

**ATTRACTORS
IN EXTENDED SUPERGRAVITY**

Sergio Ferrara

CERN

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Outline of the Talk

1. The Attractor Mechanism
2. The Black Hole Potential : examples
3. Attractor Equations
in $N \geq 2$ extended
ungauged $d = 4$ Supergravity
4. Critical Points for $N = 8$:
BPS and non-BPS
5. Charge Orbits
and Flat Directions (*Moduli Spaces*)
6. Scalar Flow Equations :
First Order Formalism
7. Recent Developments
(see also Talks at this Conference)

A fascinating aspect of black hole physics is on thermodynamic properties that seem to encode fundamental insights of a so far not established final theory of Quantum Gravity

In this context a central role is played by the Bekenstein-Hawking entropy - area formula

$$S_{\text{BH}} = \frac{k_B}{4 l_p^2} A_H = \pi R_{\text{H}}^2 \quad (k_B = l_p = c = 1)$$

(k_B Boltzmann constant, $l_p^2 = \frac{G\hbar}{c^2}$ is the Planck length square, H denotes the horizon)

R_{H+} is the radius of a sphere which encircles the outer horizon (effective radius)

Another thermodynamic property is the B-H temperature T_H

also given by a geometric quantity

$$T_{BH} = \frac{\kappa}{2\pi}$$

where κ is the "surface gravity"

In terms of the "extremality parameter"

$$c = 2T_{BH} S_{BH} = \frac{1}{2}(r_+ - r_-)$$

r_+ event horizon

r_- Cauchy horizon

For "extremal" black holes

$$c = 0 \Rightarrow T_{BH} = 0 \quad r_+ = r_-$$

(F. Kiskosh, Strozinger)

The "Attractor Mechanism" applies
to a class of "Extremal Black Holes",
where "scalar field trajectories",
behave as dynamical systems.

As the BH approaches the
horizon the scalar field tends
to a "fixed point" (zero velocity)

$$\dot{\phi}^a(r) \rightarrow 0, \quad \phi^a(r) \rightarrow \phi_H^a(r)$$

$$r \rightarrow r_H$$

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whose value does depend
on the original electric and magnetic
charges (p^1, q_1) $1=1 \dots n_V$
but not on their asymptotic

$$\text{value } \lim_{r \rightarrow \infty} \phi^a(r) \rightarrow \phi_\infty^a$$

$$\phi_\infty^a \in \mathcal{M}$$

moduli space

