figS_18S_probetest

July 30, 2020

0.0.1 Fig S 18S probe test

- S1A-S1C: thermodynamic properties vs. performance for the 20 probes
- S1D: Tm by position in 18S
- S1E: Performance of low vs. high Tm probes

[1]:

```
#Imports
import sys
import pandas as pd
import matplotlib as mpl
import matplotlib.pyplot as plt
import os
import gffutils
import seaborn as sns
import numpy as np
import scipy.stats as stats

sys.path.append('../scripts/')
from plot_helpers import *

%matplotlib inline
%load_ext autoreload
%autoreload 2
```

[2]:

```
#load properties of probes
prop_file = '../figures/F1/TableS1_18S_candidate_properties.csv'
df = pd.read_csv(prop_file)
df['percent_remaining'] = df['mean_frac_remaining']*100

#Annotate id labels with categories
pool2_ids = range(21, 31)
lowtm_pool1_ids = range(1, 12)

df['length_category'] = df['probe_num'].apply(lambda x: '~30mer' if x <= 30␣
 ↪else '~50mer')
df['tm_category'] = df['probe_num'].map(lambda x: 'high Tm' if x in pool2_ids␣
 ↪else ('low Tm' if x in lowtm_pool1_ids else np.nan))
```

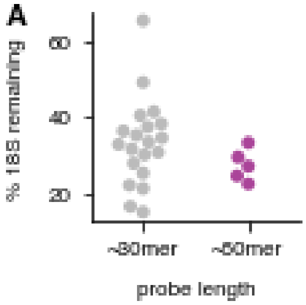
[3]:

```
#Make outdir and load the data
outdir = '../figures/FS2'
os.makedirs(outdir, exist_ok = True)
```

[4]:

```
#Fig S1A: plot longer probes vs shorter probes
panel_name = 'S2A'

plot = Plotter(corners = [0.27, 0.27, 0.68, 0.68], figsize = (sfig, sfig))
plot.nudge_corners(bottom = True, right = True)
plot.setup_axis()
#Not sure why it does a better job here not overlapping the points than in F1
plot.ax = sns.swarmplot(x = 'length_category', y = 'percent_remaining',
                       data = df.loc[(df['probe_num'] < 21) | (df['probe_num'] >␣
 ↪30)],
                        ax = plot.ax)
plot.set_ylabel('% 18S remaining')
plot.set_xlabel('probe length')
plot.add_letter('A')
plt.savefig(os.path.join(outdir, '{}.{}'.format(panel_name, outfmt)), dpi = 600)
```



[5]:

```
#Fig S2B - S2D: Plotting depletion vs thermodynamic properties for the first 20␣
 ↪probes
#https://stackoverflow.com/questions/1452995/
 ↪why-doesnt-a-python-dict-update-return-the-object
to_plot = ['homodimer_dG', 'hairpin_dG', 'Tm']
x_label_dict = {'homodimer_dG': r'homodimer $\Delta$G', 'hairpin_dG': r'hairpin␣
 ↪$\Delta$G', 'Tm': 'Tm'}
first_df = df.loc[df['probe_num'] < 21].copy()

default_margins = {'top':False, 'bottom':False, 'left':False, 'right':False}
to_plot = {'homodimer_dG': {'letter': 'B', 'margins': dict(default_margins,␣
 ↪**{'bottom':True, 'left':True})},
          'hairpin_dG': {'letter': 'C', 'margins': dict(default_margins,␣
 ↪**{'top': True, 'right':True})},
          'Tm': {'letter': 'D', 'margins': dict(default_margins, **{'top':True,␣
↪'left':True})}}

for i in to_plot:
    panel_name = 'S2{}'.format(to_plot[i]['letter'])
    plot = Plotter(corners = [0.27, 0.27, 0.68, 0.68], figsize = (sfig, sfig))
    plot.nudge_corners(top = to_plot[i]['margins']['top'], bottom =␣
↪to_plot[i]['margins']['bottom'],
                       left = to_plot[i]['margins']['left'], right =␣
↪to_plot[i]['margins']['right'])
    plot.setup_axis()

    #create a little space on the left and right so the the points don't get␣
↪cutoff
    #but the seaborn generated components only extend to the data range, so keep␣
↪as is
    #min_x = first_df[i].min() - abs(first_df[i].min()*0.05)
    #max_x = first_df[i].max() + abs(first_df[i].max()*0.05)

    plot.ax = sns.regplot(x = i, y = 'percent_remaining', data = first_df, ax =␣
↪plot.ax, scatter_kws = {'edgecolors': 'none'})
    r_value = stats.spearmanr(first_df[i], first_df['percent_remaining'])

    r_squared = r_value[0]**2
    p_value = r_value[1]
    plot.ax.annotate('r'r'$^2$'' = %1.2f' % r_squared, xy=(0.95, 0.85),␣
↪annotation_clip=False,
                     xytext=None, textcoords='axes fraction',fontsize = 8,␣
↪arrowprops=None,
                     ha = 'right', va = 'top')

    plot.set_ylabel('% 18S remaining')
    plot.set_xlabel(x_label_dict[i])
    plot.add_letter(to_plot[i]['letter'])

    print(p_value)
    plt.savefig(os.path.join(outdir, '{}.{}'.format(panel_name, outfmt)), dpi =␣
↪600)
```

```
/Users/maryk.thompson/miniconda3/envs/plotting/lib/python3.7/site-
packages/ipykernel_launcher.py:31: UserWarning: You have used the `textcoords`
kwarg, but not the `xytext` kwarg.  This can lead to surprising results.
```

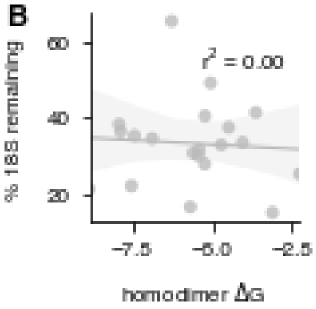
```
0.9949797739432688
```

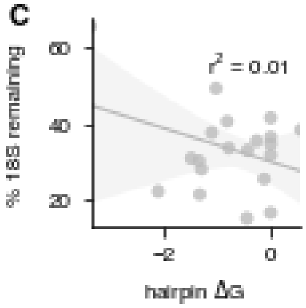
```
/Users/maryk.thompson/miniconda3/envs/plotting/lib/python3.7/site-
packages/ipykernel_launcher.py:31: UserWarning: You have used the `textcoords`
kwarg, but not the `xytext` kwarg.  This can lead to surprising results.
```

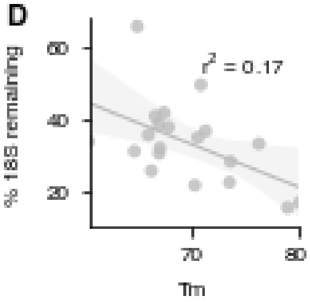
```
0.6516702358175535
```

```
/Users/maryk.thompson/miniconda3/envs/plotting/lib/python3.7/site-
packages/ipykernel_launcher.py:31: UserWarning: You have used the `textcoords`
kwarg, but not the `xytext` kwarg.  This can lead to surprising results.
```

```
0.07334086574364809
```







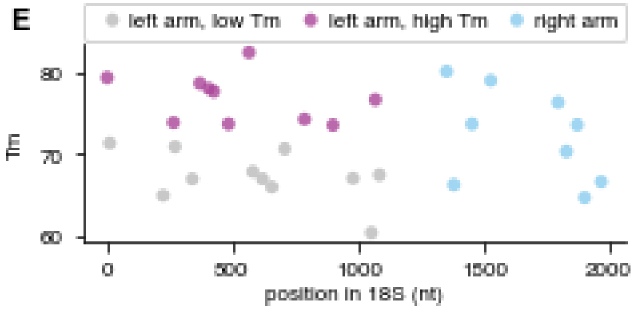
[6]:
```
#Fig S1E: Plot Tm vs. 18S position for the selected probes
panel_name = 'S2E'
plot = Plotter(corners = [0.12, 0.24, 0.855, 0.64], figsize = (sfig*2, sfig))
```

```
plot.nudge_corners(top = True)
plot.setup_axis()

short_df = df.loc[df['probe_num'] < 31].copy()
left_low = plot.ax.scatter(*short_df[short_df['tm_category'] == 'low␣
↪Tm'][['consensus_start', 'Tm']].transpose().values, alpha = 0.8, edgecolors =␣
↪'none')
left_hi = plot.ax.scatter(*short_df[short_df['tm_category'] == 'high␣
↪Tm'][['consensus_start', 'Tm']].transpose().values, alpha = 0.8, edgecolors =␣
↪'none')
right_mixed = plot.ax.scatter(*short_df[short_df['tm_category'].
↪isnull()][['consensus_start', 'Tm']].transpose().values, alpha = 0.8,␣
↪edgecolors = 'none')
plot.ax.legend([left_low, left_hi, right_mixed], ['left arm, low Tm', 'left␣
↪arm, high Tm', 'right arm'],
               mode = 'expand', fontsize = 8, ncol = 3, bbox_to_anchor=(0., 1.
↪02, 1., .102), loc=3,
               borderaxespad=0., handletextpad = -0.2)

plot.set_ylabel('Tm')
plot.set_xlabel('position in 18S (nt)')
plot.add_letter('E')

plt.savefig(os.path.join(outdir, '{}.{}'.format(panel_name, outfmt)), dpi = 600)
```



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