rough notebook that had some experimenting for a two parameter surface illustration. This notebook was not left in a useful looking state.

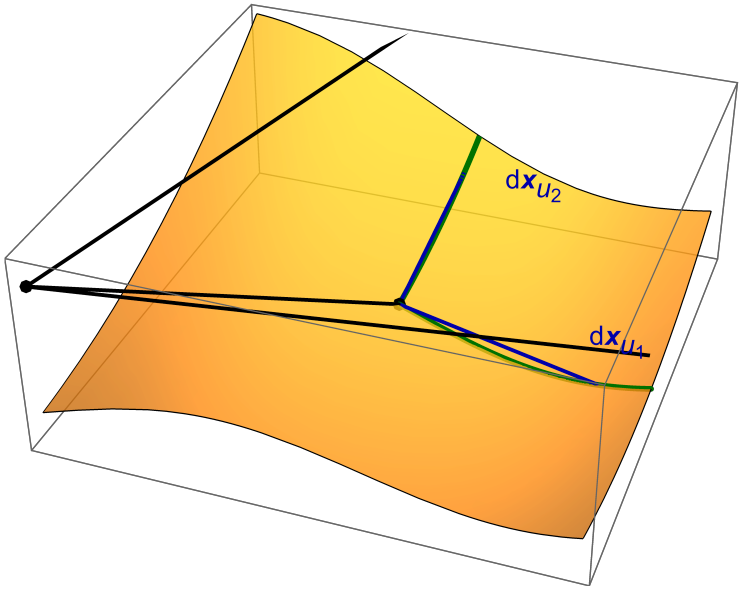
```
<< peeters` ;
peeters`setGitDir[ "../project/figures/GAelectrodynamics" ]
```

```
/Users/pjoot/project/figures/GAelectrodynamics
```

```
ClearAll[o, f, triple, bold, fs, bxOfa, dxa, dxb,
 bxOfaDa, bxOfaDb, p, p2, pa, pb, g, x, y, dx, pay, pbx]
o = {0, 0, 0};
f[x_, y_] = -4 + Sin[5 x + y] + (x - 2 y) ^ 2 ;
triple[x_, y_] = {x, y, f[x, y]} ;
bold = Style[ #, Bold] &;
fs = 14;
bxOfa = Style[Row[{bold[x], "(u₁, u₂)"}], FontSize → fs] ;
bxOfaDa = Style[Row[{bold[x], "(u₁ + Δu₁, u₂)"}], FontSize → fs] ;
bxOfaDb = Style[Row[{bold[x], "(u₁, u₂ + Δu₂)"}], FontSize → fs] ;

t = Style[ #, FontSize → fs] &;
dx[v_, e_ : "", s_ : ""] :=
  Row[{s // t, t["d"], Subscript[bold[x] // t, v // t], e // t}] ;
dxa = dx["u₁"];
dxb = dx["u₂"];


p = Plot3D[
    f[x, y], {x, 0, 1}, {y, 0, 1},
    PlotTheme → "ThickLines" ,
    Axes → None, Mesh → None, PlotStyle → Directive[Opacity[0.8] ]
  ] ;

pay[l_, h_, a_] := ParametricPlot3D[ triple[a, y], {y, l, h},
    PlotTheme → "ThickLines", PlotStyle → Directive[Green // Darker // Darker]];
pbx[l_, h_, b_] := ParametricPlot3D[ triple[x, b], {x, l, h},
    PlotTheme → "ThickLines", PlotStyle → Directive[Green // Darker // Darker]];
pa = pay[0.5, 1, 0.5];
pb = pbx[0.5, 1, 0.5];

low = 0.5;
high = 1.5;
lowlow = triple[low, low];
lowhigh = triple[low, high];
```

```
highlow = triple[high, low];
highhigh = triple[high, high];


(*Callout doesn't appear to work for 3D plot*)
p2 = ListPointPlot3D[{
     (*Callout[lowlow,bxOfa, Above],
     Callout[highlow,bxOfaDa, Above],
     Callout[lowhigh,bxOfaDb, Above]*)
     lowlow,
     highlow,
     lowhigh,
     o
    },
    PlotStyle → Directive[Black, PointSize[Large]]
  ] ;


g = Show[p, p2, pa, pb,
  Graphics3D[{
     Thick, Arrowheads[0.001],
     Arrow[{o, lowlow}],
     Arrow[{o, highlow}],
     Arrow[{o, lowhigh}],
     Blue // Darker,
     (*Arrowheads[0.01],*)
     Arrow[{lowlow, triple[0.5, 0.9]}],
     Arrow[{lowlow, triple[0.9, 0.5]}],
     (*Text[bxOfa,lowlow + {-1,1,0.1}0.2],*)
     Text[bxOfaDa, highlow + {1, 1, 0} 0.3],
     Text[bxOfaDb, lowhigh + {1, 1, 0} 0.3],
     Text[dxb, triple[0.5, 0.9] + {1, 0, 0} 0.15],
     Text[dxa, triple[0.9, 0.5] + {0, 1, 0} 0.15]
    }]
 ]
```

$\boldsymbol{x}(u_1, u_2 + \Delta u_2)$



$\boldsymbol{x}(u_1 + \Delta u_1, u_2)$

```
pah = pay[0.5, 1.5, 1.5];
pbh = pbx[0.5, 1.5, 1.5];

g2 = Show[p, pa, pb, pah, pbh,
  Graphics3D[{
    Thick, Arrowheads[0.001],

    Arrow[{lowhigh, triple[low + 0.3, high]}],
    Arrow[{highhigh, triple[high, high - 0.3]}],
    Arrow[{lowlow, triple[low, low + 0.3]}],
    Arrow[{highlow, triple[high - 0.3, low]}],

    Text[ dx["a", "(b=1)"], triple[low + 0.3, high] + {0, 1, 0} 0.2],
    Text[dx["b", "(a=1)", "-"], triple[high, high - 0.3] - 0.3 {1, 0, 0}],
    Text[ dx["b", "(a=0)", ""], triple[low, low + 0.3] + 0.3 {1, 0, 0}],
    Text[dx["a", "(b=0)", "-"], triple[high - 0.3, low] - 0.2 {0, 1, 0}]

   }]
 ]



peeters`exportForLatex["twoParameterDifferentialFig1", g]
(*peeters`exportForLatex["twoParameterDifferentialBoundaryFig2", g2]*)
{twoParameterDifferentialFig1.eps, twoParameterDifferentialFig1pn.png}
```

```
ClearAll[z, r, rx, ry]
z[x_, y_] := y + 4 x^2;
r[x_, y_] := {x, y, z[x, y]};
rx[x_, y_] := {1, 0, 8 x};
ry[x_, y_] := {0, 1, 1};
surface = Plot3D[z[x, y], {x, 0, 1}, {y, 0, 1}, PlotRange → Full];
plotAlong = ParametricPlot3D[{rx[x, y], ry[x, y]}, {x, 0, 1}, {y, 0, 1}];
(*plotAlongY[xv_] := ParametricPlot3D[{xv,y,z[xv,y]},{y,0,1}]*)

(*Show[{surface,
  plotAlong
  (*plotAlongX[0.1],
  plotAlongY[0.3]*)
 }]*)
```