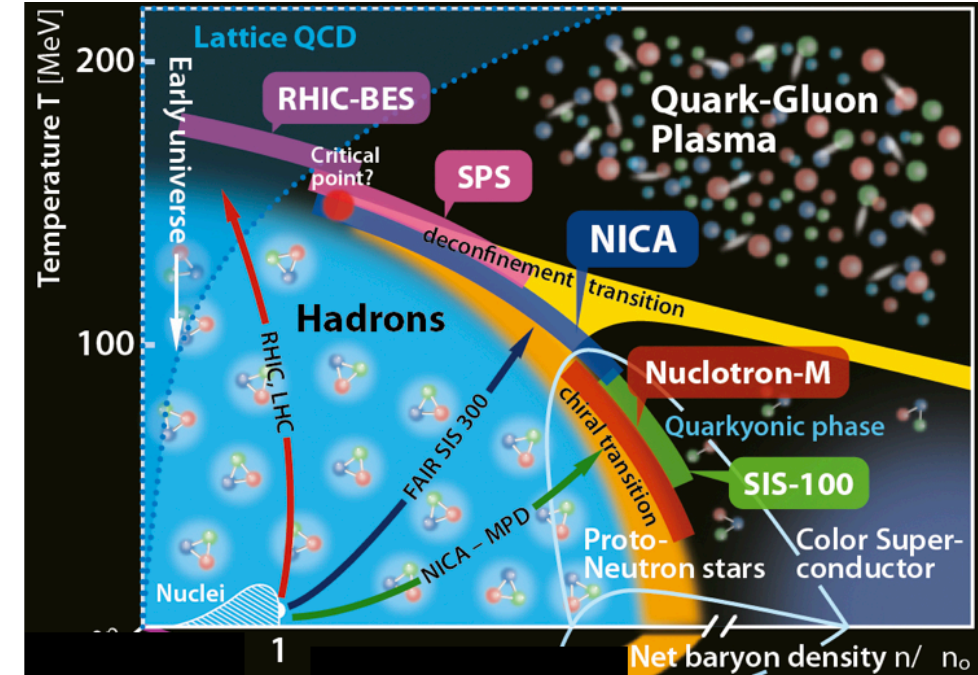
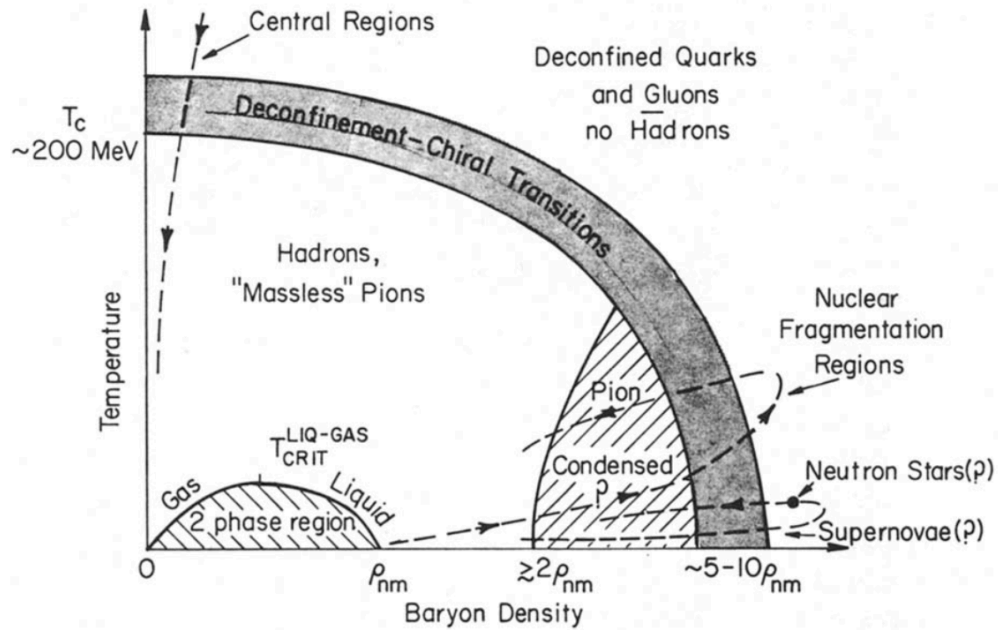


Frithjof Karsch and QCD at non-zero temperature and density from 1981 to present

Peter Petreczky



1981: the field of hot and dense lattice QCD was born

Engels, Karsch, Satz, Montvay, Phys. Lett. 101B (1981) 89 (320 citations)

B, number 1,2

PHYSICS LETTERS

30 April 1981



TR440: 800KFlops

Deconfinement transition in terms of screening:
McLerran, Svetitsky, Phys. Rev. D 24 (1981) 450
Kuti, Polónyi, Szlachányi, Phys. Lett. 98B (1981) 199

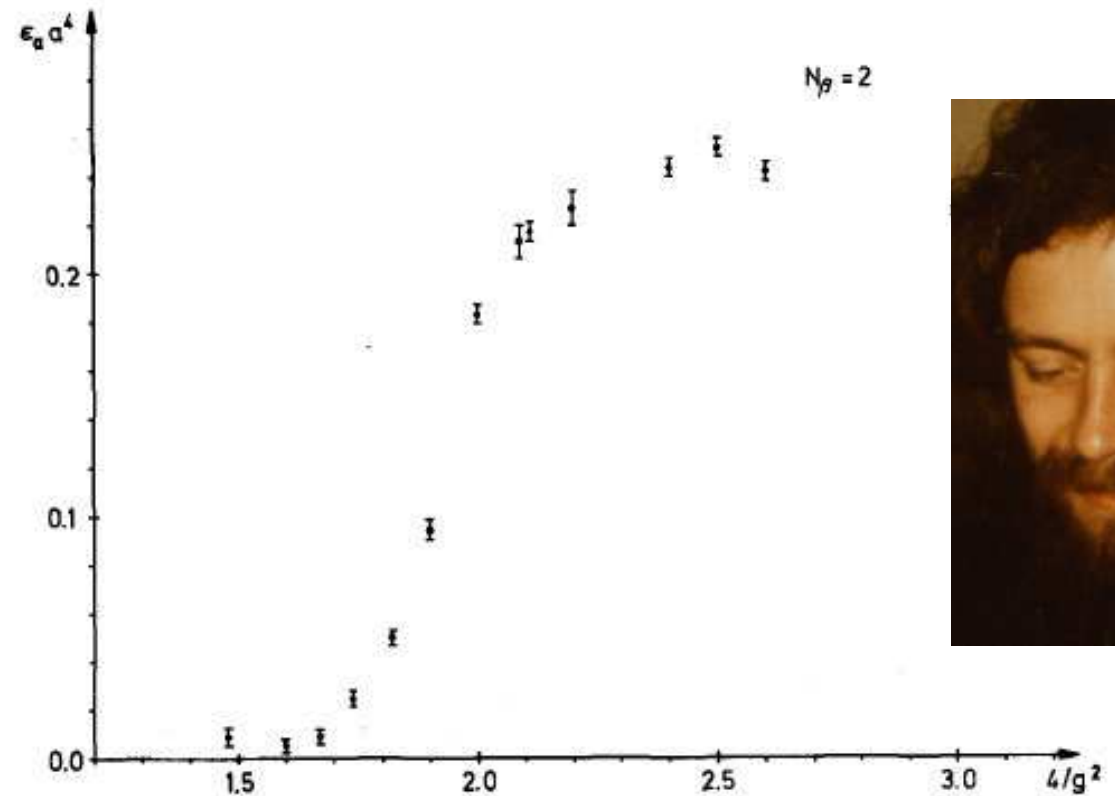


Fig. 3. Energy density of gluon matter versus $4/g^2$, at fixed lattice size $N_\beta = 2$, after about 500 iterations.



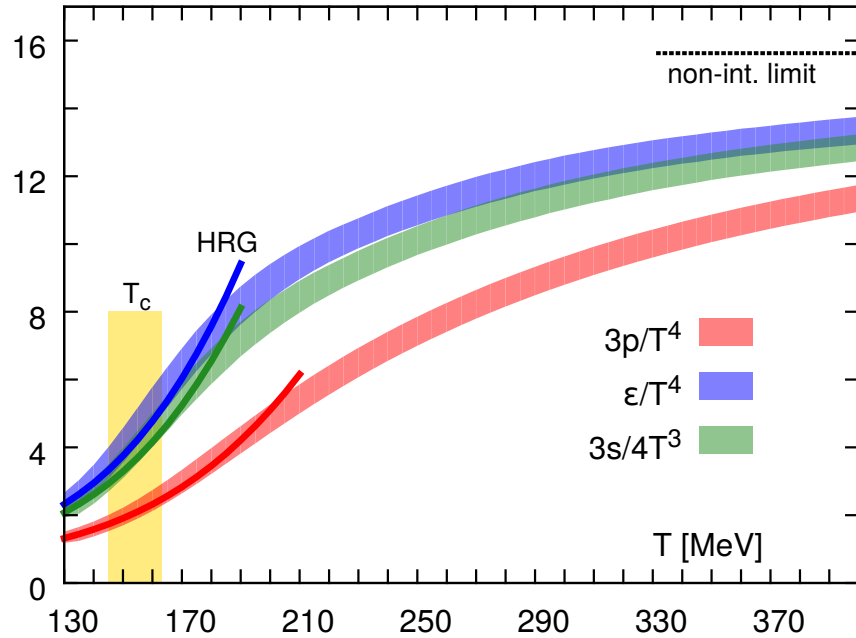
Helped to make the case for RHIC in 1983 NSAC Long Range Plan

Same year the differential method for EoS was proposed (Karsch coefficients) :

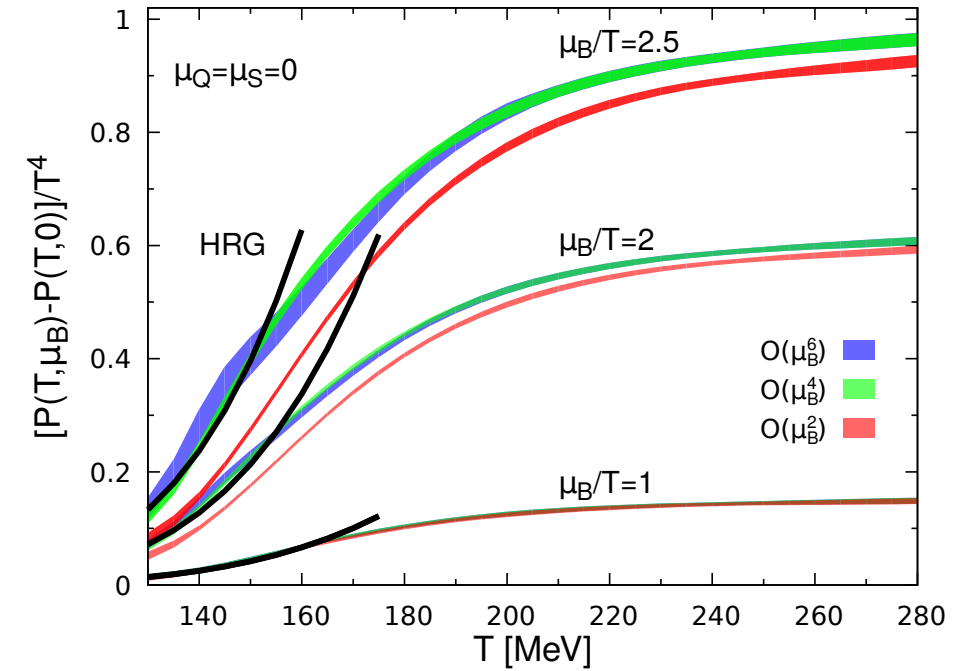
Karsch, Nucl.Phys. B205 (1982) 285 (265cit) , Engels, Karsch, Satz, Montvay, Nucl.Phys. B205 (1982) 545 (320cit).

Fast forward to present (from Mflop to Pflop, from 4 co-authors to HotQCD Collaboration):

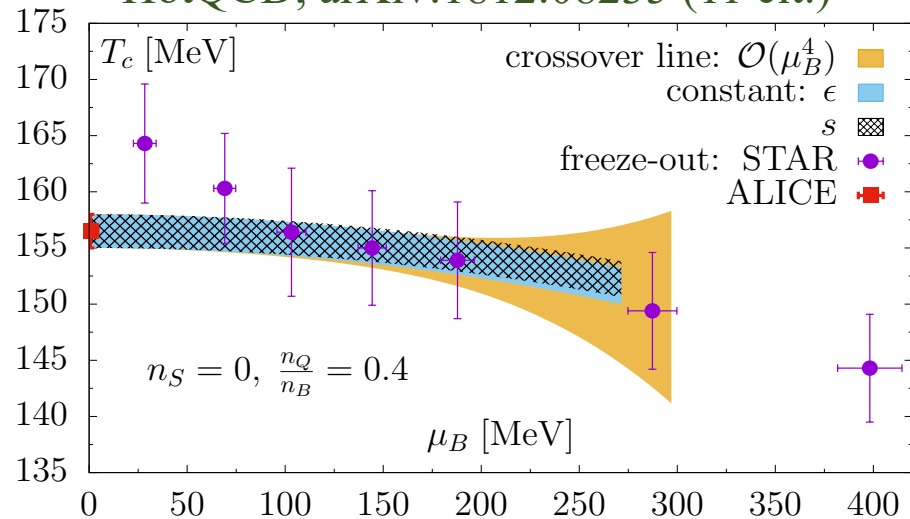
HotQCD, Phys. Rev. D90 (2014) 094503 (561 cit.)



HotQCD, Phys. Rev. D95 (2017) 054504 (129 cit.)



HotQCD, arXiv:1812.08235 (11 cit.)



HotQCD, arXiv:1903.04801 (1cit.)

Chiral phase transition for massless quarks and $O(4)$ scaling

$$T_c^0 = 132_{-6}^{+3} \text{ MeV}$$



Bielefeld years:

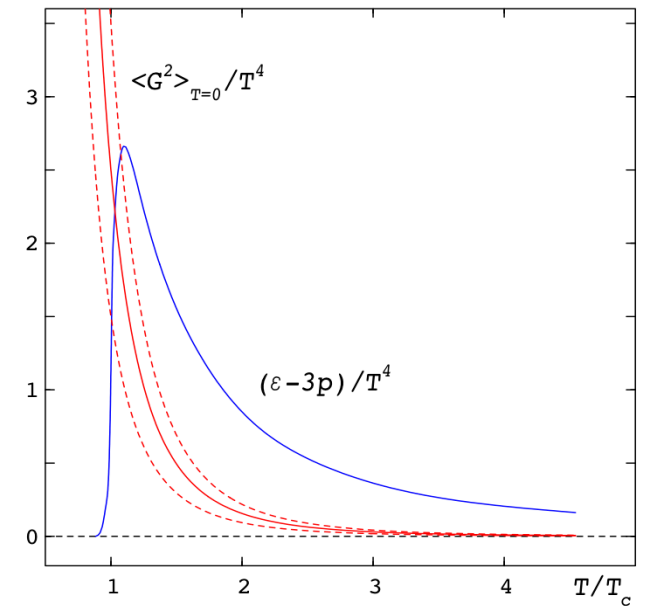
Integral method and first continuum results for $SU(3)$ EoS

$$\frac{p(T)}{T^4} - \frac{p(T_0)}{T_0^4} = \int_{T_0}^T dT' \frac{(\epsilon - 3p)}{T'^5}$$

Boyd et al, Nucl. Phys. B 469 (1996) 419 (990 cit.)

Chiral transition in QCD and universal scaling

Karsch, Laermann, Phys. Rev. D50 (1994) 6954 (280 cit.)



Improved action for QCD thermodynamics

Heller, Karsch, Phys.Rev. D 60 (1999) 114502 (87 cit.)

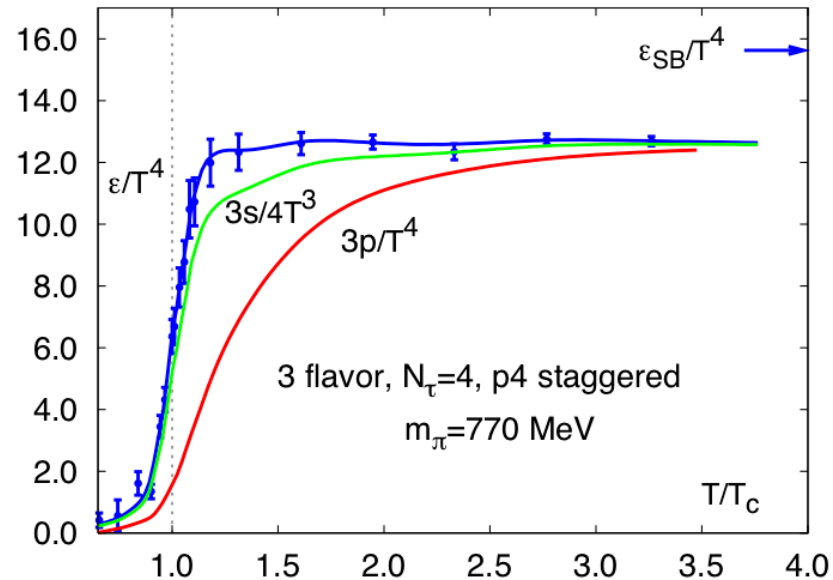
Karsch, Laermann, Peikert,

Phys. Lett. B 478 (2000) 447 (479 cit.)

Finite density QCD via Taylor expansion

Allton et al, Phys. Rev. D 66 (2002) 074507 (595 cit.)

Allton et al, Phys. Rev. D 68 (2003) 014507 (421 cit.)



Hadron resonance gas and lattice QCD

Karsch, Redlich, Tawfik, Eur. Phys. J. C29 (2003) 549 (277 cit.)



Broad range of works from the foundations of lattice QCD to phenomenology :

Chemical potential on the lattice

Karsch, Hasenfratz, Phys. Lett. 125B (1983) 308 (351cit.)

Color screening and quarkonium suppression

Karsch, Mehr, Satz, Z. Phys. C 37 (1988) 617 (358 cit.)

Kaczmarek, Karsch, Petreczky, Zantow, Phys. Lett. B 543 (2002) 41 (386 cit.)

Datta, Karsch, Petreczky, Wetzorke, Phys. Rev. D 69 (2004) 094507 (429 cit.)

Transport coefficients and thermal dilepton rate

Ding et al, Phys. Rev. D 83 (2011) 034504 (209 cit.)

Karsch, Wyld, Phys. Rev. D 35 (1987) 2518 (117 cit.)

Fluctuations of conserved charges and freeze-out in heavy ion collisions

Karsch, Redlich, Phys. Lett. B 695 (2011) 136 (224 cit.)

HotQCD, Phys. Rev. Lett. 109 (2012) 192302 (217 cit.)

Screened perturbation theory and the EoS in the high temperature limit

Karsch, Patkós, Petreczky, Phys. Lett. B 401 (1997) 69 (163 cit.)

Complex Langevin approach

Karsch, Wyld, Phys. Rev. Lett. 55 (1985) 2242 (102 cit.)

In summary:

Frithjof is retiring from BNL but will continue to lead the field of QCD at non-zero temperature and density in years to come

Thank you Frithjof for all your contributions to the field and we hope that many more new exciting results will come in the future