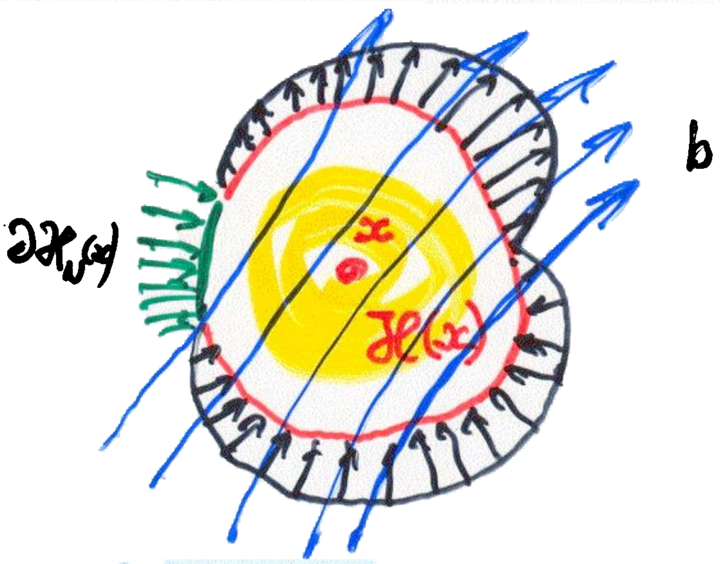
Remark 3.1:

1. $u \in V_g \cap W_2^{1+\lambda}(\Omega)$ ensures an integrable trace of $\frac{\partial u}{\partial N} := (a\nabla u, n)$ on $\partial\mathcal{H}$ ($\frac{\partial u}{\partial N} \in L_1(\partial\mathcal{H})$!), if $\lambda > 1/2$ and if $a(\cdot)$ and $\partial\mathcal{H}$ are "sufficiently" smooth (Sobolev's embedding theorem on manifolds !).
2. Physical meaning of (3):
   The bilance equation (3) expresses the equilibrium (balance) of the following quantities:

Total flux through $\partial\mathcal{H} \setminus \partial\mathcal{H}_N$ + input into $\mathcal{H}$ via convection + reaction by solution-dependent sources cu and $\varkappa u$ = total intensity of the sources given by the intensities of the volume sources f in $\mathcal{H}$ and the boundary sources g on $\partial\mathcal{H}_N$ (if $\neq \emptyset$)



→ see Modeling Lectures: Transport Theorem

3. In Section 3.3, we use the bilance equation (3) in discrete points $x \in \omega = \mathring{\omega} \cup \gamma_2 \cup \gamma_3$ (=primary grid) and special boxes $\mathcal{H}(x)$ (= secondary grid) for constructing finite difference schemes on arbitrary triangular, rectangular and combined meshes
4. The generalization to 3D is trivial !