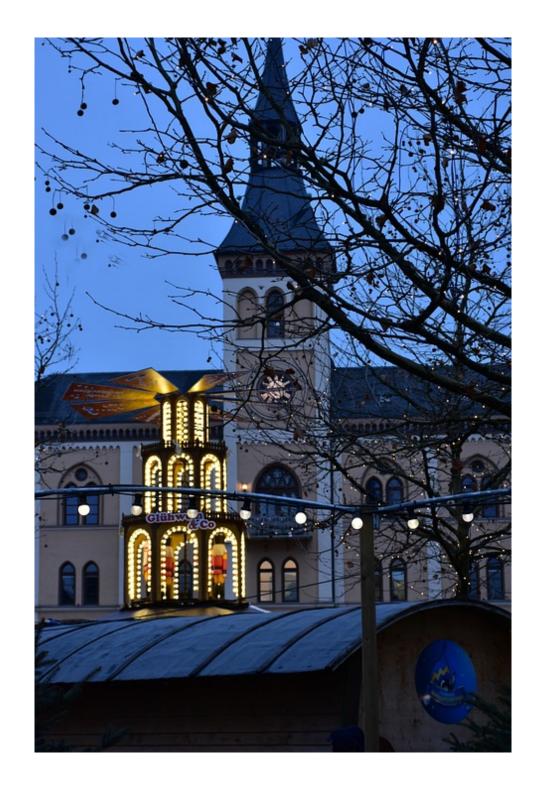


# $DZUZZYb \ CZYb \ Ub \ XYf = a . \ 9]b \ Y \ Y]a \ h]dd$ $ZØf \ 9bh X Y \ W \ Yf \ b X \ Yb]Y \ Yf \$



K ]``\_ca a Yb`]b`DZUZZYb\cZYb`Ub`XYf`=a žY]bYa `W\Ufa UbhYbGhÀXhW\Yb`]a `< YfnYb`6UmYfbgž`XUg`a ]h`gY]bYf`A ]gW\ib[`Ui g; YgW\]W\hYžBUhi f`i bX`?i`hi f`VY[Y]ghYfh"`9]b[YfU\a h`j cba U`Yf]gW\Yb`@UbXgW\UZhYb`i bX`XYf`]Xm``]gW\Yb`=a ž`V]YhYhDZUZZYb\cZYb`b]W\h'bi f`Y]bY`ZUgn]b]YfYbXY`5`hghUXhž`X]Y`a ]h`]\fYb\]ghcf]gW\Yb`; YVÀi XYb`i bX`j Yfk]b\_Y`hYb`; UggYb`ni a `: `Ub]YfYbY]b`AXhž`gcbXYfb`Ui W\`nU\`fY]W\Y`A O[`]W\\_Y]hYbž`X]Y`BUhi f`]bj c``Yf`DfUW\h'ni `Yf`YVYb"`K Ybb`Xi `Y]b`: Y]bgW\a YW\_Yf`V]ghž`k]fgh

## $9bhXYW_ib[XYf']ghcf]gWXYb'5`hghUXh'jcbDZUZZYb\cZYb$

8]Y'5`hghUXh'j cb'DZUZZYb\cZYb']gh'[YdfÀ[h'j cb'[i h'Yf\U`hYbYb; YVÀi XYbž'X]Y'j YfgWX]YXYbYb'9dcWXYb'YbhghUa a Yb"'9]bYg'XYf a Uf\_UbhYghYb'6Ui k Yf\_Y']gh'XUg'VUfcW\_Y'FUh\Ui gž'XUg'a ]h'gY]bYf ]a dcgUbhYb': UggUXY'i bX'XYa 'Y`Y[UbhYb'Hi fa 'XUg'NYbhfi a 'XYfGhUXh'Xca]b]Yfh"8]Y'XYhU]`fY]WXY'5fWX]hY\_hi f'a UWXh'Yg'ni 'Y]bYa VY`]YVhYb': chca ch]j 'i bX'n]Y\h'6Ygi WXYf'Ui g'XYf'[UbnYb'FY[]cb Ub"

I bk Y]h'XYg'F Uh\ Ui gYg'Z]bXYh'g]W\ 'X]Y'Gh"'  $\approx$  \ UbbYg'6Udh]gh'? ]fW\ Yž X]Y'U'g'Y]bYg'XYf'À`hYghYb'6Ui k Yf\_Y'DZUZZYb\cZYbg'[]`h"'  $\Rightarrow$  fY fca Ub]gW\ Yb'I fgdfØb[Y'g]bX']a a Yf'bcW\ 'g]W\ hVUf'i bX'j Yf`Y]\ Yb XYf'?]fW\ Y'Y]bYb'VYgcbXYfYb'7\ Ufa Y"'8]Y'\_Øbgh`Yf]gW\ [YghU`hYhYb': YbghYf'i bX'X]Y'VYY]bXfi W\_YbXY'  $\Rightarrow$  bYbUi gghUhhi b[`UXYb'ni f'6Yg]W\ h][i b['Y]b'i bX'nYi [Yb'j cb'XYf'h]YZYb FY`][]cg]hÀh'XYf'FY[]cb"

9]b'VYgcbXYfYg'<][\`][\hi]gh'XYf'GhUXhd`Uhnž'XYf'b]W\h'bif'U`g < YfnghØW\_'XYf'5`hghUXh'Z b[]Yfhž'gcbXYfb'UiW\'Y]b'VY`]YVhYf HfYZZdib\_h'ZØf'9]b\Y]a]gW\Y'ibX'Hcif]ghYb']gh''la[YVYb'jcb7UZÅg'ibX'\_`Y]bYb'; YgW\ÀZhYbž']gh'XYf'D`Uhn']XYU`žia'VY]'Y]bYf

HUggY?UZZYYX]Y5ha cgd\ÀfYni [Yb]Y»YbcXYf``c\_U`YGdYn]U`]hÀhYb'ni 'dfcV]YfYb"J]Y`YJYfUbghU`hi b[Ybž'k]YA Àf\_hYi bX:YghYž'Z]bXYb'fY[Y`a À»]['Ui Z'X]YgYa ``YV\UZhYb'D`Uhn'ghUhhi bX`Vf]b[Yb'X]Y; Ya Y]bgWXUZh'ni gUa a Yb"

6Y]Y]bYa 'FibX[Ub['XifW.'X]Y'5`hghUXh'gc``hY'a Ub'ibVYX]b[h'X]Y j YfghYW\_hYb'; UggYb'ibX'<]bhYf\ÒZY'Yf\_ibXYb"'<]Yf'j YfghYW\_Yb g]W\'\_`Y]bYž'W\Ufa UbhY'; YgW\ÀZhY'ibX'[Ya Øh`]W\Y'@c\_U`Yž'X]Y nia 'JYfk Y]`Yb'Y]b`UXYb"'8]Y'?ibghgnYbY']gh'YVYbZU``g'ghUf\_j YfhfYhYbž'ibX'fY[Y`a À»]['Z]bXYb'5igghY``ib[Yb'jcb'`c\_U`Yb?Øbgh`Yfb'ghUhhž'X]Y'X]Y'\_fYUh]j Y'GY]hY'XYf'GhUXh'dfÀgYbh]YfYb"

K Ybb'G]Y'Yhk Ug'; YgWk]WkhY'`]j Y'Yf`YVYb'a ÒWkhYbž'gc``hYb'G]Y'XUg\]Yg][Y'GhUXha i gYi a 'VYgi WkYb"'9g'V]YhYh']bhYfYggUbhY'9]bV`]W\_Y]b'X]Y'9bhk]W\_`i b['XYf'GhUXh'i bX']\fYf'6Yk c\bYf"'8]Y 5i gghY``i b[Yb'g]bX'UVk YWkg`i b[gfY]Wk'i bX']bZcfa Uh]j ž'i bhYfUbXYfYa 'a ]h'\]ghcf]gWkYb'5fhYZU\_hYbž'X]Y'Ui g'j YfgWk]YXYbYb 9dcWkYb'ghUa a Yb"

8]Y`\]ghcf]gW\Y`6YXYi hi b[`DZUZZYb\cZYbg`nY][h`g]W\`Ui W\`]b`XYf ghÀXhYVUi`]W\Yb`D`Ubi b["`J]Y`Y`XYf`U`hYb; YVÀi XY`g]bX`j cb Y]bYa `[YgW\ØhnhYb`8Yb\_a U`gW\i hn`i a [YVYbž`XYf`XUni `VY]hfÀ[hž XUg`\_i`hi fY``Y`9fVY`ni `VYk U\fYb"`6Y]`[YZØ\fhYb`GhUXhZØ\fi b[Yb YfZU\fYb`X]Y`6Ygi W\Yf`a Y\f`ØVYf`X]Y; YgW\]W\hYb`i bX @Y[YbXYbž`X]Y`X]Y`GhUXhï a [YVYb"

< ]Yf'g]bX'Y]b][Y'H]ddg'ZØf' $\Rightarrow$ fYb'6Ygi W\']b'XYf'\]ghcf]gW\Yb 5`hghUXh.

- 6Ygi WXYb'G]Y'XUg'FUh\Ui g. '8]Y'5fWX]hY\_hi f']gh VYY]bXfi W\_YbX'i bX'`c\bh'Y]bYb'6`]W\_'j cb']bbYb"
- DfcV]YfYb'G]Y'`c\_U`Y'GdYn]U`]hÀhYb.'8]Y'7UZÅg'i bX
   FYghUi fUbhg'fi bX'i a 'XYb'GhUXhd`Uhn'V]YhYb'j ]Y`Y
   VUmYf]gWXY'? Ògh`]WX\_Y]hYb"
- Bi hnYb'G]Y'[YZØ\fhY'HcifYb.'9|dYfhYb'\_ÒbbYb'=\bYb]bhYfYggUbhY'=bZcfa Uh]cbYb'ibX'; YgWX]WXhYb'ØVYf'X]YGhUXh'bÀ\YfVf]b[Yb"
- =bhYfU[]YfYbG]Ya]hXYb9]bY]a]gWXYb.CZhaUg

\_`ObbYb`X]YgY`X]Y`VYghYb`H]ddg`i bX`j YfghYW\_hYb`GW\A`hnY XYf`GhUXh`j YffUhYb"

### $K \ ]WX h][ Y GY \setminus Y b g k \emptyset f X][ _Y]hY b ]b XYf 5 hghUXh$

GY\Ybgk ØfX][ _Y]h	6YgWkfY]Vib[	
FUh\Ui g	6UfcW_Yg'; YVÀi XY'a ]h	
	Y`Y[UbhYf': UggUXY'i bX	
	\]ghcf]gW\Ya 'K Yfh"	
Gh"∵≈\UbbYg~6Udh]gh'?]fW\Y	9]bY`XYf`À`hYghYb`?]fWXYb`XYf	
	GhUXh'a ]h'fca Ub]gWXYb	
	9`Ya YbhYb"	
GhUXhd`Uhn	HfYZZdib_h`ZØf'JYfUbghU`hib[Yb	
	i b X '_i `hi fY ``Y '5 _h]j ]hÀ hY b "	
GhUXha i gYi a	≠oZcfa Uh]j Y`5i gghY``i b[Yb`ØVYf	
	$X]Y^{+}; YgWX]WXhY^{+}DZUZZYb \ cZYbg"$	

8]Y 5`hghUXh'j cb'DZUZZYb\cZYb'Ub'XYf'=a ']gh'Y]b'k U\fYg'¾k Y`ž
XUg'XUfUi Z'k UfhYhž'YbhXYW\_h'ni 'k YfXYb"'CV'G]Y'Ub'; YgWk]WkhYž
5fWk]hY\_hi f'cXYf'Y]bZUWk'Ua '5a V]YbhY']bhYfYgg]Yfh'g]bX' 'X]YgY
WkUfa UbhY'GhUXh'V]YhYh'ZØf'YXYb'Yhk Ug"'8Yf'6Ygi Wk'`c\bh'g]Wk
b]Wkh'bi fži a 'X]Y'\]ghcf]gWkYb'; YVÀi XY'ni 'VYk i bXYfbž'gcbXYfb
Ui Wk'i a ']b'X]Y'`YVYbX][Y'?i `hi f'XYf'FY[]cb'Y]bni hUi WkYb"

## BUhi f'Yf`YVYb']a 'BU\Yf\c`i b[g[YV]Yh'Ub XYf'=`a

DZUZZY b\cZY b`Ub`XYf`=a 'V]Y hY h`gY]bYb`6Ygi WX Yfb`b]WX h`bi f`Y]bY WX Ufa UbhY`5`hghUXhž`gcbXYfb`Ui WX`VYY]bXfi W\_YbXY B Uhi f`UbXgWX UZhYbž`X]Y`ni a '9bhgdUbbYb`i bX`9fZcfgWXYb Y]b`UXYb"`8 Ug`BU\Yf\c`i b[g[YV]Yh`Ub`XYf`=a ']gh`Y]b`k U\fYf GWX Uhn`ZØf`B Uhi fZfYi bXY`i bX`ci hXccfVY[Y]ghYfhY`FY]gYbXY"`A]h gY]bYb`a U`Yf]gWXYb`K Y[Yb`i bX`XYf`fi\][Yb`:`i gg`UbXgWX UZh`]gh Yg`XYf`dYfZY\_hY`C fhži a 'XYa '5``hU[gghfYgg`ni 'YbhZ]Y\Yb"

9bh`Ub[ 'XYf'=`a 'YfghfYW\_h'g]W\ 'Y]b'i a ZUb[ fY]W\ Yg'B Yhn'Ub K UbXYf!'i bX'F UXk Y[ Ybž'X]Y'Xi fW\ 'X]Y']Xm``]gW\ Y'B Uhi f'ZØ\ fYb" 8 ]Y'UVk YW\ g`i b[ gfY]W\ Y'@UbXgW\ UZh']gh'gck c\``ZØf'5bZ\\deltab[ Yf'U`g

Ui W. ZØf YfZU\fYbY K UbXYfYf [YY][bYh" 8]Y K UbXYfk Y[Y g]bX [i h'Ui g[YgW]`XYfh'i bX V]YhYb UhYa VYfUi VYbXY 5i gV`]W\_Y 'Ui Z X]Y i a `]Y[YbXYb': Y`XYf i bX K À`XYf"

- K UbXYfk Y[ '='a hU`. '8]YgYf'a U`Yf]gWXY'K Y[ 'j Yf`Ài Zh'X]fY\_h
  Ua ': `i gg'Ybh`Ub[ 'i bX'V]YhYh'nU\`fY]WXY
  GY\Ybgk ØfX][ \_Y]hYb'k ]Y'U`hY'A Ø\`Yb'i bX'ZUgn]b]YfYbXY
  : `cfU'i bX': Ui bU"
- FUXk Y[ 'i a 'DZUZZYb\cZYb.'⇒XYU`ž'i a 'X]Y'l a [ YVi b[ 'Ui Z nk Y]'FÀXYfb'ni 'Yf\_i bXYb"'A ]h'[ YgUa h'fi bX') ) '\_a ']gh'Yg Y]b'\_]bXYfZfYi bX`]WXYf'i bX'`Y]WXh'ni [Àb[`]WXYf'K Y[ "
- : ]hbYgg!DUfWcifg. '9bh`Ub[ 'XYf'=`a '[ ]Vh'Yg'a Y\fYfY GhUh]cbYbž'X]Y': ]hbYgg'i bX'6YkY[i b[ 'ZÒfXYfbž'dYfZY\_h'ZØf U\_h]j Y': Ua ]`]Yb'cXYf'GdcfhVY[Y]ghYfhY"

9]b'k Y]hYfYg'<][\`][\h'g]bX'X]Y'DUf\_Ub`U[Yb'i bX'K]YgYbž'X]Y'g]W\Ybh`Ub['XYg': `i ggYg'YfghfYW\_Yb'' 8]YgY'V]YhYb'b]W\h'bi f'D`Uhn'ni a GdUn]YfYb[Y\Ybž'gcbXYfb'Ui W\ni a 'D]W\_b]W\_Yb'i bX'9bhgdUbbYb'' 9]b'VY`]YVhYf'Gdch']gh'XYf'GhUXhdUf\_ž'k c'a Ub'X]Y'GYY`Y'VUi a Y`b`UggYb'i bX'X]Y'BUhi f'[Yb]Y»Yb'\_Ubb'''6Y]'gW\ÒbYa 'K YhhYf'g]hnYb\]Yf'j ]Y`Y'A YbgW\Yb'Ui Z'XYb'K]YgYbž'`YgYb'Y]b'6i W\cXYf[Yb]Y»Yb'Y]b'D]W\_b]W\_'a ]h': fYi bXYb'i bX': Ua ]`]Y''

: Øf`X]Y`H]Yf`]YV\UVYf`i bhYf`XYb`6Ygi WXYfb`[]Vh`Yg`\]Yf`YVYbZU``g
j ]Y``ni `YbhXYW\_Yb"`8]Y`I ZYf`XYf`=`a `g]bX`@YVYbgfUi a `ZØf`j ]Y`Y
j YfgWX]YXYbY`Jc[Y`UfhYbž`XUfi bhYf`FY]\Yf`i bX`9bhYb"`6Y]`Y]bYa
[Ya Øh`]WXYb`GdUn]Yf[Ub[`cXYf`Y]bYf`FUXhci f`\_Ubb`a Ub`a ]h
Yhk Ug`; `ØW\_`X]YgY`H]YfY`]b`]\fYa `bUhØf`]WXYb`I a ZY`X
VYcVUWXhYb"`6YgcbXYfg`gWX`Ob`]gh`Ygž`XYbgY`VYb`K Y[`k À\fYbX
XYf`j YfgWX]YXYbYb`\$J\fYgnY]hYb`ni `VY[Y\Ybž`XU`X]Y`BUhi f`g]WX
ghÀbX][`j YfÀbXYfh`i bX`bYi Y`DYfgdY\_h]j Yb`V]YhYh"

=a 'Gca a Yf'V]YhYh'X]Y '=`a 'Ui » YfXYa 'X]Y 'A Ò[`]W\\_Y]h'ni a '6UXYb i bX'? Ubi ZU\fYb"'8 Ug'\_`UfY'K UggYf']gh'b]W\h'bi f'YfZf]gW\YbXž gcbXYfb'Ui W\']XYU`'ni a '6UXYb"'9]b][Y'5bV]YhYf']b'XYf'FY[]cb j Yfa ]YhYb': U\ffÀXYf'i bX'6cchY'i bX'cf[Ub]g]YfYb'[YZØ\fhY Hci fYbž'gcXUgg'YXYf'X]Y'I a [YVi b['Ui Z'gY]bY'Y][YbY'5fh YbhXYW\_Yb'\_Ubb"'? Ubi ZU\fYb'Ui Z'XYf'=`a ']gh'Y]bY'[fc» Ufh][Y

A Ò[`]WX\_Y]hži a 'X]Y'k i bXYfgW\ÒbY'@UbXgW\UZh'Ui g'Y]bYf'UbXYfYb DYfgdY\_h]j Y'ni 'Yf`YVYb"

 $6 YgcbXYfg': Ua \ ]`]Yb'``UVYb']a ``BU``Yf``c`i b[ g[ YV]Yh'`Ub'`XYf'=`a ``X]YA ``O[``]WX_Y]hz'j ]Y`Y'5_h]j ]hAhYb'`ni '`[ Yb]Y">Yb''`Gd]Y`d`AhnYz ; f]``d`AhnY'i bX'gdYn]Y``Y': fY]nY]hY]bf]WXhi b[ Yb'`ZØf'?]bXYf'gcf[ YbXUZØfz'XUgg'XYf'`HU[ '`ZØf'X]Y'[ UbnY': Ua ]`]Y'i bhYf`\U`hgUa 'i bXUVK YWXg`i b[ gfY]WX']gh'''8Yf'[ fc">nØ[ ][ Y'D`Uhn']a ': fY]YbYfa ``O[``]WXh'Yg'XYb'?]bXYfbz'g]WX'ZfY]'`ni '`VYK Y[ Yb'i bX'ni 'gd]Y`Ybz'k A`\fYbX'9fk UWXgYbY'YbhgdUbbYb'_ObbYb''$ 

BUhi fZfYi bXY'gc``hYb'Ui WX'X]Y'; Y`Y[Yb\Y]h'bi hnYbž'X]Y
j YfgWX]YXYbYb'BUhi fgWXi hn[YV]YhY']b'XYf'I a [YVi b['ni
VYgi WXYb"'8]YgY'[YgWXØhnhYb': `ÀWXYb'g]bX'b]WXh'bi f
FØW\_ni [gcfhY'ZØf'j]Y`Y'VYXfc\hY'H]YfUfhYbž'gcbXYfb'Ui WX'Y]bY
k i bXYfVUfY'A Ò[`]WX\_Y]hž'X]Y'6]cX]j Yfg]hÀh'XYf'FY[]cb'\Ui hbU\'ni
Yf`YVYb"'; YZØ\fhY'Hci fYb'Xi fWX'X]YgY'; YV]YhY'V]YhYb'cZh
gdUbbYbXY'9]bV`]W\_Y'i bX'\DZcfa Uh]cbYb'ØVYf'X]Y'fY[]cbU`Yb
2 \_cgmghYa Y"

K Ybb'Xi 'a Y\f'ØVYf'X]Y'BUhi fgW\i hn[YV]YhY'cXYf'j YfgW\]YXYbY 5\_h]j ]h\hankan'b']b'XYf'BUhi f'YfZU\fYb'a \(\hankan'a\) \(\han

Ni gUa a YbZUggYbX``Àggh'g]W\`gU[Ybž'XUgg`XUg BU\Yf\c`i b[g[YV]Yh'Ub`XYf'=`a 'Y]b`k U\fYg`DUfUX]Yg`ZØf BUhi f`]YV\UVYf']gh"'9[U`ž'cV'Xi '[YfbY'k UbXYfghž'FUX'ZÀ\fghž d]W\_b]W\_gh'cXYf'Y]bZUW\`bi f'X]Y'5i gg]W\h'[Yb]Y\"h' \\]Yf'Z]bXYh  $\ YXYf'Yhk\ Ugž'XUg']\ b'VY[Y]ghYfh"'A]h'gY]bYf'VYY]bXfi W_YbXYb bUhØf`]W\Yb'GW\`Ob\Y]h'i bX'XYb'j ]Y`ZÀ`h][Yb': fY]nY]ha <math>\ O[`]W\_Y]hYb$  ]gh'DZUZZYb\cZYb'Ub'XYf'=`a 'Y]b']XYU`Yf'Cfhži a 'X]Y'BUhi f']b'j c``Yb  $\ N\emptyset[Yb'ni '[Yb]Y\)$ Yb"

# ?i`]bUf]gWXY'?Ògh`]WX\_Y]hYb'XYf'FY[]cb.'9]b; Ui a YbgWXa Ui g

 $K Ybb `G]Y `DZUZZYb \ cZYb `Ub `XYf `= a ~VYgi ~WXYb \ z`gc ``hYb `G]Y `b]WXh'bi f$ 

 $X]Y`UhYa\ VYfUi\ VYbXYb`@UbXgWkUZhYb`i\ bX`X]Y`\ ]ghcf]gWkY`5`hghUXh [Yb]Y``Ybž`gcbXYfb`Ui Wk`X]Y`\_i`]bUf]gWkYb`8Y`]_UhYggYbž`X]Y X]YgY`FY[]cb`ni`V]YhYb`\Uh"`8]Y`VUmYf]gWkY`?ØWkY`]gh`VY_Ubbh`ZØf]\fY`\Yfn\UZhYb`i\bX`Ødd][Yb`;\Yf]Wk\hYž`X]Y`cZh`j\cb`\cWk\Yfh][YbžfY[]cbU`Yb`Ni\hUhYb`[YdfÀ[h`g]bX"`<]Yf`g]bX`Y]b][Y`XYf`_Ògh`]WkYb GdYn]U`]hÀhYbž`X]Y`G]Y`i\bVYX]b[h`dfcV]YfYb`gc``hYb"$ 

9]bY'XYf'VY\_UbbhYghYb'HfUX]h]cbYb']b'6UmYfb']gh'X]Y 6]YfVfUi \_i `hi f"' $\pm$ 0'DZUZZYb\cZYb'Z]bXYb'G]Y'nU\`fY]W\Y'6fUi YfY]Ybž X]Y'Y]b\Y]a ]gW\Yg'6]Yf'\YfghY``Ybž'XUfi bhYf'X]Y'hfUX]h]cbY``Y K Y]» V]YfgcfhY"'J]Y`Y'XYf'`c\_U`Yb'6]Yf[ ÀfhYb'`UXYb'XUni 'Y]bž'VY] Y]bYa '\_ $\emptyset$ \`Yb'6]Yf'i bX'Y]bYa '6fYnYb'X]Y'VUmYf]gW\Y ; Ya  $\emptyset$ h`]W\\_Y]h'ni '[ Yb]Y» Yb"'6Y`]YVhY'A Uf\_Yb'g]bX'X]Y' 6fUi YfY] DZUZZYb\cZYb 'i bX'X]Y' 6fUi YfY]'A U]f ž'k c'a Ub'cZh'X]fY\_h'j cf'Cfh X]Y'Zf]gW\Yb'6]YfY'j Yf\_cghYb'\_Ubb"

Ni 'XYb 'hmd]gWX Yb 'VUmYf]gWX Yb'; Yf]WX hYb 'nÀ\ `Yb 'Ui WX GWX k Y]bg\UI Yž'?bÒXY``i bX'6fUhk i fgh"'9]b'A i gg']gh'XUg' <YbX` fbfUh\À\bWXYbŁž'XUg'dYfZY\_h'[Yk Øfnh'i bX'gWX Òb'\_bi gdf][']gh"'8]Y?ca V]bUh]cb'Ui g'gUZh][Ya ': `Y]gWX'i bX'Y]bYf'\_bi gdf][Yb'< Ui ha UWX h'Yg'ni 'Y]bYa 'VY`]YVhYb'; Yf]WX h']b'XYb'FYghUi fUbhg'XYf GhUXh"'8]Y'`c\_U`Y'?ØWXY'gYhnh'cZh'Ui Z'Zf]gWXYž'fY[]cbU`Y'Ni hUhYbž gcXUgg'G]Y'; YgWXa ÀW\_Yf'Yf`YVYb'\_ÒbbYbž'X]Y'X]fY\_h'Ui g'XYf Ia [YVi b['ghUa a Yb"

9]b'k Y]hYfYg'<][\`][\h'g]bX'X]Y'GØ» gdY]gYb'i bX'6UW\_k UfYbž'X]Y']bDZUZZYb\cZYb'j YfghÀf\_h'ni f'HfUX]h]cb'[Y\ÒfYb"'8Yf' 6UmYf]gWXY5dZY`ghfi XY` ']gh'\]Yf'VYgcbXYfg'VY`]YVh'i bX'k ]fX'a ]h'Y]bYfDcfh]cb'GU\bY'gYfj ]Yfh"'5i WX'X]Y' F]bXYffci `UXY ']gh'Y]bY GdYn]U`]hÀhž'X]Y'Ui Z'\_Y]bYf'GdY]gY\_UfhY'ZY\`Yb'gc``hY"'CZha U`gkYfXYb'ni 'XYb'; Yf]WXhYb'Ui WX'Zf]gWXY'GU`UhY'Ub[YVchYbž'X]Y'a ]hfY[]cbU`Ya'; Ya ØgY'ni VYfY]hYh'k YfXYb"

9]b; Y\Y]a h]dd ZØf: Y]bgW\a YW\_Yf]gh'XUg' GW\Ya a Yb']a GhÀXh]gW\Yb FYghUi fUbh ž'XUg'Y]bY'\_fYUh]j Y'A ]gW\i b['Ui g VUmYf]gW\Yb'i bX']bhYfbUh]cbU`Yb'? ØW\Yb'UbV]YhYh'' < ]Yf'\_ÒbbYbG]Y']bbcj Uh]j Y'; Yf]W\hY'[Yb]Y» Ybž'X]Y'a ]h'hfUX]h]cbY``Yb VUmYf]gW\Yb'Ni hUhYb'ni VYfY]hYh'k YfXYb''8]Y'5ha cgd\ÀfY']gh

[Ya Øh`]W\`i bX`ZfYi bX`]W\`ž`k Ug`XUg`9ggYb`ni `Y]bYa `VYgcbXYfYb 9f`YVb]g`a UW\`h"

8]Yii a `]Y[YbXYb'6Ui Yfba Àf\_hY'g]bX'XYf']XYU`Y'C fhžii a ``c\_U`Y DfcXi \_hY'ni '\_Ui ZYb''' < ]Yf'Z]bXYb'G]Y'? ÀgYž'K i fghk UfYb'i bX Zf]gWXYg'C Vgh'i bX'; Ya ØgYž'X]Y'j cb'XYb'UbgÀgg][Yb'@UbXk]fhYbUb[YVchYb'k YfXYb'''6Ygi WXYb'G]Y'XYb'A Uf\_h'Ua 'A ]hhk cWX'cXYfGUa ghU[žii a 'X]Y'j c``Y'5i gk U\`ni '[Yb]Y»Yb'i bX'j ]Y``Y]WXh'Y]bdUUf' GWXa Ub\_Yf` 'ZØf'qdÀhYf'a ]hni bY\a Yb'''

9]b'k Y]hYfYf'\_i `hi fY``Yf'; Ybi gg'g]bX'X]Y'K Y]bZYghYž'X]Y']a '\\\f\ghUhhZ]bXYb'i bX'Ub'XYbYb'`c\_U`Y'K ]bnYf']\fY'VYghYb'K Y]bY dfÀgYbh]YfYb''; Yb]Y» Yb'G]Y'X]Y'VUmYf]gW\Yb'K Y]» k Y]bY'i bX'X]Y X]Yg'\(\hat{A}\f)[ Yb'BYi \Y]hYb\z'X]Y'Ua 'I ZYf'XYf'\)=a 'j Yf\_cghYh'k YfXYb'' 8]Yg'[ ]Vh'\(\hat{A}\text{b}Yb'b)W\th'bi f'X]Y'A \(\hat{O}[\cdot]\)W\\_Y]h\z'j YfgW\]YXYbY K Y]bgcfhYb'ni 'dfcV]YfYb\z'gcbXYfb'Ui W\'a ]h'XYb'K ]bnYfb']bg; Ygdf\(\hat{A}\W\'ni '\_ca a Yb'i bX'a Y\f'\@VYf'X]Y'K Y]bdfcXi \_h]cb']b'XYf FY[ ]cb'ni 'YfZU\fYb''

<]Yf'\UVYb'k]f'Y]bY'\_i fnY'HUVY``Y'ØVYf'Y]b][Y'XYf
[Ughfcbca]gW\Yb'<][\`][\hgž'X]Y'G]Y'b]W\hijYfdUggYb'gc``hYb.</pre>

; Yf]W\h 6YgW\fY]Vi b[
------------------------

GWXkY]bg\UIY	?bi gdf][ '[ YVfUhYbY'< Ul Y'a ]h	
	GUi Yf_fUi hii bXi?bÒXY`b"	
< Y b X `	GUZh][Yg*6fUh\À\bW\Ybž*dYfZY_h	
	[Yk Øfnhi bX [c`XVfUi b"	
5dZY`ghfi XY`	GØ» Ygʻ; YVÀW_ʻa ]hʻŸdZY`bž'N]a h	
	i bX`Y]bYf`GU\bY\Ui VY"	
6]Yf	<ui g[ya="" td="" uwkhyg^6]yf^jcb<=""></ui>	
	`c_U`Yb`6fUi YfY]Yb"	
?bÒXY`	HfUX]h]cbY``Y`VUmYf]gWXY	
	6Y]`U[YžcZh'Uig'?UfhcZZY`b'cXYf	
	GYa a Y`"	

5 V g W \ `]Y \ Y b X ``Aggh 'g ] W \ 'g U [ Y b ž' X U g g 'X ] Y `F Y [ ] c b 'i a 'D Z U Z Z Y b \ c Z Y b U b 'X Y f '= a 'b ] W h b i f ``U b X g W U Z h`] W 'f Y ] n j c `` '] g h ž' g c b X Y f b 'U i W 'Y ] b k U \ f Y g 'D U f U X ] Y g 'Z Ø f ': Y ] b g W a Y W Y f 'X U f g h Y ``h " '8 ] Y '? c a V ] b U h ] c b

Ui gʻhfUX]h]cbY``YfʻVUmYf]gW\Yfʻ?ØW\Yž``c\_U`YbʻGdYn]U`]hÀhYbʻi bX a cXYfbYbʻ ⇒bhYfdfYhUh]cbYbʻa UW\hʻYXYgʻ9ggYbʻni ʻY]bYa i bj Yf[ Ygg`]W\Ybʻ9f`YVb]g"'@UggYbʻG]Yʻg]W\`U`gcʻX]Yʻ\_i `]bUf]gW\Yb ?Ògh`]W\\_Y]hYbʻb]W\hʻYbh[ Y\Ybž'k À\fYbX'G]YʻX]YʻW\Ufa UbhYʻGhUXh Yf\_i bXYb"

## GdUbbYbXY'JYfUbghU`hi b[Yb'i bX': YghY'XUg [UbnY'>U\f'ØVYf

DZUZZYb\cZYb'Ub'XYf'=a ']gh'b]W\h'bi f'ZØf'gY]bY'\]ghcf]gW\Y 5`hghUXh'i bX'X]Y'VYY]bXfi W\_YbXY'BUhi f'VY\_Ubbhž'gcbXYfb'Ui W\ZØf'gY]bY'`YVYbX][Y'JYfUbghU`hi b[g\_i `hi f"'8 Ug'[UbnY'\*\]\f'ØVYfZ]bXYb'nU\`fY]W\Y': YghYž'A Àf\_hY'i bX'\_i `hi fY``Y'9j Ybhg'ghUhhž'X]Y gck c\`'9]b\Y]a ]gW\Y'U`g'Ui W\'6Ygi W\Yf'Ub`cW\_Yb"'8]YgY JYfUbghU`hi b[Yb'V]YhYb'Y]bY'\Yfj cffU[YbXY'; Y`Y[Yb\Y]hž'X]Y`c\_U`Y'?i `hi f'ni 'Yf`YVYb'i bX'a ]h'XYf'; Ya Y]bgW\UZh']b'?cbhU\_h'ni hfYhYb"

9]b'k Y]hYfYg'k ]WXh][ Yg'9j Ybh']gh'XYf'K Y]\bUWXhga Uf\_hž'XYf']b'XYf 5Xj YbhgnY]h'X]Y'5`hghUXh']b'Y]b'nUi VYf\UZhYg'@]WXhYfa YYf j Yfk UbXY`h''<]Yf'\_ObbYb'X]Y'6Ygi WXYf'\UbX[ YZYfh][ hY ; YgWXYb\_Yž'k ]bhYf`]WXY'@YW\_YfY]Yb'i bX'; `Ø\k Y]b'[ Yb]Y»Yb''8]Y ZYgh`]WXY'Gh]a a i b[ 'k ]fX'Xi fWX'X]Y'j YfgWX]YXYbYb'a i g]\_U`]gWXYb 8UfV]Yhi b[ Yb'i bX'X]Y'`]YVYj c```XY\_cf]YfhYb'GhÀbXY'bcWX j YfghÀf\_h''9g']gh'XYf'dYfZY\_hY'Cfhž'i a 'g]WX'Ui Z'X]Y': Y]YfhU[ Y Y]bni gh]a a Yb'i bX'j ]Y``Y]WXh'XUg'Y]b'cXYf'UbXYfY'VYgcbXYfY; YgWXYb\_'ni '\_Ui ZYb''

 $\exists a : f\emptyset \land U \land f : Z]b X Y h : Y X Y g : \exists J \land f : X U g : ? i : hi f : Y g h]j : U : D Z U Z Y b \land c Z Y b$ 

ghUhhž'k Y`WX Yg`Y]b`VfY]hYg`GdY\_hfi a `Ub`\_i `hi fY``Yb`5\_h]j ]hÀhYb V]YhYh"'Jcb'H\YUhYfUi ZZØ\fi b[Yb`ØVYf`?cbnYfhY`V]g`\]b'ni ?i bghUi gghY``i b[Yb`]gh`ZØf`5Vk YWXg`i b[`[Ygcf[h"`8]Y JYfUbghU`hi b[`Vf]b[h'?Øbgh`Yf`Ui g`XYf`[UbnYb`FY[]cb'ni gUa a Yb i bX`\YVh`X]Y`\_fYUh]j Y`GY]hY`XYf`GhUXh`\Yfj cf"

HYWX bc`c[]Y! ii bX' ⇒bcj Uh]cbgVY[Y]ghYfhY'k YfXYb'XUg'A U\_Yf
: U]fYg']b'DZUZZYb\cZYb'`]YVYbž'XUg'fY[Y`a À»]['UV[Y\U`hYb'k]fX"
<]Yf'\_ca a Yb'HØZh`Yfž'8Yg][bYf'i bX'6Ugh`Yf'ni gUa a Ybž'i a ']\fY
bYi YghYb'Dfc'Y\_hY'j cfni ghY``Yb"'8]Y'JYfUbghU`hi b['ZÒfXYfh'X]Y
?fYUh]j ]hÀh'i bX'XYb'5i ghUi gWX'j cb' ⇒XYYb'i bX']gh'Y]b'A i gg'ZØf
U``Yž'X]Y'g]WX'ZØf'<UbXk Yf\_'i bX'HYWXb]\_']bhYfYgg]YfYb"

9]b'k Y]hYfYg''À\f`]W\ ghUhhZ]bXYbXYg'9j Ybh']gh'XUg'GhUXhZYghž'XUg Ub'Y]bYa 'Gca a Yfk cW\YbYbXY'[YZY]Yfh'k ]fX'i bX'X]Y'\bYbghUXh ]b'Y]b'[fc\"Yg': Ygh'j Yfk UbXY\h'''@]j Y!A i g]\_ž'GhfU\"Yb\_Øbgh\Yf'i bX Y]b'A Uf\_h'a ]h'\c\_U\Yb'DfcXi \_hYb'gcf[Yb'ZØf'Y]b'Vi bhYg'HfY]VYb'' 8]Y'JYfUbghU'hi b['V]YhYh'Y]bY'YbhgdUbbhY'5ha cgd\ÀfYž']b'XYf'X]Y A YbgW\Yb'X]Y'k Ufa Yb'Gca a YfUVYbXY'[Yb]Y\"Yb'\_ObbYb''

9]b'\_`Y]bYf'; Y\Y]a h]dd']gh'XUg'DZ'UbnYbZYghž'XUg']a :: fØ\'U\f
ghUhhZ]bXYh'i bX'@]YV\UVYf'XYf'; UfhYb!'i bX'DZ'UbnYbk Y`h'Ubn]Y\h''
<]Yf'\_ObbYb'9]b\Y]a ]gW\Y'i bX'6Ygi W\Yf'`c\_U`Y'; ÀfhbYfY]Yb'i bX
<ÀbX`Yf'hfYZZYb'i bX'g]W\']bgd]f]YfYb'`UggYb'''K cf\_g\cdg'i bX
J cfhfÀ[ Y'ØVYf'DZ'UbnYbdZY[ Y'i bX'bUW\\U`h][ Y'; UfhYbUfVY]h
a UW\Yb'XUg'9j Ybh']bZcfa Uh]j'i bX'i bhYf\U`hgUa''

Ni '[i hYf'@Yhnh'gc``hY'XUg'Gca a YfbUWkhgZYgh'b]Wkh'i bYfk À\bh V`Y]VYbž'XUg'Y]bY'fca Ubh]gWkY'5ha cgd\ÀfY'a ]h'Aig]\_'i bX @JWkhYfb'gWkUZZh"'8]Y'JYfUbghU`hi b['n]Y\h'DUUfYž': Ua ]`]Yb'i bX : fYi bXY'Ubž'X]Y'[Ya Y]bgUa 'Y]bY'gWkÒbY'NY]hij YfVf]b[Yb'k c``Yb" 8 Ug'k i bXYfgWkÒbY'5a V]YbhY'Ybh`Ub['XYf'=a 'i bX'X]Y'`YVYbX][Y Gh]a ai b['a UWkYb'Yg'ni 'Y]bYa 'i bj Yf[Ygg`]WkYb'9f`YVb]g"

 $8 ]Y "J YfUbghU"hi b[Yb"]b"DZUZZYb\cZYb"Ub"XYf"=a "g]bX"a Y\f"U"g"bif Y]bZUW\XY": YghY/g]Y"V]YhYb"9]bV"]W_Y"]b"X]Y"?i "hi fž"HfUX]h]cbYb"i bX XUg"; Ya Y]bgW\UZhg`YVYb"XYf"GhUXh""K Ybb"Xi "]b"XYf"FY[]cb"V]ghž j YfdUggY"b]W\h"X]Y"7\UbW\ž"Ub"Y]bYf"X]YgYf"gdUbbYbXYb JYfUbghU"hi b[Yb"hY]"ni bY\a Yb"": Øf"U_hi Y``Y"<math>\pm$ bZcfa Uh]cbYb"i bX HYfa ]bY"VYgi W\Y"X]Y"cZZ]n]Y"Y"K YVgY]hY"j cb"DZUZZYb\cZYb"Ub XYf"=a ""

 $9bhXYW_Y`X]Y`J]Y`ZU`h`XYf`JYfUbghU`hi b[Yb`i bX`Yf`YVY`X]Y\\ Yfn`]WXY`; UghZfYi bXgWXUZhž`X]Y`DZUZZYb\cZYb`Ub`XYf`=a `ni V]YhYb`\Uh''`9[U``ni `k Y`WXYf`$J\fYgnY]h`Xi `X]Y`GhUXh`VYgi WXghž`Yg []Vh`]a a Yf`Yhk Ug`ni `ZY]Yfb°$ 

## Gdcfh'i bX': fY]nY]h. '5\_h]j ]hÀhYb 'ZØf'^YXYb ; YgWXa UW\_

9]bY'UVgc`i hY'i Hcd!5\_h]j ]hÀhi ]b'DZUZZYb\cZYb']gh'XUg'FUXZU\fYb"
8]Y'GhUXh'i bX']\fY'I a [YVi b['V]YhYb'Y]b'[i h'Ui g[YVUi hYg
FUXk Y[YbYhnž'XUg'Yg'=\bYb'Yfa Ò[`]Wkhž'X]Y'UhYa VYfUi VYbXY
@UbXgWkUZh'XYf'i a `]Y[YbXYb': Y'XYf'i bX'K À'XYf']b'j c``Yb'NØ[Yb
ni '[Yb]Y»Yb"'6YgcbXYfg'Ya dZY\`Ybgk Yfh']gh'X]Y'FUXhci f'Ybh`Ub[
XYf'=a ž'X]Y'Y]bY'a U`Yf]gWkY'?i `]ggY'a ]h'g]Wk'Vf]b[h''CV'G]Y'Y]b
[Ya Øh']WkYf'FUXZU\fYf'g]bX'cXYf'X]Y'<YfUi gZcfXYfi b['j cb
`Ab[YfYb'GhfYW\_Yb'gi WkYbž\]Yf'\_ca a h'YXYf'Ui Z'gY]bY'?cghYb''

K UbXYfZfYi bXY'k YfXYb'YVYbZU``g'ZØbX]["'8]Y'K À`XYf'i bX'K ]YgYb fi bX'i a 'DZUZZYb\cZYb'V]YhYb'nU\`fY]W\Y'K UbXYfk Y[Yž'X]Y']XYU` g]bXž'i a 'X]Y'Zf]gW\Y'@ Zh'i bX'X]Y'i bVYfØ\fhY'BUhi f'ni '[Yb]Y $^{*}$ Yb" C V'U``Y]bž'a ]h: Ua ]`]Y'cXYf': fYi bXYb'' 'X]Y'K UbXYfi b[Yb'g]bX'Y]b dYfZY\_hYf'K Y[ž'i a 'X]Y'fY[]cbU`Y': `cfU'i bX': Ui bU \_YbbYbni `YfbYb"JYf[YggYb'G]Y'b]W\hž'\=\fY'?Ua YfU a ]hni bY\a Ybž'XYbb'X]Y'@UbXgW\UZh'V]YhYhj ]Y`Y'[i hY': chca ch]j Y"

: Øf'X]Y'gdcfh`]W\5a V]h]cb]YfhYb'i bhYf'=\bYb'[]Vh'Yg']b
DZUZZYb\cZYb'Ui W\nU\`fY]W\Y'Gdcfhj YfY]bY'i bX
: ]hbYgga Ò[`]W\\_Y]hYb"8]YgY'VY]b\U`hYb'i bhYf'UbXYfYa .

- : i » VU``j YfY]bY
- < UbXVU```i bX'Jc``YmVU``
- @Y]W\hUh\`Yh]\_
- GWk]a a j YfY]b
- HYbb]gWi Vg
- : ]hbYggghi X]cg

K Ybb'K UggYf' $\Rightarrow$ fY'@Y]XYbgW\UZh']ghž'XUbb'[]Vh'Yg'Ui W\'nU\`fY]W\Y K UggYfgdcfha  $\bullet$ [`]W\\_Y]hYb']b'XYf'I a [YVi b["'8]Y' $\Rightarrow$ a 'Y][bYh'g]W\\Yfj cffU[YbX'ni a '? Ubi ZU\fYb'cXYf'GhUbX!I d!DUXX`]b["'5b Ui g[Yk]YgYbYb'GhY``Yb'\_ $\bullet$ bbYb'G]Y'g]W\'5i gfØghi b[Yb'Ui g`Y]\Yb i bX']b'X]Y'YfZf]gW\YbXYb'; Yk  $\bullet$ AggYf'Y]bhUi W\Yb"'8]Yg']gh'Y]bY dYfZY\_hY'A  $\bullet$ [`]W\\_Y]hž'i a 'X]Y'GcbbY'ni '[Yb]Y\*Yb'i bX'g]W\\[`Y]W\nY]h]['qdcfh`]W\'ni 'VYh $\bullet$ h][Yb"

 $: \emptyset f^*X]Y^*K ]bhYfgU]gcb^*V]YhYh^*DZUZZYb^cZYb^ni XYa^*bU^[Y^Y[YbYG_][YV]YhYž^*X]Y^Y]bY^J]Y^nU^*j cb^*K ]bhYfgdcfhUfhYb^Yfa Ò[^]WXYbž k ]Y^*G_]^*ZU^fYbz^*Gbck VcUfXYb^i bX^@Ub[^Ui Z'^8]YgY^; YV]YhY^*g]bX b]WXh^k Y]h^j cb^*XYf^GhUXh^YbhZYfbh^i bX^*Y]WXh^ni YffY]WXYbz^*gcXUgg$ 

G]Y'Ui W\`]b'XYb'\_À`hYfYb'A cbUhYb'Ui Z'≒fY'?cghYb'\_ca a Yb"

< ]Yf'Y]bY'\_`Y]bY', VYfg]W\h'ØVYf'X]Y'VY`]YVhYghYb'5\_h]j ]hÀhYb.

5_h]j ]hÀh	6YgW\fY]Vi b[	
F UXZU\fYb	9bhXYW_Yb^G]Y^X]Y^a U^Yf]gW\Yb	
	FUXk Y[Y'Ybh`Ub['XYf'=a "	
K UbXYfb	9f_i bXYb^G]Y^X]Y^gW\ObYb	
	K UbXYfk Y[Y'i bX'[Yb]Y»Yb'G]Y	
	X]Y BUhi f"	
JYfY]bgdcfh	HfYhYb'G]Y'Y]bYa'XYf'j]Y`Yb	
	Gdcfhj YfY]bY <sup>.</sup> VY]"	
K UggYfgdcfh	9f`YVYb'G]Y'?UbiZU\fYb'cXYf	
	GhUbX!I d!DUXX`]b[ 'Ui Z'XYf'=a "	
K]bhYfgdcfh	: U\fYb'G]Y'G_]'cXYf'Gbck VcUfX	
	]b'XYb'bU\Y[Y`Y[YbYb	
	G_][ Y V ] Y h Y b "	

9]b'k Y]hYfYg'<][\`][\h'ZØf': Ua ]`]Yb']gh'XYf': fY]nY]hdUf\_']b'XYf BÀ\Yž'XYf'Y]bY'J]Y`nU\`'j cb'5hhfU\_h]cbYb'i bX'Gd]Y`Yb'ZØf'?]bXYf i bX'9fk UW\gYbY'V]YhYh''<]Yf'\_ObbYb'G]Y'Y]bYb'HU['j c``Yf'GdU» ž GdUbbi b['i bX'5VYbhYi Yf'j YfVf]b[Ybž'k À\fYbX'X]Y'?`Y]bYb'g]W bUW\'<YfnYbg`i gh'Ui ghcVYb"

Ni gUa a YbZUggYbX``Àggh`g]W\`gU[Ybž`XUgg`DZUZZYb\cZYb`Ub`XYf
=`a `ZØf`YXYb`Gdcfh!`i bX`: fY]nY]h`]YV\UVYf`Y]bY`A Yb[Y`ni `V]YhYb
\Uh"`9[U`ž`cV`G]Y`X]Y`Fi\Y`XYf`BUhi f`gi W\Yb`cXYf`U\_h]j `Ua
Gdcfh[YgW\Y\Yb`hY]`bY\a Yb`a ÒW\hYbž`X]YgY`GhUXh`\Uh`X]Y
f]W\h][Yb`5b[YVchY`ZØf`G]Y"`6Ygi W\Yb`G]Y`X]Y`cZZ]n]Y``Y`K YVg]hY
XYf`GhUXh`DZUZZYb\cZYb`ZØf`KY]hYfY`±bZcfa Uh]cbYb`ni `XYb
j YfZØ[VUfYb`5\_h]j ]hÀhYb`i bX`JYfUbghU`hi b[Yb"

## 5i gZ`i [gn]Y`Y`i bX`; Y\Y]a h]ddg`]b`XYf La [YVi b[

DZUZZYb\cZYb`Ub`XYf`=`a `]gh'b]W\h'bi f`gY`Vgh'Y]bY`W\Ufa UbhY GhUXhž`gcbXYfb`Ui W\`XYf`dYfZY\_hY`5i g[ Ub[ gdi b\_h`ZØf`nU\`fY]W\Y gdUbbYbXY`5i gZi [ gn]Y`Y`i bX`j YfghYW\_hY`; Y\Y]a h]ddg`]b`XYf I a [YVi b["I a [YVYb'j cb'a U`Yf]gWXYb'@UbXgWXUZhYbž\]ghcf]gWXYb'GY\Ybgk ØfX][\_Y]hYb'i bX'\_i `hi fY``Yb'< Ò\Ydi b\_hYb[]Vh'Yg'j]Y``ni 'YbhXYW\_Yb"'<]Yf'g]bX'Y]b][Y'XYf'VYghYb'CfhYž'X]Ya Ub'VY]'Y]bYa '6Ygi WX']b'DZUZZYb\cZYb'i bVYX]b[h'Ui Z'X]Y'@]ghYgYhnYb'gc``hY"

%"'8]Y'k i bXYfgWX ObY'GhUXh' \( \pi\) [ c`ghUXh Bi f'Yhk U'' \( \pi\) A]bi hYb'a ]h'XYa '5i hc'YbhZYfbhž']gh' \( \pi\) [ c`ghUXh'Y]b YWXhYf'6Ygi WXYfa U[ bYh"'8]Y'GhUXh'VY[ Y]ghYfh'a ]h'Y]bYf'[i h Yf\U`hYbYb'5`hghUXhž'nU\`fY]WXYb'A i gYYb'i bX'XYa 'VYfØ\a hYb 5i X]': cfi a "'<]Yf'\_Ubb'a Ub'X]Y'; YgWX]WXhY'XYf 5i hca cV]`]bXi ghf]Y'Yf`YVYb'i bX'g]WX']b'X]Y'K Y`h'XYg 5i hca cV]`XYg][ bg'YbhZØ\fYb'`UggYb''6YgcbXYfg'\Yfj cfni \YVYb ]ghXUg'8Yi hgWXY'A YX]n]b\]ghcf]gWXY'A i gYi a ž'XUg'9]bV`]W\_Y']b

#### &"'?`cghYf'GWXYmYfb

 $X]Y^9bhk]W^ib[XYf^AYX]n]b^V]YhYh''$ 

Bi f'Y]bY'\_i fnY'5i hcZU\fh'j cb'DZUZZYb\cZYb'YbhZYfbhž'Z]bXYh'a Ub XUg'\]ghcf]gW\Y'?`cghYf'GW\YmYfb"'8]Y'?`cghYf\_]fW\Yž'Y]bY VYY]bXfi W\_YbXY'fca Ub]gW\Y'6Ug]`]\_Už'n]Y\h'YXYg'\\\f'j ]Y`Y 6Ygi W\Yf'Ub"'8Ug'XUni [Y\Of][Y'?`cghYf'V]YhYh'b]W\h'bi f'Y]bYb gW\ObYb'; UfhYb'ni f'9f\c`i b[ $\check{z}$ 'gcbXYfb'Ui W\'X]Y'AO[`]W\\_Y]hž fY[]cbU`Y'DfcXi \_hY'ni 'Yfk YfVYb $\check{z}$ 'X]Y'j cb'XYb'AObW\Yb'gY`Vgh \Yf[YghY``h'k YfXYb"'9]b'Cfh'XYf'Gh]``Y'i bX'XYg'bUW\XYb\_`]W\Yb K UbXY`g"

#### ' "'@UbXUi 'Ub'XYf'=gUf

9]b 'k Yb][ 'k Y]hYfž'UVYf'XYZ]b]h]j 'Y]bYb'6Ygi W\'k Yfhž']gh'@UbXUi 'UbXYf'=gUf"'8]Y'GhUXhž'X]Y'dYfZY\_h'ZØf'Y]bYb'HU[YgUi gZ'i [']ghž'V]YhYhY]b'W\Ufa UbhYg'GhUXhV]`X'i bX'Y]bY'J]Y`nU\`'Ub : fY]nY]ha Ò[`]W\\_Y]hYb"'8]Y'j]Y`ZÀ`h][Yb'FUX!'i bX'K UbXYfk Y[YYbh`Ub['XYf'=gUf'a UW\Yb'X]Y'I a [YVi b[']XYU`'ZØf'BUhi f`]YV\UVYf i bX'5\_h]j i f`Ui VYf"

#### ("8]YUb[YgU[hYFY[]cb'< U`YfhUi]

 $: \varnothing f \cdot 6] Y f \cdot ] Y V \setminus U V Y f \cdot ] g h \cdot X] Y \cdot < U \cdot Y f h U i \quad \check{z} \cdot X] Y \cdot [f \grave{O} \Rightarrow h Y \cdot < c d Z Y b U b V U i ! \\ F Y [] c b \cdot X Y f \cdot K \quad Y \cdot h \check{z} \cdot Y] b \cdot k \quad U \setminus f Y g \cdot D U f U X] Y g " \Rightarrow `X Y b \cdot \_ Y] b Y b \cdot 6 f U i Y f Y] Y b i b X \cdot [Y a \ \varnothing h \cdot ] W Y b \cdot 6] Y f [ \ \grave{A} f h Y b \cdot \_ U b b \cdot a \ U b \cdot X U g \cdot Y] b \cdot c X Y f \cdot U b X Y f Y$ 

`c\_U`Y`6]Yf`dfcV]YfYb"`K Yf`a Y\f`ØVYf`X]Y`<cdZYbdfcXi \_h]cb YfZU\fYb`a ÒW\hYž`XYa `gY]Yb`X]Y`[YZØ\fhYb`6fUi YfY]hci fYb`Ubg <Yfn`[Y`Y[h` `Y]bY`\_Ògh`]W\Y`i bX``Y\ffY]W\Y`9fZU\fi b["

) "'8]Y'5`hY'K UW\Y']b'5VYbgVYf[

5VYbgVYf[ ž'gØX`]W\'j cb'DZUZZYb\cZYb'[ Y`Y[ Ybž']gh'VY\_Ubbh'ZØf'X]Y
a cbi a YbhU`Y'?i W\`VUi Yf'Hi fa ž'X]Y'Y]bYb'UhYa VYfUi VYbXYb
6`]W\_'ØVYf'X]Y'FY[]cb'V]YhYh''6Ygi W\Yf'\_ÒbbYb'X]Y'6fUi YfY]
?i W\`VUi Yf'VYg]W\h][ Yb'i bX'Ub'Y]bYf': Ø\fi b[ 'hY]`bY\a Ybž'i a
a Y\f'ØVYf'X]Y'?i bgh'XYg'6fUi Ybg'ni 'YfZU\fYb"'8 Ug'Ub[ fYbnYbXY
?i bgh\Ui g']gh'YVYbZU``g'Y]b'<][\`][\hii bX'nY][ h'fY[ Y`a À»][
k YW\\gY`bXY'5i qghY``i b[ Yb"

#### \*"'K U`\U``U'VY]'8cbUi ghUi Z

9]b'k Yb]['k Y]hYf'YbhZYfbhž'UVYf'Xi fW\gY]bY'Y]bXfi W\_gj c``Y
5fW\]hY\_hi f'i bX'; YgW\]W\hY'i bj Yf[Ygg`]W\ž']gh'X]Y'K U`\U``U"'8]YgY
Fi\a Yg\U``Y'Ui Z'Y]bYa '<Ø[Y``ØVYf'XYf'8cbUi ']gh'Y]b
VYY]bXfi W\_YbXYg'6Ui k Yf\_ž'XUg'Ub'X]Y'[fc>Yb'DYfgÒb`]W\\_Y]hYb
XYf'XYi hgW\Yb'; YgW\]W\hY'Yf]bbYfh"'8Yf'6`]W\_'j cb'\]Yf'cVYb']gh
gdY\_hU\_i `Àf'i bX'`ÀXh'ni 'Ui g[YXY\bhYb'GdUn]Yf[Àb[Yb']b'XYf
I a [YVi b['Y]b"

+""; Y\Y]a h]ddg. 8]Y K UbXYfi b[ 'Ui Z'XYa '8cbUi !=`Yf!FUXk Y[ K Ybb'Xi 'ni ZÀ``][ 'Y]b': Ub'j cb'FUXZU\fYb'V]ghz'gc``hYgh'Xi 'XYb 8cbUi !=`Yf!FUXk Y[ 'Ui gdfcV]YfYb"'9f'ZØ\fh'Xi fW\'k i bXYfgW\ObY@UbXgW\UZhYb'i bX'V]YhYh'nU\`fY]W\Y'A O[`]W\\_Y]hYb'ZØf'DUi gYb'Ub a U`Yf]gW\Yb'D`AhnYb"'<]Yf'\_Ubbgh'Xi 'X]Y']Xm`]gW\Y'BUhi f'XYf FY[]cb'\Ui hbU\'Yf`YVYb'i bX'XYb'5``hU[ '\]bhYf'X]f'`UggYb"

, "'8 Ug'A Uf\_hhfY]VYb']b'DZUZZYb\cZYb
GWX`]Y»`]WX'XUfZ'a Ub'VY]a '6Ygi WX'XYf'GhUXh'DZUZZYb\cZYb'gY`Vgh
b]WXh'XYb'k ÒWXYbh']WXYb'A Uf\_h'j YfdUggYbž'XYf'YXYb'8 cbbYfghU[
ghUhhZ]bXYh''<]Yf'Z]bXYgh'Xi 'Zf]gWXY'`c\_U`Y'DfcXi \_hYž
\UbX[Ya UWXhY'GdYn]U`]hÀhYb'i bX'X]Y'A Ò[`]WX\_Y]hž'a ]h'XYb
9]b\Y]a ]gWXYb']bg'; YgdfÀWX'ni '\_ca a Yb'''9g']gh'XYf'dYfZY\_hY'Cfhž
i a 'Y]b'V]ggWXYb'j cb'XYf'`c\_U`Yb'?i `hi f'Ui Zni gUi [Yb''

	DZUZZY b\cZY b`fWU"Ł	
⇒b[c`ghUXh	'\$"A]bihYb	5i hca i gYi a ž
		5`hghUXh
?`cghYf'GWXYmYfb	%) A]bi hYb	< ]ghc f]gW\ Y
		?`cghYf_]fVXY
@UbXUi 'Ub'XYf'=gUf	(\$'A]bihYb	FUX!'i bX
		K UbXYfk Y[Y
< U``YfhUi	'\$"A]bihYb	< cdZYbUbVUi i bX
		6fUi YfY] Hci fYb
K U`\U``U	%'Ghi bXY	Fi\a Yg\U``Y`a ]h
		DUbcfUa UV`]W_

9bhZYfbib[jcb

6YgcbXYf\Y]hYb

A ]h'X]YgYb'nU\`fY]W\Yb'5i gZi [ gn]Y`Yb'i bX'; Y\Y]a h]ddg']b'XYf I a [ YVi b[ 'j cb'DZUZZYb\cZYb'Ub'XYf'=`a ']gh'Yg'`Y]W\hž'X]Y'GYY`Y VUi a Y`b'ni '`UggYb'i bX']b'X]Y'fY]W\Y'?i `hi f'i bX'BUhi f'X]YgYf FY[ ]cb'Y]bni hUi W\Yb''CV'Xi 'Y]b'5VYbhYi Yf'gi W\gh'cXYf'Y]bZUW\bi f'X]Y'Fi \Y'[ Yb]Y» Yb'a ÖW\hYghž'\]Yf'Z]bXYgh'Xi '[ UfUbh]Yfh Yh\k Ugž'XUg'XY]bYa '; YgW\a UW\_'Ybhgdf]W\h''

8 Y hU 1 c

5i gZi [gn]Y`

6Ygi WXYb G]Y i bg Ui Z Y]bY!fY]gY "XY