

ARTS1210

7 cbW dhg cZ5g]U

HYfa 'Hk c''##'&\$&%

7ci fgY[·]Cj Yfj]Yk

GhUZZ 7 cbhUWh 8 YhU] `g

7cbj Ybcfg

B Ua Y	9a U]`	5jU]`UV]`]m m	@cWUh]cb	D∖cbY
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7ci fgY 8YHJ] g

7 fYX]h'Dc]bhg'*

Gi a a UfmcZh\Y 7ci fgY

H\]g; UhYk UmWti fgY`]bhfcXi Wyg`mci 'hc`h\Y`X]ZYfYbhWti bhf]Yg;h\Uha U_Y`i d`h\Y`5g]Ub`fY[]cb`UbX`h\Y]bhYfX]gW]d`]bUfma Yh\cXg`i gYX`hc`fYgYUfW\`UbX`ghi Xm5g]U`f_bck b`Ug`5g]Ub`Ghi X]Ygt"'I g]b[`Ub`U``!5g]U UddfcUW\`k]h\`U`ZcW g`cb`h\Y`h\Y`hk Ybh]Yh\`W\bhi fmž]hk]``[]j Y`mci 'U`VfcUX`_bck `YX[Y`cZh\Y`X]j Yfg]micZh\Y gcW]Yh]Yg`h\UhWtbgh]hi hY`5g]U'`Mci 'k]````YUfb`UVci hih\Y`X]ZYfYbhW``hi fYg`h\Uha U_Y`i d`9UghžGci h\`UbX Gci h\YUgh5g]Už`]bWi X]b[`fY`][]cbž[YbYfU``Wt`cb]U``\]ghcf]Ygž'Wtbghfi Wh]cbg`cZ[YbXYfž5g]Ub`W]h]Ygž'h\Y dc`]h]Wj`cZXYa cWfUWmUbX`Ui h\cf]hUf]Ub]ga ž'UbX`h\Y`WtbbYW]cbg`VYhk YYb`5g]Ub`ZccX`UbX`Yh\b]W [XYbh]hYq"

7 ci fgY @YUfb]b[Ci hWca Yg

%" 5fh]W `UhY`U`VfcUX`VcXmcZ_bck `YX[Y`UVci hih\Y`X]j Yfg]lmiUbX`XmbUa]Wg`cZh\Y`5g]Ub`fY[]cb &" 8YgWf]VY`_YmYj YbhgždYcd`Yž'UbX`hfYbXg`Wcj YfYX`Vmh\]g`Wci fgY"

"5bgk Yf'ei Ygh]cbg'dcgYX'i g]b['Uf[i a Ybh'UbX'Yj]XYbVW

("AU_Y'qWxc'Uf'mUf[iaYbhq'iq]b[']bXYdYbXYbhm'cWUhYX'Yj]XYbWY

HYUWX]b[GhfUhY[]Yg

 $\label{thm:condition} $$H\g''g'Xyg'' byX'hc'Y'd'mci'XYjY'cd'U'eiYghjcb]b['a]bX'kYb'UddfcUWk]b['h\Y'ghiXmcZ5g]U'' H\Y''YWhifYg'dfcj]XY'VUW_[fcibX']bZcfaUhjcb'UbX']bHcXiWY'h\YcfYhJWU''UbX'UbU'mhJWU''dYfgdYWhjYg'UbXXYVUhYg'h\UhUTY'YId'cfYX']b'cfYYIYad']ZYX'VmgdYWJU']nYX'kYY_`mfYUX]b[g'''=h]g']adcfhUbhh\Uhmci''YUfbh\Y'g_]``g'cZWf]hJWU''UbU'mg]g'''H\YgY'g_]``g'bYYX'hc'VY'XYjY'cdYX'fY[i'Uh'mcjYf'hJaY'UbX'hihcf]U'g'UfY'UZbUaYbhU''dUfhcZh\]g''YUfb]b['dfcWygg''Kf]hhYb'fYgdcbgYg'hc'h\Y'fYUX]b[g'hfU]b'mci'hc'fYZYWhUbX$

5ggYgga Ybh

D`YUgY`gYY`h\Y`AccX`Y`g]hY`Zcf`UhtUW\aYbhg`cb.`

fl/k='Hi hcf]U``fYUX]b[g'UbX'ei Ygh]cbg'Zcf'h\Y`fYgdcbgYg'hc`fYUX]b[g'UbX'hi hcf]U``X]gW gg]cbz'`UbX'h\Y`XYhU]`g Zcf'h\Y`cb!`]bY'UWhj]hmhc'VY'X]gW ggYX'U`gc']b'hi hcf]U`g'fh\Y`a UhYf]U``]b'h\Y`cb!`]bY'UWhj]hjYg'k]```U`gc'VY]bWi XYX`]b'h\Y`WUgg'hYghz''

f&L:@YWhifY`\UbXcihg`k\]WX`k]``VY`jYfmigYZI``Zcf`HU_]b[`bchYg`UbX`Zcf`fYj]Yk]b[`Zcf`h\Y`WUgg`hYgh'

.

5ggYgga YbhHUg_g

5ggYgga Ybh'hJg_	K Y][\h	8i Y'8UHY	Gh XYbh@YUfb]b[Ci hWca Yg 5ggYggYX
FYgdcbgYg'hc'FYUX]b[g'	&\$ı	%*#\$*#&\$&%`\$*.\$\$`DA	-
<]ghcf]WU``g]hY`YIYfVJgY`	&\$ı	% #\$+#&\$&%`\$) .\$\$`DA	(
HYgh	&\$ı	\$(#\$,#&\$&%`\$%\$\$`DA	%ž`&ž`'
A U⁄cf [·] 9ggUm	(\$1	\$-#\$+#&\$&%`\$).\$\$`DA	%ž" ž'(

5ggYgga Ybh'8YHJ]`g

5ggYgga Ybh% F YgdcbgYg hc F YUX]b[g

GhUfhiXUhY. '\$' #\$*#&\$&%'\$-.\$\$'5A

8 YHJ] g.

Gh XYbhgʻgi Va]hUʻfYgdcbgYʻfWUʻʻ) \$\$!*\$\$ʻk cfXgŁhcʻgYhei Ygh]cbgʻcbʻUʻk YY_`mfYUX]b[ʻVYZcfYʻcbYhi hcf]U`ʻʻ: YYXVUW_`]gʻVm]bX]j]Xi U``Wca a YbhgžUbX`]b!WUggʻX]gW gg]cb''

5XX]h]cbU`XYhU]`g.

5ggYgga Ybh'& <]ghcf]WU`g]hY`YI YfW]gY

GhUfhiXUhY. '&' #\$*#&\$&%'\$&.\$\$ DA

@Yb[H\\. '*\$\$'k cfXg

8YHJ]`g.

 $: \mathbf{YYXVUW}\underline{W}^{-}]\mathbf{j}\mathbf{g}^{-}\mathbf{W}^{-}\mathbf{j}\mathbf{j}\mathbf{g}^{-}\mathbf{W}^{-}\mathbf{j}\mathbf{j}\mathbf{g}^{-}\mathbf{W}^{-}\mathbf{j}\mathbf{g}^{-}\mathbf{X}^{-}\mathbf{j}\mathbf{v}^{-}\mathbf{y}\mathbf{g}^{-}$

5XX]h]cbU`XYhU]`g.

5b'YbhjfY'`YWhifY']g'X

% Y]f'dfYgYbHJhJcbm Uh `Ug

&\$&%`UbX`ghi XYbhg`bYYX`hc`i d`cUX`h\Y]f`fYgdcbgYg`hc`h\Y`ei Ygh]cbg`Vmi%da `cb`h\UhXUmi`H\YcfYh]WU``mž mci `g\ci `X`\Uj Y`cbY`\ci f`UbX`) \$`a]bi hYg`hc`Xc`h\Y`hYghVi h`='Ua `[]j]b[`U`%\$`a]bi hY`U``ck UbWY`Zcf Xck b`cUX]b[`h\Y`ei Ygh]cbg`UbX`i d`cUX]b[`h\Y`fYgdcbgYg''``

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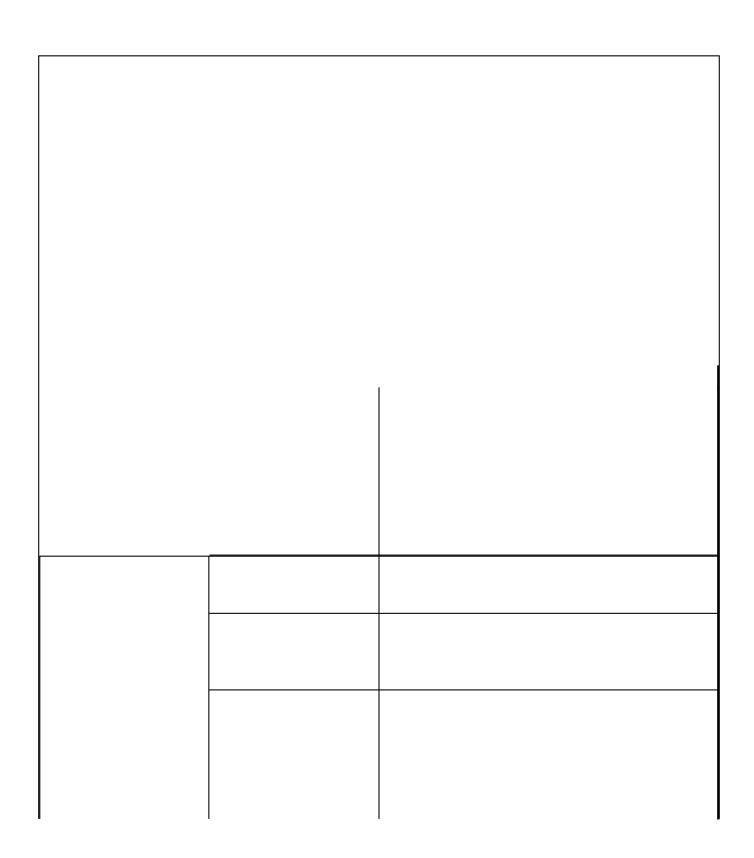
 $\label{eq:higher} \mbox{Hi fb]h]b"gYh]b" (All halls) a property of the label of$

5ggYgga Ybh (. ʿA U cf 9ggUm

GhUfh:XUhY. "\$&#\$*#&\$&%:\$%\$\$ DA

8YHJ]`g.

F YgYUfW '9ggUm'



F Ygci fWyg

DfYgWf]VYX F Ygci fWyg

H\YfY"]g'bc"hYl hVcc_"fYei]fYX"Zcf"h\Y"Wci fgY""

GYY'h\Y'A ccX`Y'G]hY'Zcf'h\Y'Z]Y'cb'"Hi hcf]U``FYUX]b[g'UbX'EiYgh]cbg'Zcf'8]gW gg]cb"ii bXYf'h\Y'\YUX]b["7cbhYbhg'UbX'FYgcifW\g"Zcf'h\Y'`]ghcZfYUX]b[g'fYei]fYX'Zcf'YUW\k\YY_"'FYUX]b[g'Zcf'h\p'\]g'UfYUW\ygg]V`Y'Y`YWfcb]WU``mh\fci[\'h\Y'@]VfUfm@Y[Ubhc'gmghYa'Ya VYXXYX']b'h\Y'A ccX`Y'g]hY'Zcf'h\Y'\thi fgY"'''7`]W_cb'h\Y'[fYYb']Wcb'Ybh]hYX'"FYei]fYX'FYUX]b[g'Zcf'Hi hcf]U`g'"

 $H(Y^*) = g'hc'h(Y'cb') + Y'cb') + Y'cb' + Y$

FYWca a YbXYX FYgci fWyg

GYY a m\UbXci hcb 9ggUmei Yghcbg UbX V]V`]c[fUd\]Yg"

7 ci fgY 9j U'i Uhjcb UbX 8 Yj Y'cda Ybh

 $: YYXVUW_k] ```VY'[U]bYX'h fci [\ A m9I dYf]YbW'Uhih Y'YbX'cZhYfa "`=\Uj Y'fYgdcbXYX'hc'h Y'ZYYXVUW_Vm' fYXi W]b['h Y'UggYgga Ybh'''@UghmYUf''f&$&$L'h c'fYgdcbgYg'hc'fYUX]b[g'k YfY'fYei]fYX"': fca '&$&%= \Uj Y'fYXi WXX'h]g'hc'cb'm%fYgdcbgY'hc'fYUX]b['Xi Y']b'k YY_'' "'$

7 ca a Ybhg]bWi XYX k YfY.

"A]bUfg``YWn fYg`k YfY`gi dYf`Yb[U[]b[`Xi Y`hc`\Yf`\i a ci fž'dfcj]X]b[`dYfgcbU``Yl dYf]YbWfg`cb``YWn fY hcd]Wg`UbX`]bWcfdcfUh]cb`cZj]XYcg`hc`dfcj]XY`Z fh\Yf`]bg][\hg`Zcf`ghi XYbhg`cb`h\Y`hcd]Wg\Yfg`X]gW gg]b["`G\Y`a UXY`hcd]Wg`gi dYf`YUgmhc`i bXYfghUbX`UbX`h\Y``YWn fY`\UbXci hg`k YfY`YgdYW]U``m\Y`dZ``Zcf fYj]g]cb""

"5```]b`U```=fYU``mYb`cmYX`7 cbWYdrg`cZ5g]U`!!`]h\Ug`VYYb`a ma cghYb`cmUV`Y`Wci fgY`Uhi b]`rc`XUhY"`±i\Ug`YbWci fU[YX`a Y`rc`a U'cf`]b`5g]Ub`Ghi X]Yg`UbX`\Y][\hYbYX`a mdUgg]cb`]b`r\Y`5g]Ub`fY[]cb""

"5XX]h]cbU``mh\Y`UggYgga Ybhg`k YfY`\][\`mfY`Yj Ubh'hc'h\Y`Wci fgYk cf_'UbX'j Yfmi gYZi ``]b`[U]b]b['U`VYhhYf i bXYfghUbX]b['cZgca Y'cZh\Y`Wci fgYfgi'WcbWYdhg""

 $\begin{tabular}{ll} $$ ``H\Y'hcd] Wg'fY[UfX]b['5g] Ub'W'hifY'fWch\Ygz'[YbXYf'UbX'ZYa]b] ga z'ZccX'UbX'fY'][]cbŁ'k YfYz'Zcf'a Y'k Y''! \\ hci[\hcihubX'j Yfmk Y''`Wcbg] XYfYX'''=k Ug']blfcXi WYX'hc'X] ZZYfYbh_]bXg'cZ5g] Ub'WcbW'dhg'UbX'W'hifYgz k \]WX'a UXY'a Y'dfcZcibX'mUddfYW] UhY'a m'\Yf] hU[Y'YjYb'a cfY'''=Yb'cmYX'h\Y'fYUX] b[g'UbX'h\Y''YWffYg k \]WX'k YfY'Yb[U[]b[""$

"'='Y**‰** 'UbX'W `h h\

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 i]gii g]b[ih\Yik cfXgicfi]XYUgicZch\YfgiUbXidfYgYbh]b[ih\Ya iUgimci fick b"i=hWJbihU_Yia Ubm Zcfa gžZfca iXYi]VYfUhYiWXYUh]b[ihciUWW]XYbhU`mWcdm]b[iZfca iUigci fWYik]h\ci hiUW_bck iYX[Ya Ybh'

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

- i bXYfgHUbX'mci f'f][\hg'UbX'fYgdcbg]V]`]h]Yg'Ug'U'ghi XYbh'Uhi BGK VY'Uk UfY'cZd`U[]Uf]ga ž'Wcdmf][\hž'I BGK 'Ghi XYbh'7cXY'cZ7cbXi Wh'UbX'5VWWdhUV`Y'I gY'cZ IBGK =7 H°F Ygci fW/g°Dc`]Wm

5 WUXYa]W + DZcfa Uh]cb

: cf'YggYbhJU`'ghi XYbhi]bZcfa UhJcb'fY`UhJb['hc.

- fYei Yghg Zcf Yl hYbg]cb/
- `UhY`gi Va]gg]cbg`[i]XY`]bYg/
- fYj]Yk 'cZa Uf_g/
- I BGK '< YU'h\ 'UbX'GUZYhm'dc']W]Yg/