

# **ARTS2066**

K f h b [ Tc f h Y G W Y b ]

HYfa 'C bY''##'&\$&%

# 7 ci fgY Cj Yfj ]Yk GHJZZ 7 cbHJWh 8 YHJ] g

### 7ci fgY 8YHJ] g

### 7 fYX]hDc]bhg \*

### Gi a a UfmcZh\Y 7ci fgY

H\]g`Wci fgY`]bHcXi WYg`mci `hc`h\Y`ghi XmUbX`dfUWNJWY`cZghcfmhY``]b[`Zcf`gWfYYb`a YX]U"`\dfk]``dfcj]XY`mci k]h\`U`ZfUa Yk cf\_`h\fci [\`k\]W\`hc`fYWc[b]gY`UbX`Wf]hJWU``mUbU`mgY`\_YmY`Ya Ybhg`cZh\Y`gWfYYbk f]hJb[dfcWYgg"`H\fci [\`dfUWNJWU``YI YfWJgYgžmci `k]``VY`UV`Y`hc`XYj Y`cd`Z bXUa YbhU``g\_]``g`]b`h\Y`UfhcZk f]hJb[Zcf`h\Y`gWfYYb"`Mci `k]``ghi XmU'j Uf]YhmcZgWfYYbk f]hJb[`Zcfa g`]bWi X]b[`g\cfhiZja gžZYUhi fY`Zja g`UbX kf]hJb[`Zcf`hY`Yj]g]cb"`

#### 7 ci fgY @YUfb]b[ Ci hMca Yg

%" → XYbhjZmUbX`]a d`Ya Ybhih\Y`Z bXUa YbhU``Y`Ya Ybhg`UbX`hYW\b]ei Yg`cZgWfYYbk f]hjb["
&" 9b[U[Y`Wf]hjWU``mUbX`fYZYWhjj Y`mk ]h\`Wf]hjWU``UbX`WcbWfdhi U``gW\c`Ufg\]d`cb`gWfYYbk f]hjb["
' " 7 ca dcgYžXfUZh`UbX`fYj ]gY`U'd]YWf`cZgWfYYb`k f]hjb["
("@b\_`WfYUhjj Y`dfcXi Whjcb`k]h\`h\YcfYhjWU``UbX`Wf]hjWU``\_bck`YX[Y"
) " 7 c``UVcfUhY`]b`U`Wc``Y[]U``dfcWfgq`cZdYYf`fYj ]Yk

#### HYUW ]b[ GhfUhY[ ]Ya

H\]g'Wci fgY']bffcXi Wrg'ghi XYbhg'hc'h\Y'Z bXUa YbhU`g\_]``g'UbX'hYWb]ei Yg']b'gWfYYbk f]h]b['VmhU\_]b['Ub UddfcUW\'h\UhWca V]bYg'h\YcfmUbX'dfUWhW'"-\Dh\Y'Z[fgh]bghUbW''h\Y'Wci fgY'k]``'VY'HUi [\hi]b'U'HfUX]h]cbU` a cXY'k]h\'U'%\ci f`'YWi fY'UbX'&'\ci f`gYa]bUf'fcf'Yei ]j U'Ybh]b']bhYbg]j Y'a cXYŁ"\Dh\]g'a cXYž'h\Y Wci fgY'k]``'VY'gi ddcfhYX'Vmg][b]Z]WUbhcb`]bY'a UhYf]U`'h\Uhk]``'dfYdUfY'ghi XYbhg'Zcf'UWhj Y'`YUfb]b[']b'h\Y ZUWY!hc!ZUW''hYUW\]b['Ybj]fcba Ybh''\Di Z hi fY']hYfUhJcbg'h\Y'Wci fgY'a UmVY'HUi [\hi]b'U'V'YbXYX'a cXY XYdYbX]b['cb'ghUZYI dYfh]gY']b'h\]g'UfYU"'H\]g'k]``']bWi XY'cb']bY'dfY!'YUfb]b['a UhYf]U`']bWi X]b[ gWfYYbWJghgžfYUX]b['a UhYf]U`'UbX'Z]`a 'j ]Yk]b[''5b']a dcfhUbhdUfhcZh\Y'fYei ]fYX'dfY!'YUfb]b['Zcf'h\Y Wci fgY']b'Y]h\Yf'a cXY'k]``Wcbg]ghcZfYUX]b['UbX'UbU'mg]b['U'j Uf]YhmcZWf]h]WU`'UbX'WcbWdhi U```]hYfUhi fY UVci hgWfYbk f]h]b['ž'Ug'k Y```Ug'fYUX]b['gWfYYbd'UmhYl hg'UbX'j]Yk]b['h\Y'WcffYgdcbX]b['Z]`a g''Ghi XYbhg k]``fYZYWhcb'h\YgY'UbX'XfUk '`Yggcbg'Zfca 'h\Ya 'Xi f]b['h\Y'&!\ci f`gYa]bUfg''

5g'Ub']blfcXi WcfmWci fgYž'h\Y'h\UW\]b[ 'a Yh\cXg'UfY'ZcW gYX'cb'g\ck ]b[ 'ghi XYbhg'\ck 'UbX'\Y'd]b[ h\Ya 'hc'XYj Y`cd'U``Yj Y``cZWca dYh\bW\ž'fUh\Yf'h\Ub'XYj Y`cd]b[ '\][\!'Yj Y``Yl dYf]YbW''cf'a Ugh\fm''5hih\Y gUa Y'hja Yžghi XYbhg'k]````YUfb'\ck 'hc'UWW\gg'\_bck `YX[Y'UbX'fYgci fW\gž'Ug'k Y```Ug'h\Y'j U`i Y'cZ]bWcfdcfUhjb[ 'dYYf'ZYYXVUW\_']bhc'h\Y'`YUfb]b[ 'WhWYžk\]W\'k]```YbUV`Y'h\Ya 'hc'Wcbhjbi Y'hc'XYYdYb'h\Y]f`YUfb]b[ 'VYmcbX'h\Y'Wci fgY"

## 5ggYgga Ybh

Q: YfY 'mci 'WUb'ci h]bY'UbmfY`Yj Ubh]bZcfa Uf]cb'h\Uhk Ug'bch]bWi XYX']b'5  $\neq$  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][ b

#### : YYXVUW\_'j ]U'@A G

 $\label{thm:limit} \begin{tabular}{ll} Hi & fb \end{tabular} $$ Hi & fb \end{tabular} $$ h' \end{tabular} $$ Hi & fb \end{tabular} $$ h' \end{tab$ 

5ggYgga Ybh' . 'GWf]dhžgmbcdg]g 'UbX ``c[`]bY

8YHJ]`g.

⊕X]j ]Xi U`

Gh XYbhg hc XYY)j Yf U %! & dU[Y W a d YhY g W YYbd Umi]b W ffY W ig W YYbk f]h]b[ 'Zcfa Uh z U c [`]bY z Ub X U ) \$\$!k cfX gmbcdg]g"

: YYXVUW\_'j ]U'@A G

.

Fygci fWyg

DfYgWf]VYX`F Ygci fWYg`

5```fYgci fWYg`Uj U]`UV`Y`cb`A ccX`Y

FYWca a YbXYX FYgci fWYg

5 ```fYgci fWfg'Uj U]`UV`Y'cb'A ccX`Y

### 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 bXYfgHJbX'mci f'f][\hg'UbX'fYgdcbg]V]`]h]Yg'Ug'U'gh XYbh'Uhil BGK

## 5WUXYa]W±bZcfaUhjcb

: cf'YggYbhJU`ghi XYbh]bZcfa UhJcb'fY`UhJb['lc.