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Paolo Allievi

# **Cataclysms & Reconstruction**

Science & Technology

*in collaboration with*  
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*to Rocco, Vittoria and Matilda, immense treasures!  
to Gemma, a hard worker who will be appreciated!  
to Julia that has tremendously encouraged me to public my physical and  
mathematical models of natural phenomena.*



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## Symbols

$\alpha$  = Helium Nuclei.

$\alpha$  = coefficient of linear thermal expansion of a material.

$\alpha$  = angle of “shot” of laser beams towards a meteorite.

$\alpha$  = angle of rotation.

$\alpha$  = ratio between muscle mass and total mass of a living being.

$\alpha$  = ratio between power losses, at no load, and total power losses in the operation of an electric machine (Alternator or transformer).

$\alpha$  = fraction of annual melting of the surface ice mass  $M_{\text{isps}}$  of the polar caps.

$\alpha$  = number of solar masses.

$\alpha = (R/r)^2$  = reduction factor of the gravitational force with distance  $r$  from a celestial body (star, planet) of radius  $R$ .

$\alpha_{100}$  = fraction of secular melting of the surface ice mass  $M_{\text{isps}}$  of the polar caps.

$\alpha_a$  = coefficient of heat exchange, by convection, of the air–ice system.

$\alpha_c$  = coefficient of linear thermal expansion of a cement matrix.

$\alpha_e$  = fraction of the water mass of the oceans, for a depth of 20 m, evaporated into the atmosphere ( $\alpha_e = M_{\text{we}}/M_w$ ).

$\alpha_f$  = coefficient of linear thermal expansion of the iron.

$\alpha_\lambda$  = ratio of the average free paths of a photon by diffusion from carbon dioxide and from steam present in the atmosphere.

$\alpha_{\vartheta, 0-\pi/2}$  = coefficient of reduction of luminous flux on Earth by the light emission, from various angles  $\vartheta$ , of all the stars in the universe.

$\alpha_s$  = annual change in the ratio between  $\Sigma_s$  and  $\Sigma_{\text{CO}_2}$ , due solely to the variation of the density of the vapour in the Earth’s atmosphere.

$\alpha_S = S/h^2$  = coefficient of surface of a living being.

$\alpha_{SU} = S/h^2$  = coefficient of surface of human skin.

$\alpha_T$  = atmospheric thermal factor.

$\alpha_V = V/h^3$  = coefficient of volume of a living being.

$\alpha_{VU} = V/h^3$  = coefficient of volume of a man.

$a$  = acceleration.

$a = k_a h$  = width of a living being.

$a = 4\sigma/c$  = constant of a black body.

$a$  = coefficient of luminous absorption.

$a_a$  = absolute acceleration with respect to an inertial reference frame  $S$ .

$a_c$  = centripetal acceleration.

$a_{cf}$  = centrifugal acceleration.

$a_{Coriolis}$  = Coriolis acceleration.

$a_l$  = light-year.

$a_r$  = relative acceleration with respect to a non-inertial reference system  $S'$ .

$a_t$  = drag acceleration of a non-inertial reference system  $S'$  with respect to an inertial reference system  $S$ .

$a_u$  = acceleration imparted to a cubic concrete module immediately after the impact to the ground, falling by 1 m in height.

$a_{uU}$  = acceleration imparted to a man immediately after the impact to the ground, falling by 10 m in height.

$A$  = area.

$A$  = absorption of chemical product in aqueous solution (g/litre s).

$A$  = atomic weight.

$A_{CO_2}$  = atomic weight of carbon dioxide molecule.

$A_{H_2O}$  = atomic weight of water molecule.

$A_{N_2}$  = atomic weight of nitrogen molecule.

$A_{O_2}$  = atomic weight of oxygen molecule.

$AU$  = Astronomical Unit.

$\beta$  = ratio between transverse dimension and height of a living being (man, ant, etc.).

$\beta$  = coefficient of cubical expansion of water.

$\beta^-$  = electron.

$\beta^+$  = positron.

$b$  = base of the rectangular section of a metal rod, fixed at one end.

$b = k_b h$  = length of a living being.

$b_G$  = Angular momentum, of a rigid body in rotation, with respect to the axis of rotation passing through the centre of gravity  $G$  of the body itself.

$b_{spin}$  = angular momentum.

$B$  = magnetic Induction.

$B_{max}$  = magnetic field limit due to both transmitting antennas (1 GHz) and grids at high voltage and at 50 Hz.

$B_{Earth}$  = Earth's magnetic field.

$c$  = speed of light in vacuum.

$c$  = speed of seismic waves in a material medium.

$c = c_s$  = speed of sound (overpressure) in water.

$c$  = concentration of a chemical product in aqueous solution (g/litre).

$c$  = electrical capacitance, per unit of length, of a metallic threadlike conductor with respect to ground.

$C$  = moving torque on the rotor of a turbine-generator.

$c_a$  = specific heat of water.

$c_{Al}$  = specific heat of aluminium.

$c_c$  = specific heat of the concrete.

$c_{cls}$  = specific heat of the concrete.

$c_{fe}$  = specific heat of the iron.

$c_F$  = specific heat of a metal cable subjected to constant stretch (force)  $F$ .

$c_i$  = specific heat of ice.

$C_i$  = Curie (1 Ci = 1Curie, are the disintegrations per second per gram of radium).

$c_l$  = specific heat of a metal cable, at constant length  $l$ .

$c_m$  = average specific heat of the atmosphere-oceans-continent system of the Earth.

$\cos\varphi$  = power factor.