This is the figure for pillbox integration volume that was used in the boundary value analysis of Maxwell's equations.

```
<< peeters` ;
peeters`setGitDir[ "../project/figures/GAelectrodynamics" ]
/Users/pjoot/project/figures/GAelectrodynamics

ClearAll[bold, fs, e1, e2, e3, o, f, xx, xy, n, p, p2]
bold = Style[ #, Bold] &;
fs := Style[ #, FontSize → 14] &;
{e1, e2, e3} = IdentityMatrix[3];
o = {0, 0, 0};
f[x_, y_] := 0.5 Sin[x] Exp[-y] Cos[3 y];
xx[x_, y_] := e1 + e3 D[f[a, b], a] /. {a → x, b → y};
xy[x_, y_] := e2 + e3 D[f[a, b], b] /. {a → x, b → y};
n[x_, y_] := Cross[ xx[x, y] , xy[x, y] ] // Normalize;
nt := fs[Subscript["n" // bold, #]] &;
p[x_, y_, z_] := {x, y, f[x, y] + z};
p2 = Module[{ r1, zr, rr, r},

  r1 = 0.3;
  zr = 5;
  rr = 0.7 {-1, 1};
  r = 0.2;

  Show[{
    Plot3D[ f[x, y], {x, -1, 1}, {y, -1, 1}, PlotRange → {rr, rr, rr}, Ticks → None,
     PlotStyle → Directive[Opacity[0.6], Blue],
     BoxRatios → Automatic(*,Boxed → False*)
    ],
    Plot3D[r1 + f[x, y], {x, -1, 1}, {y, -1, 1}, Ticks → None,
     PlotStyle → Directive[Opacity[1]],
     RegionFunction → Function[{x, y, z}, x^2 + y^2 < r^2]
    ]
    ,
    Plot3D[-r1 + f[x, y], {x, -1, 1}, {y, -1, 1}, Ticks → None,
     PlotStyle → Directive[Opacity[1]],
     RegionFunction → Function[{x, y, z}, x^2 + y^2 < r^2]
    ],
    ParametricPlot3D[ r {Cos[t], Sin[t], z}, {t, 0, 2 Pi}, {z, -20, 20},
     RegionFunction → Function[{x, y, z}, z < r1 + f[x, y] && z > -r1 + f[x, y]]
    ]
    ,
    Graphics3D[ {
```
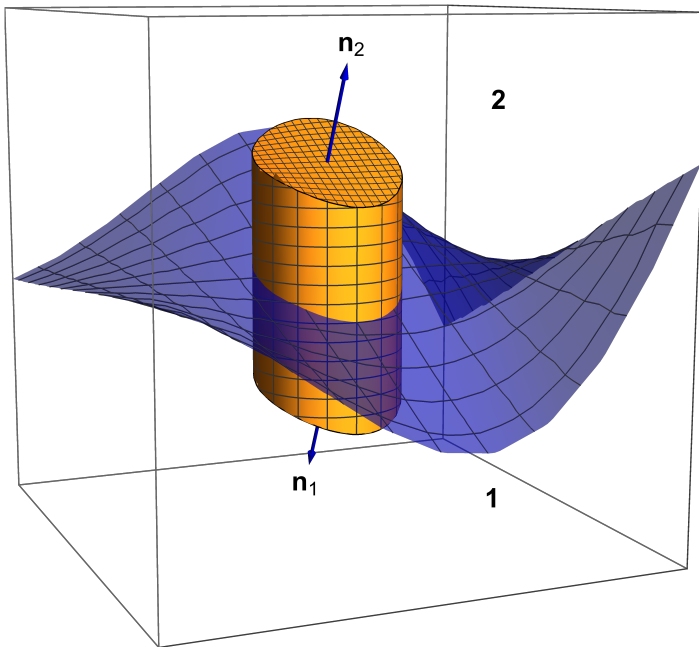
```
      Text[2 // fs // bold, p[-1 / 3, -1 / 3, 2 r1]],
      Text[1 // fs // bold, p[-1 / 3, -1 / 3, -1.5 r1]],
      Arrowheads[0.019],
      Blue,
      Arrow[Tube[{p[0, 0, r1], p[0, 0, r1] + r1 n[0, 0]}]],
      Arrow[Tube[{p[0, 0, -r1], p[0, 0, -r1] - r1 n[0, 0]}]],
      Black,
      Text[nt[2], p[0, 0, r1] + 1.2 r1 n[0, 0]],
      Text[nt[1], p[0, 0, -r1] - 1.2 r1 n[0, 0]]
    } ]
  }
 ]
]
```



```
peeters`exportForLatex["pillboxIntegrationVolumeFig1", p1]
```
{pillboxIntegrationVolumeFig1.eps, pillboxIntegrationVolumeFig1pn.png}