

MUSC3807

Aig]7i`h fYg

HYfa "Hk c"#"&\$&\$

7ci fgY⁻Cj Yfj]Yk

GHJZ7cbHJWh8YHJ]`g

7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`]lm	@cWJhjcb	D\cbY
A Ubc`YhY'A cfU	a "a cfU4 i bgk "YXi "Ui		If)	b"U"

GWXcc`7cbHJWh′±bZcfa Uh]cb

Fcca " ‰ž@Yj Y`" žFcVYfhK YVghYf'6i]`X]b[fl %(Ł

D\cbY.`f\$&Ł'-',)`(,)*

9a U]`. 'gUa 4 i bgk "YXi "Ui

K YVg]hY. k k k "Ufhg"i bgk "YXi "Ui #gUa

 $\text{H} \text{Y'GV} \text{Kcc'} \text{cZh} \text{Y'5fhg'} \text{UbX'A YX]} \text{U'k ci `X''} \text{_Y'hc'} \text{F YgdY} \text{M'M} \text{``m'5} \text{W} \text{bck `YX[Y'hh,Y'HfUX]} \text{h} \text{cbU''} \text{7 i ghcX]} \text{Ubg} \text{\r} \text{Z} \text{Ubg} \text{Z} \text{Ubg} \text{\r} \text{Z} \text{Ubg} \text{Z} \text{Ubg} \text{\r} \text{Z} \text{Ubg}$

7 ci fgY 8YHJ]`g 7 fYX]hDc]bhg ** Gi a a UfmcZh\Y 7 ci fgY

Gi VYWh5fYU. ? ge[U

H\]g`Wci fgY`YI Ua]bYg`h\Y`bUhi fY`cZa i g]WUg`"ffUX]h]cb"ž]bj Ygh][Uh]b[`X]gWci fgYgžj U`i Yg`UbX`i gYg`cZa i g]WUh\UhYbXi fY`cf`W\Ub[Y`UhiU`X]ZZYfYbhifUhY`UbX`]b`X]ZZYfYbhik Umg`Zca 'a i g]WU``Zcfa g`h\Ya gY`j Yg" 9I Ua]b]b['h\Y`XYj Y`cda YbhcZcbY`cf`a cfY`a i g]WU``W`hi fYgž'h\Y`Wci fgY`k]``XYa cbghfUhY`\ck '[YbfYgž k cf_g`UbX`dYfZcfa UbW'g`Ya VcXmUbX`[YbYfUhY`a YUb]b['h\fci [\ 'h\Y]f`fY`Uh]cbg\]d'hc`Wca a i b]hm]b gdYW]ZJW\]ghcf]WU`žgcWJU`ž'UbX`dc`]h]WU``WcbhYI hg"5ZZYWhUbX`UYgh\Yh]WgžWfYUh]j]hmUbX`Wc[b]h]cbž Ya VcX]a YbhUbX`a Ya cfmžfYWdh]cb`UbX`hfUbga]gg]cbžUbX`dYfZcfa UbW'`UbX`f]hi U``UfY`gca Y`cZh\Y dcgg]V`Y`h\Ya Yg`h\UhYbhYf`h\Y`YI Ua]bUh]cb`cZ\ck 'a i g]WWca a i b]hmfY`Uh]cbg\]dg`UbX`]bhYffY`UhYX a YUb]b[g`UfY`fYhJ]bYX`cf`a cX]ZJYX`]b`h\Y`WcbhYI hg`cZa cXYfb]gUh]cbž[`cVU`]gUh]cb`UbX`a][fUh]cb"`H\Y Wci fgY`]bj Ygh][UhYg`\ck 'UbX`k \mžUg`bYk 'Zcfa g`UfY`XYj Y`cdYXžgca Y`VYWca Y`Ub`YbXi f]b['ZYUhi fY`cZU

5ggYgga Ybh

Q YfY'mci 'WUb'ci h]bY'UbmfY'Yj Ubh]bZcfa Uh]cb'h\Uhk Ug'bch]bWi XYX']b'5 ≠ G'Vi ha Umdfcj Y'\Y`dZ ``Zcf mci f'ghi XYbhg": cf'Yl Ua d'Yžmci 'a][\hdfcj]XY'XYhU]`g'cb'h\Y'fYZYfYbW]b['gmghYa ž`]b_g'hc'dfYj]ci g ghi XYbhYl Ya d'Ufg'cf'h\Y'XYg][bUhYX'k YY_`]b'h\Y'Wci fgY'h\Uhmci 'k]``X]gWi gg'h\Y'UggYgga YbhUh`Yb[h\" = dcfhUbhmž'h\]g'gYWf]cb']g'Ub'UfYU'Zcf'mci 'hc'dfcj]XY']bZcfa Uh]cb'h\UhXcYg'bch[c'h\fci [\'h\Y'Uddfcj YX [cj YfbUbWYghfi Whi fY"Q

5ggYgga Ybh'HUg_g'

5ggYgga Ybh'hJg_	K Y][\h	8iY'8UHY	Gh XYbh@YUfb]b[Ci hWca Ygʻ5ggYggYX
±b!WUgg`UW¶j]hYg`	&\$ı	cb^[c]b[&Ž
DfYgYbhJhjcb.	&\$ı	K	&Ž
J]fhi U`Gma dcg]i a	*\$1	' ⁻ 5i [⁻ &\$&\$	%ž&Ž

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5ggYgga Ybh% +b!WUgg UWhjj]hYg

GHJfh'XUhY.

@Yb[h\."b"U"

8YHJ]`g.

7 cbg]ghg cZei]nnYgža i `hjd`Y WXc]WY ei Yghjcbg UbX chXYf WUgg UWhjj]hjYg"

K YY_`mdfYdUfUhjcb'k]``[YbYfU``mVY'Wca a YbhYX'cb"

Hi fb]hjb gYhjb[. H\]g]g bchU Hi fb]hjb Ugg][ba Ybh

5ggYgga Ybh& DfYgYbhJh]cb

GhUfh'XUhY.

@Yb[h\.'' \$ a]bi hYg fdfYgYbHJh]cbbUbX %) a]bi hYg X]gW gg]cb

8 YW] g.

Mci 'k]```VY`fYei]fYX`hc`i bXYfhU_Y`U`fYgYUfW\\`hcd]Whc`VY`Uddfcj YX`Vmh\Y`Wci fgY`Wcbj Ybcf`UbX`XY`]j Yf`Ub]b!dfc[fYgg`gYa]bUf`cb`]bY`k]h\ 'Zc``ck 'i d`X]gW gg]cb`h\Uhmci 'k]```X]fYWh'H\]g`]g`U`Zcfa Uhjj Y`UggYgga Ybh HUg_ž'k \]W\ 'k]```VY`gW\YXi `YX`UZhYf`k YY_`Zci f`cf`Zj Y`UbX`]g`XYg][bYX`hc`dfYdUfY`mci 'Zcf`h\Y`Z]bU` dfYgYbhUhjcb`h\UhiZcfa g`dUfhcZh\Y`Gma dcg]i a 'dcfhZc`]c`Ugg][ba Ybh'

Gh XYbhg k]``fYWY]j Y]a a YX]UhY gdc_Yb ZYYXVUW_žUbX U ``UhYfžg\cfhigi a a Ufm'

Hi fb]hjb gYhjb[. H\]g]g bchU Hi fb]hjb Ugg][ba Ybh

5ggYgga Ybh' . 'J]fh U`Gma dcg]i a

GhUfh XUhY.

@Yb[h\. &\$ a]b fdfYgYbHJh]cb\2#\&\2) \$\$! &\2\$\$\$ k cfX fdUdYf\2

8YHJ]`g.

 $H\g''UggYgga\YbhhUg_'WcbhU]bg'hhfYY'gWUZZc`XYX'WcadcbYbhg'Ug'Zc``ckg.$

%"'Gma dcg]i a 'dUdYf'UVglfUWh!'' \$'k cfXg'f&\$ı Ł

&"'Cb`]bY'dfYgYbHJhJcb'!'&\$'a]bi hYgžd`i g'%\$'a]bi hY'ei YghJcbg'f(\$i Ł

 $H\]g']g'h\Y'ZbU``UggYgga Ybh'hUg_"$

.

: cfa Uhji YʻZYYXVUW_ʻ]gʻdfcj]XYXʻcbʻ]bX]j]Xi UʻʻWta dcbYbhgʻʻGi a a Uhji YʻZYYXVUW_ʻUbXʻUʻbi a Yf]WUʻʻ[fUXY]gʻdfcj]XYXʻZcfʻh\YʻWta dʻYhYXʻUggYgga Ybhʻʻ

 $\begin{tabular}{ll} Gi Va]gg]cb `bchYg. DUdYf `hc `VY `gi Va]hhYX `k]hh `h]hY `dU[Y `f]bW'k cfX ``Yb[hh\Łž F ca Ub `& `dhž &") Wa a Uf[]bgž '%") <math>\begin{tabular}{ll} gdUW]b[~zV]V^*]c[~fUd\mbox{ } m \end{tabular}$

 $\label{eq:higher} \mbox{Hi fb]h]b'gYh]b[.'H\]g'gg][ba Ybh]g'gi Va]hhYX'h\fci [\'Hi fb]h]b'UbX'gh XYbhg'Xc'bchgYY'Hi fb]h]b g]a]'Uf]hmfYdcfhg''$

F Ygci fWYg

DfYgWf]VYX F Ygci fWYg

;`fWdUg1fgd6^? ge[U+Jc`"`*"'dd"%(%%))""&\$\$+""fWcdm'UjU]`UV`Y`cb'AccX`Y`g]hYt""fgUad`Yg`UjU]`UV`Y`cb

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Hi fb]h]b Gi Va]gg]cb

Image: Ybwei bhyfu'dfcv'ya k \yb'uhhya dhjb['hc'gi va]hmci f'Ugg][ba Ybhh\fci [\ 'Hi fb]h]bž'd'YUgY

Hy'Yd\cby'9| hy'fbu''Gi ddcfhcb'-',) '' ' ' %cf'Ya U]''h\Ya 'cb'Y! hy'fbu'hy'hgi ddcfh4 i bgk "YXi "Ui "''Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-').\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUft"'=Z'mci
UfY'i bUV'Y'hc'gi va]hmci f'Ugg][ba YbhXi Y'hc'U'ZJi 'hk]h\ 'Hi fb]h]b'mci 'a Um'Udd'mZcf'Ub'Y! hy'bg]cbž'Vi hmci
a i ghfYhJ]b'mci f'h]W_Yhbi a VYf'Zfca '9! hy'fbU''Gi ddcfhfU'cb['k]h\ 'Ubmch\Yf'fy'Yj UbhXcW a Ybhgt'hc
]bWi XY'Ug'Yj]XYbW' 'hc'gi ddcfhmci f'Y! hy'bg]cb'Udd']WUh]cb"'=Zmci 'Ya U]''9! hy'fbU''Gi ddcfhmci 'k]'`
Ui hca Uh]WJ'`mfYW']j Y'U'h]W_Yhbi a VYfZ'Vi h]Zmci 'hY'Yd\cbY'mci 'k]``bYYX'hc'gdYW]Z]WJ'`mUg_'Zcf'cbY''
Hi fb]h]b'U'gc'dfcj]XYg'i dXUhy'g'cb'h\Y]f'gmghYa 'ghUh' g'cb'Hk]hyf''

; YbYfU`mž'UggYgga YbhiHug_g'a i ghVY'gi Va]hhYX'Y`YVWfcb]\WJ``mij]U'Y]h\Yf'Hi fb]h]b'cf'U'A ccX`Y Ugg][ba Ybh''=b']bgHJb\W'g'k \YfY'h\]g']g'bchdcgg]V`Yž']hk]```VY'gHJhYX'cb'mci f'\\circ i fgY'g'A ccX`Y'g]hY'k]h\U`hYfbUh]j Y'gi Va]gg]cb'XYHJ]`g"

cfi]bZcfa Uhjcbicbi\ckihcigi Va]hUgg][ba Ybhgicbi]bYij]UiA ccXiY.i\hdg.#gh XYbhi bgk "YXi "Ui #\ck! gi Va]hUgg][ba Ybha ccXiY

5 WUXYa]W<cbYghmUbX D`U[]Uf]ga

D`U[]Uf]ga `]g`i g]b['h\Y`k cfXg`cf`]XYUg`cZch\Yfg`UbX`dfYgYbh]b['h\Ya `Ug`mci f`ck b"`±hWJb`hU_Y`a Ubm Zcfa gžZfca `XY`]VYfUhY`W\YUh]b['hc`UWW]XYbhJ``mWcdm]b['Zfca `U`gci fWY`k]h\ci hUW_bck `YX[Ya Ybh'

IBGK [fcidg'd'U[]Uf]ga]bhc'h\Y'Zc``ck]b['WUhY[cf]Yg.

 $7 \text{ cdm}b[...i g]b[...h\Y.gUa Y.cf.j Yfmig]a] \Uf'k cfXg'hc'h\Y.cf][]bU''hYl h'cf']XYU'k]h\ci h'U\V_bck `YX[]b[...h\Y.cf][]bU''hYl h'cf']XYU'k]h'cf']$

- i bXYfgfUbX mci f'f][\hg'UbX'fYgdcbg]V]`]hJYg'Ug'U'gh XYbhUhl BGK
- VY`Uk UfY`cZd`U[]Uf]ga ž`Wcdmf][\hz'l BGK `Gh XYbh7cXY`cZ7cbXi WhUbX`5VWWdhUV`Y`l gY`cZ I BGK `=\forall H`F Ygci f\W\g`Dc`]\m\m
- VY 'Uk UfY 'cZh\Y 'ghUbXUfXg 'cZVY\Uj]ci f'Yl dYWYX 'cZYj YfmcbY ']b 'h\Y 'l BGK 'Wca a i b]hm
- `cWUHY 'gYfj]WYg'UbX ']bZcfa UH]cb'UVci hI BGK 'UbX'I BGK '@]VfUfm

Gca Y'cZh\YgY'UfYUg'k]``VY'ZJa]`]Uf'hc'mci ž'ch\Yfg'k]``VY'bYk"'; U]b]b['U'gc`]X'i bXYfgHJbX]b['cZU``h\YfY`UhYX'UgdYWng'cZ9@+G9'k]``\Y`d'mci 'a U_Y'h\Y'a cghcZmci f'gh X]Yg'UhI BGK "'\\hd.#gi VYWn[i]XYg"`]VfUfm"i bgk "YXi "Ui #\`]gY#JVci hY`]gY