



# ARTS1780

7cbWdhg'cZ9i fcdY

GYa YghYf'C.bY''##'&\$%



## 5 WUXYa JWbZcfa Uh]cb`

: cf`YggYbh]U`gh XYbh]bZcfa Uh]cb`fY`Uh]b[ `hc.`fYeI Ygrg`Zcf`YI hYbg]cb/fYj ]Yk `cZa Uf\_g/cVWw dUh]cbU`\\YU`h  
UbX`gUZ`hm/YI Ua ]bUh]cb`dfcW`Xi fYg/gdYW]U`Wtbg]XYfUh]cb`]b`hY`Yj YbhcZ]`bYgg`cf`a ]gUXj Ybh fY/  
gh XYbh\$ UXj Y & %o %o `cZ]`- `gh XYbh] UXj Ybh fY/

7ci fgY'8YHJ]`g

7fYX]hDc]bHg`\*`

Gi a a UfmicZ\hY'7ci fgY

Gi VYWh5fYU.'9i fcdYUb'Gh X]Yg

K \Uh]g'9i fcdY3'<ck '\Ug']hVYYb'WcbW]j YX'cj Yf'hY'Wbhi f]Yg'UbX'\ck '\Uj Y'hYgY'WcbWdh]cbg  
W\Ub[ YX3'<ck '\Uj Y'hYgY'WcbWdh]g\UdYX'cb[ c]b[ 'Wcbhfcj Yfg]Yg'cj Yf'9i fcdYž]hg'g][ b]Z]WUbWž]hg  
Ugd]fU]cbgž]hg'g\cfhWca ]b[ g3' b'h]g'Wci fgY'mci 'k]'`YUfb'UVci h\_YmWcbWdh]gž]bgh]h]h]cbgž'UbX  
a cj Ya YbHg]'bZcfa ]b[ 'a cXYfb'9i fcdYf]gY'Zi bXYfghUbX]b[ "'Mci 'k]'`Yi d'cfY'\ck 'WUgg]W'`W`h fYž  
fY'[[ ]ci g'ghfi [ [ 'Yž'9b][ \hYba Ybž'fYj c'i h]cbg'UbX'k Ufg'\Uj Y'g\UdYX'\ck '9i fcdY'k cf\_g'UbX'ja U[ ]bYg  
]hgY'ZhcXUm'

# 5ggYgga Ybh

## 5ggYgga YbhHUg\_g

5ggYgga YbhHUg_	K Y][ \h	8i Y'8UH	Gh XYbh@YUfb]b[ Ci hWta Yg'5ggYggYX
K f]HYb'fYgdcbgYg'hc fYUX]b[ g'	&)	7cb]bi ci g	&Z ž)
HU_Y`ca Y'YggUmi	' \$	\$) #*\$ #&\$% '\$-.\$\$.DA	&Z ž( ž)
F YgYUfW`YggUmi	()	' \$#\$) #&\$% '\$-.\$\$.DA	%&Z ž( ž)

## 5ggYgga Ybh8YHU]`g

5ggYgga Ybh% 'K f]HYb'fYgdcbgYg'hc'fYUX]b[ g

GhUfhXUH. 'K YY\_%

@Yb[ h. 'a Ul " &) \$'k cfXg

8YHU]`g. 'K YY\_%mei Ygh]cbg'cb'hY'fYUX]b[ g'k ]`'Y'd'ghi XYbhg'XcW a Ybh'hY]f'fYUX]b[ 'UbX'h]b\_]b[ 'cb'hY  
a Uhf]U"" Gh XYbhg'k ]`'bYYX'hc'gi Va ]hY][ \hgYhg'cZfYgdcbgYgžYUW'cZa Ul ]a i a ' &) \$'k cfXgž'cj Yf'hY  
hYfa 'Wcbg]gh]b[ 'cZU'fYgdcbgY'hc'cbY'cZ'hY'fk c'fYUX]b[ g'cZU'[ ]j Yb'k YY\_'UbX'U'X]gW'gg]cb'ei Ygh]cb'cZ

[ ] Y`gh XYbHg`hY`cddcfh b]mhc`XYa cbghfUHy`hY]fi bXYfghUbx]b[ `cZhY`hYa Ygž]ggi Yg`UbX`XYVUHyg  
Wcj YfYX`]b`hY`Wci fgY": YYXVUW`j ]U`a Uf\_]b[ `fi Vf]Wg`UbX`Vf]YZWca a YbHg

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

Gh XYbHg`fYW]j Y`hY`hU`Y!\ca Y`YggUmei Ygh]cb`cb`A cbXUmž( `>i bYž%\$Ua "

Hi fb]h]b`gYHh]b[ . H\]g`Ugg][ ba Ybh]g`gi Va ]hYX`h`fci [ \ `Hi fb]h]b`UbX`ghi XYbHg`WU`b`gYY`Hi fb]h]b`g]a ]Uf]hm  
fYdcfHg"

5ggYgga Ybh" . `F YgYUfW`YggUm

GHUfhXUHy . Bch5dd`]WVY

@Yb[ h. `&\$\$\$`k cfX`Ž#%\$i

8YHJ]`g. `H\Y`&\$\$\$!k cfX`YggUm]g`U`gi VghUbh]U`d]YW`cZ]bXYdYbXYbhfYgYUfW`žfYZYW]cb`UbX`UbU`mg]g"  
: YYXVUW`\_j ]U`fi Vf]Wg`UbX`Vf]YZ]bX]j ]Xi U`Wca a YbHg"H\]g`]g`hY`Z]bU`UggYgga YbhZcf`UHybXUbW  
di fdcgYg"

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

F YgYUfW`YggUmeYgh]cbg`dfcj ]YX`]b`k`YY\_) /Z`fhYf`]bghfi W]cbg`cb`YggUmik f]h]b[ ž]bWi X]b[ `fYZfYbW]b[  
gmghYa `hc`VY`i gYXžYhWždfcj ]YX`]b`k`YY\_g`- `UbX`%\$"

Hi fb]h]b`gYHh]b[ . H\]g`Ugg][ ba Ybh]g`gi Va ]hYX`h`fci [ \ `Hi fb]h]b`UbX`ghi XYbHg`WU`b`gYY`Hi fb]h]b`g]a ]Uf]hm  
fYdcfHg"

Gi Va ]gg]cb`cZ5ggYgga YbhHUg\_g

Gh XYbng`UfY`YI dYW`X`hc`di h`h`Y]f`bUa Yg`UbX`gh XYbhbi a VYfg`cb`Yj YfmdU[ Y`cZ`h`Y]f`Ugg][ ba Ybhg"

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

≠mci`YbWci bhYf`U`dfcV`Ya`k`Yb`U`h`Ya`dh]b[`hc`gi Va ]hmcif`Ugg][ ba Ybh`h`fci [ `h`Hi`fb]h]b`z`d`YUgY  
h`Y`d`cb`Y`9I`h`fb`U`Gi`ddcfh`cb`-`'`,`)`''`'`%cf`Ya`U]`h`Ya`cb`[YI`h`fb`U`h`h`gi`ddcfh`i`bgk`"YXi`"Ui`"Gi`ddcfh](#)

f`G][ b]Z]W]b]h]m]U]Z]Y]W]h]m]i] f]d]Y]f]Z]c]f]a] U]b]W]W] ]b]U]g]g]Y]g]g]U]V]`]Y]`]k] c]f]\_]Z]V]Y]`]h]U]`]Z]c]f]a] U]`]Y]b]X]!]c]Z]g]Y]a] Y]g]h]f]`]Y]I] U]a] ]b]U]h]c]b]Z]U] W]U]g]g]`]h]Y]g]h]Z]U]`]U]V]c]f]U]h]c]f]m]h]Y]g]h]Z]U]`]g]Y]a] ]b]U]f]d]f]Y]g]Y]b]h]U]h]c]b]`]c]f]U]b]m]c]h]Y]f]Z]c]f]a] `]c]Z]U]g]g]Y]g]g]a] Y]b]h]

: c]f]Z] f]h]Y]f]X]Y]h]U]`]g]`]b]`]f]Y]`]U]h]c]b]`]h]c]`]G]d]Y]W]U]`]7]c]b]g]X]Y]f]U]h]c]b]`]b]W]i] X]b] [ ]`]K] \]Y]b]`]h]c]`]5]d]d]`]m]Z]`]<]c]k]`]h]c]`]5]d]d]`]m]`]U]b]X] `]G]i] d]d]c]f]h]b] [ ]`]8]c]W]a] Y]b]h]U]h]c]b]`]d]`]Y]U]g]Y]`]f]Y]Z]f]`]h]c]`]h]Y]`]G]d]Y]W]U]`]7]c]b]g]X]Y]f]U]h]c]b]`]k] Y]V]g]h]Y]`]

[\\]h\]c\]g.\]#\]g\]h\] X\]Y\]b\]h\]i\] b\]g\]k\] "Y\]X\]i\] "U\]i\] #\]g\]d\]Y\]W\]U\]`\]!\]W\]c\]b\]g\]X\]Y\]f\]U\]h\]c\]b\]](#)



5 WUXYa ]W<c bYghmUbX 'D`U[ ]Uf]ga

D`U[ ]Uf]ga ]g`i g]b[ 'hY`k cfXg`cf]XYUg`cZchYfg`UbX`dfYgYbh]b[ 'hYa`Ug`mci f`ck b" #WUb`hU`Y`a Ubm  
Zcfa gZ`Zca`XY`]VYfUHY`WXYU]b[ 'hc`UWV]XYbU`mW`dm]b[ `Zca`U`gci fW`k ]h`ci hUW`bck`YX[ Ya`Ybh`

I BGK` [ fci dg`d`U[ ]Uf]ga` ]bhc`hY`Zc`ck ]b[ `WUHY` [ cf]Yg.

7cdm]b[ .`i`g]b[ 'hY`gUa`Y`cf`j`Yfmg]a` ]Uf`k`cfXg`hc`hY`cf][ ]bU`hY`hcf`]XYU`k` ]h`ci hUW`bck`YX[ ]b[ 'hY`  
gci fW`cf`i`g]b[ `ei`chU]cb`a`Uf`g`"H`]g`U`gc`Udd`]Yg`hc`]a`U[ YgZ`Ufh`UbX`XYg][ `b`dfc`YWgZ`Ug`k`Y`Ug`  
dfYgYbhU]cbg`k` \Yf`gca`YcbY`dfYgYbh`Ubc`hY`f`g`]XYUg`cf`k`cfXg`k` ]h`ci hW`YX]h`

#Uddfcdf]UHY`dUfUd`fUg]b[ .`W`Ub[ ]b[ `U`Zy`k`cfXg`UbX`d`fUgYg`k` \]Y`a`cghm`fYU]b]b[ 'hY`cf][ ]bU`  
g]h`i`W`fY`UbX`]bZcfa`U]cb`k` ]h`ci hUW`bck`YX[ Ya`Ybh`"H`]g`U`gc`Udd`]Yg`]b`dfYgYbhU]cbg`k` \Yf`gca`YcbY`  
dUfUd`fUgYg`Ubc`hY`f`g`]XYUg`cf`k`cfXg`k` ]h`ci hW`YX]h` #U`gc`Udd`]Yg`hc`d`]YW]b[ `hc`[ Y`hY`f`ei`chYg`UbX`  
dUfUd`fUgYg`]bhc`U`bYk`k` \c`Y`Z`k` ]h`ci hfY`ZYfYbW]b[ `UbX`U`gh`XYbh`g`ck`b`UbU`mg]g`hc`V`f]b[ 'hY`a`U`hY`f]U`  
hc`[ Y`hY`f`"

7c`i`g]cb.`k`cf\_]b[ `k` ]h`chYfg`Vi`hdUgg]b[ `cZ`hY`k`cf\_]Ug`U`dYfgcb`g`]bX]j` ]Xi`U`k`cf\_]7c`i`g]cb`U`gc`  
]bWi`XYg`dfcj`X]b[ `mci`f`k`cf\_]hc`Ubc`hY`f`gh`XYbhVY`Zc`fY`hY`Xi`Y`XU`hY`Zc`f`Zc`f`hY`di`fdcgY`cZ`hY`a`  
d`U[ ]Uf]g]b[ `Uh`Ubmi]a`Y`Z`dUm]b[ `Ubc`hY`f`dYfgcb`hc`dYf`Zc`fa`Ub`UW`XYa` ]W`hUg`\_`Z`ghY`U`]b[ `cf`U`W`ei` ]f]b[  
Ubc`hY`f`dYfgcb`g`UW`XYa` ]W`k`cf\_]UbX`W`dm]b[ `]Z`c`ZYf]b[ `hc`W`ca`d`Y`hY`Ubc`hY`f`dYfgcb`g`k`cf\_]cf`g`YY\_]b[  
dUma`Ybh`Zc`f`W`ca`d`Y`h]b[ `UW`XYa` ]W`k`cf\_]`

#Uddfcdf]UHY`W`hU]cb.`7`]h]b[ `gci`fW`g`k` \]W` \Uj`Y`bchV`Y`b`fY`UX`Z`k` ]h`ci hUW`bck`YX[ ]b[ 'hY`"gY`W`bXU`fm`  
gci`fW`Z`ca`k` \]W`\_`bck`YX[ Y`cZ`hY`a` \Ug`V`Y`b`c`V`hU]bYX`"

8i`d`]W`h]cb`f`f`gY`Z`d`U[ ]Uf]ga` "E`gi`Va` ]h]b[ `mci`f`ck`b`k`cf\_]b`k` \c`Y`cf`]b`dU`f`Z`k` \YfY`]h` \Ug`d`fYj` ]ci`g`m`  
V`Y`Y`b`dfY`dU`fY`X`cf`gi`Va` ]hY`X`Zc`f`Ubc`hY`f`UggY`gga`Ybhcf`W`ei`fgY`UhI`BGK`cf`Ubc`hY`f`i`b]j`Yfg]h`"

7c`ffY`W`hY`ZYfYbW]b[ `dfU`W`]W`g.

- VYhYf'a UbU[ Y'mci f'hja Y



		F Yj c'i hcb
	Hi hcf]U'	; U]Ycf] 7 cbg]XYfU]hcb'cb'hY'7 cdYfb]WU]b'c d]b]cbž = f%* %) ě]b'F ZW7 eeW f[S^9 S{Vá žYX" UbX' hfUbg" A "5": ]bcVW]Ufcž- bX]UbUdc]g#7 Ua Vf]X[ Y. < UW_Yhž &\$\$, ž% \$!%* +" F cmDcf]fž" H\Y'GWYb]h]ZWF Yj c'i hcb. '5' Gdc_Y ]b h\Y'K \YY'3" ]b'DWha'gf]a` [ : [efackžYXg" F " Dcf]fžA "HY]VXž7 Ua Vf]X[ Y#B Yk 'Mcf_ '7 Ua Vf]X[ Y I b]j Yfg]mDfYggž% , *ž &- \$!' %* "
K YY_+. %* '5df]'! '&& 5df]'	@YVh fY	F Y] [ ]ci g'F YZcfa U]hcbg' UbX'GYW 'Uf]gU]hcb
	Hi hcf]U'	A Uf]b @ hYfž "B ]bYm]Z] Y H\YgYg" ]b'DWá_d_Sf]a` DWSVWžYX"8">UbnžA ]bbYUdc]g. : cffYgg' DfYggž % - - ž, %, ) " F ]WUfX'j Ub'8Øa Ybž" H\Y'F YZcfa U]hcb' UbX'h\Y A cXYfb'5 [ Y" ]b'FZW9Wd_S` DWá_d_Sf]a` žYX"7 "G" 8 ] cbžA U'XYb. '6' UW_k Y`ž% - - ž% ' !&% "
K YY_., '&' '5df]'! '&- 5df]'	@YVh fY	9b] [ \h'ba Ybh]UbX'F Yj c'i hcb
	Hi hcf]U'	8 YWUfU]hcb'cZF ] [ \h'cZA Ub'UbX'h\Y'7 ]h]Ybž]b' 7` \Yzfw _ w fDWSVWžYX" =gUUW? fUa a ]W_ž @cbXcb. 'DYb[ i ]bž% - ) ž( **!( * , " : fUbÁc]g: i fYhž "HYffcP" ]b'3 5df][US^6 [Uf]a` Sck aX fZW8dW UZ DWha'gf]a` žYXg": " : i fYhžA "C nci Ž 7 Ua Vf]X[ Yž@cbXcb. < Uf] UfX'I b]j Yfg]mDfYggž % , - ž% +!%) \$"
K YY_-. ' \$'5df]'! '* 'A Um	@YVh fY	B U]hcbU]ga
	Hi hcf]U'	9fbYghF YbUbž "K \Uh-ğ'U' B U]hcb3" ]b'FZW @Sf]a` S'fe_ DWSVWžYXg"C": \UVci fžA " =ğ\Umž B Yk ' >YfgYm < i a Ub]h]Ygž%( ' !%) &" 9f]W<cVgVUk a ž "H\Y' B U]hcb'Ug' -b] YbhYX' HfUX]hcb" ]b' > " < i h\X ]bgcbž5" Ga ]hž@Sf]a` S'fe_ žC I Žcfxž B Yk 'Mcf_ 'C I Žcfx' I b]j Yfg]mDfYggž% - ( ž+*!, &"
K YY_%\$. '+ 'A Um! '% A Um	@YVh fY	bXi gf]U]gU]hcb'UbX'7 Ud]h]U]ga
	Hi hcf]U'	? Uf' A Uf] ž: f]YXf]W'9b[ Y'gžFZW5a_ _ g` [ef ? S` [XWefa f% ( , ěžYX">"7" =gUUWžBYk < Uj Ybž @cbXcb. 'MU'Y' I Dž&\$%&ž+' !- &f# '6ci f[ Yc]g'UbX Dfc'YhUf]Ubgž=" Dfc'YhUf]Ubg'UbX'7 ca a i b]g]h]gŁ"
K YY_%% '( 'A Um! '&\$ A Um	@YVh fY	H\Y'5 [ Y'cZ9I hfYa Yg
	Hi hcf]U'	6Yb]h'c' A i ggc`b]f]f' ; ]c] Ubb]; Ybh]YĚ ": ci bXU]hcbg'UbX'8cWf]bY'cZ: UgW]ga "f%- ' &ě]b'3 Bd_ WdaX;fS'fS` 8SeU[e_ žYX">"H"GWXbUddž @]bW' bž@cbXcb. I b]j Yfg]micZBYVfUg_U'DfYggž &\$\$\$ž) \$! *%f#": UgW]ga f]g'Dc`h]WU' UbX'GcW]U' 8cWf]bY"Ě" I a VYfrc'9Wčž"i f!: UgW]ga "ž]b 8[hW? adS^B[WUWčž

		BYk 'Mc f_.' < UfWci frž &\$\$%ž*) !, , "
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	Hi hc f]U`	‡ Ub '? fUghYj ž 3XWd 7 gđabWžYI Wfdhž'D\]`UXY`d\]U. l b]j Yfg]mhcZDYbbgmj Ub]U'DfYggž &\$\$+ž &, !) - "
K YY_%' . '&, 'A Um!'' >i bY	Hi hc f]U`	F Yj ]Yk

F Ygci fWg

DfYgWf]VYX`F Ygci fWg`

5`k YY\_mfYUX]b[ g`UfY`]b`hY`Wci fgY`\_]hUj U]UV`Y`Zcf`di fWUgY`Uhl` BGK`'6cc\_ghcFY"

5XX]hcbU`fYUX]b[ g`UfY`Uj U]UV`Y`cb`hY`Wci fgY`A`ccX`Y`dU[ Y"

F YWca a YbXYX`F Ygci fWg

>c\b`<]fgh`H\Y`G\cfhYgh<]ghcfmcZ9i fcdY"

H\]g`Vcc`\_]g`Uj U]UV`Y`UhhY`I` BGK`'6cc\_ghcFY" `h]g`U`gc`Uj U]UV`Y`Y`YWfcb]WU`m`h`fci [ \`hY`i`b]j`Yfg]m`  
]VfUfm]WU]c[ i Y"

5XX]hcbU`fYUX]b[ g`cb`k`YY\_mhcd]Wg`WU]b`VY`Zci`bX`cb`hY`A`ccX`Y`Wci`fgY`dU[ Y"

7ci fgY`9j U`i U]cb`UbX`8Yj Y`cda Ybh

: cfa U`ZYXVUW`\_Zca`gh`XYbfg`k`j`VY`Wc`Y`WYX`j`U`a`m9I`dYf]YbWf`UbX`k`j`VY`i`gYX`hc`]a`dfcj`Y`Z`hi`fY`  
]hYfU]hcbg`cZ]g`Wci`fgY" `Zcfa U`ZYXVUW`\_]g`U`gc`j`Yfmk`Y`Wca`Y"

⇒ U[ Y`7`fYX]h

GmbYf[ ]Yg`]b`Gci`bX`&\$%\*`

7F ⇒ CG

7F ⇒ CG`Dfcj`jXYf`7`cXY`.\$\$\$-` ;` ;`