# INTRODUCTION to GENERAL RELATIVITY

Rinton Press, Princeton, 2001

Gerard 't Hooft

ERRATA

Page 12: The equation numbers (3.12)—(3.19) must be shifted by one, to match the citations in the text.

pages 16, 18: A macro misfired. Where it says $\partial x^\mu u^\mu$ read: $\frac{\partial x^\mu}{\partial u^\mu}$ ;
where it says $\partial u^\alpha$ read $\frac{\partial}{\partial u^\alpha}$ .

Page 29, Eq. (5.33), instead of $G^\nu_{\kappa\alpha}$ read $\Gamma^\nu_{\kappa\alpha}$ .

On page 57, Eq. (11.6) should read:

$$\mathrm{d}s^2 = -A\,\mathrm{d}t^2 + B\,\mathrm{d}r^2 + C\,r^2\,(\mathrm{d}\theta^2 + \sin^2\theta\,\mathrm{d}\varphi^2)\ , \tag{11.6}$$

Please replace Equation (15.21) on page 83 by the following:

Since there are no further kinetic terms this Lagrangian produces directly a term in the Hamiltonian:

$$\begin{aligned} H_2 &= -\int \mathcal{L}_2 \mathrm{d}^3\vec{k} = \int \frac{1}{2k^2} T^2_{0a} \mathrm{d}^3\vec{k} = \int \Big(\frac{\delta_{ij} - k_i k_j/k^2}{2k^2}\Big) T_{0i}(\vec{k}) T_{0j}(-\vec{k}) \mathrm{d}^3\vec{k} = \\ &= \tfrac{1}{2} \int T_{0i}(\vec{x})\,[\Delta(\vec{x}-\vec{y})\delta_{ij} - E_{ij}(\vec{x}-\vec{y})]\,T_{oj}(\vec{y}) \mathrm{d}^3\vec{x}\,\mathrm{d}^3\vec{y}\ ; \end{aligned} \tag{15.21a}$$

$$\text{with} \qquad \partial^2\Delta(\vec{x}-\vec{y}) = -\delta^3(\vec{x}-\vec{y}) \qquad \text{and} \qquad \Delta = \frac{1}{4\pi|\vec{x}-\vec{y}|}\ ,$$

whereas $E_{ij}$ is obtained by solving the equations

$$\partial^2 E_{ij}(\vec{x}-\vec{y}) = \partial_i\partial_j\Delta(\vec{x}-\vec{y}) \quad \text{and} \quad (x_i - y_i)\,E_{ij}(\vec{x}-\vec{y}) = 0\,, \tag{15.21b}$$

so that

$$E_{ij} = \frac{\delta_{ij}}{8\pi|\vec{x}-\vec{y}|} - \frac{(\vec{x}-\vec{y})_i(\vec{x}-\vec{y})_j}{8\pi|\vec{x}-\vec{y}|^3}\ . \tag{15.21c}$$

In $\mathcal{L}_3$ we find that $h_{00}$ acts as a Lagrange multiplier.