Matplotlib for intermediate users

A matplotlib figure is composed of a hierarchy of elements that forms the actual figure. Each element can be modified.

Figure, axes & spines

```python
fig, axs = plt.subplots(3, 3)
axs[0, 0].set_facecolor("#ddddff")
axs[2, 2].set_facecolor("#ffffdd")
```

```python
gs = fig.add_gridspec(3, 3)
ax = fig.add_subplot(gs[0, :])
ax.set_facecolor("#ddddff")
```

```python
fig, ax = plt.subplots()
ax.plot(X, Y, "C1o-", markevery=25, mec="1.0")
```

Legend

```python
ax.plot(X, np.sin(X), "C0", label="Sine")
ax.plot(X, np.cos(X), "C1", label="Cosine")
ax.legend(bbox_to_anchor=(0, 1, 1, .1), ncol=2,
mode="expand", loc="lower left")
```

Annotation

```python
ax.annotate("A", (X[250], Y[250]), (X[250], -1),
ha="center", va="center", arrowprops =
{"arrowstyle" : "->", "color" : "C1")}
```

Scales & projections

```python
fig, ax = plt.subplots()
ax.set_xscale("log")
ax.plot(X, Y, "C1o-", markevery=25, mec="1.0")
```

Text & ornaments

```python
ax.fill_betweenx([-1, 1], [0], [2*np.pi])
ax.text(0, -1, r"Period $\Phi$")
```

Colors

Any color can be used, but Matplotlib offers sets of colors:

- `C0` - blue
- `C1` - red
- `C2` - green
- `C3` - orange
- `C4` - purple
- `C5` - brown
- `C6` - gray
- `C7` - black
- `C8` - white
- `C9` - pink

Size & DPI

Consider a square figure to be included in a two-columns A4 paper with 2cm margins on each side and a column separation of 1cm. The width of a figure is $(21 - 2*2 - 1)/2 = 8$ cm. One inch being 2.54cm, figure size should be 3.15×3.15 in.

```python
fig = plt.figure(figsize=(3.15, 3.15), dpi=50)
plt.savefig("figure.pdf", dpi=600)
```

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