



ARTS2451

HYfa YX]UH`7 \]bYgY`Zcf`Bcb!6UW_[fci bX`GdYU_Yfg`6

HYfa `H\fYY`##`&\$%-

7ci fgY`Cj Yfj JYk

`GHUZZ7cbhUWih8YHUJ`g`

`7cbj Ybcfg`

B Ua Y	9a U]`	5j U]UV]`]m	@cW]h]cb	D\cbY
K U\ ; i Ub`@a	k [`]a 4 i bgk "YXi "Ui		F cca `&() ž A cfj Yb`6fck b	- ' ,) `* , %

`@YWi fYfg`

B Ua Y	9a U]`	5j U]UV]`]m	@cW]h]cb	D\cbY
K U\ ; i Ub`@a	k [`]a 4 i bgk "YXi "Ui		F cca `&() ž A cfj Yb`6fck b	- ' ,) `* , %

GW\cc``7cbhUWih`bZcfa Uh]cb

GW\cc``cZ<i a Ub]hYg`UbX`@Jb[i U[Yg

@cW]h]cb. `GW\cc``C Z]W]žA cfj Yb`6fck b`6i]X]b[ž`@Yj Y``&ž&),

CdYb]b[`<ci fg. `A cbXUm! : f]XUmž - Ua `!) da

D\cbY. `Ž*%&`- ' ,) `* , %

: U! . `Ž*%&`- ' ,) ; , +\$)

9a U]: [\U`4 i bgk "YXi "Ui](#)

7ci fgY'8YHJ]`g

7fYX]hDc]bHg`*`

Gi a a UfmicZ\hY'7ci fgY

Gi VYWh5fYU.'7\]bYgY'Gh X]Yg

H\]g`Wci fgY`]g`XYg][bYX`Zcf`ghi XYbHg`k \c`Uj Y`UWei]fYX`U`VUg]WYj Y`cZgdc`Yb`7\]bYgY`fA UbXUf]bE`UbX
U`k cf`_]b[`]_bck`YX[Y`cZi d`hc`Y][\h\i bXfYX`g]a d`]ZYX`WXUfUWYfg`]b`hY]f`%)`mYUfg`cZghi XnZ`Ug`k Y`Ug
Zcf`hcgY`ghi XYbHg`k \c`YbHf`hY`7\]bYgY`Ub[i U[Y`dfc[fUa`k`]h`Ub`Yei`j] U`Ybh`_bck`YX[Y`cZ7\]bYgY
WXUfUWYfg`" `h]g`XYg][bYX`Zcf`ghi XYbHg`k \c`Xc`bchWca`Y`Zca`U`7\]bYgY`W`h`fU`UbX`Ub[i U[Y`fctf
X]U`YW`U`VUW`[fci bX`" `h`h]g`Wci fgY`Z`mci`k`j`"ja`dfcj`Y`mci`f`7\]bYgY`g`_]`g`]b`hY`UfYUg`cZgdYU`_]b[ž
]gh`b]b[ž`fYUX]b[ž`UbX`k`f]h]b[ž`UbX`k`j`"a`U`_Y`g][b]Z]W]bhi[U]bg`]b`mci`f`Wca`a`i`b]W]h] Y`g`_]`g`]b`cfU`UbX
k`f]hY`b`Z`ca`g`"Mci`k`j`"U`gc`VY`Yi`dcgYX`hc`UgdYW`g`cZ7\]bYgY`Y`]g`hcnZ`W`h`fY`Z`dc`]h]W`ž`UbX`gc`VY`hm
fY`Yj`Ubh`c`[] Yb`h]i`hg`]b`7\]bYgY`]b`Ub[i U[Y`UWei`]g]h]cb`"

7ci fgY`@YUfb]b[`Ci hWca Yg

%`5dd`mYZZY`W]j`Y`ghfUHY`[]Yg`Zcf`fYUX]b[`7\]bYgY`hY`hg`Z`ca`j`Uf]ci`g`gci`fW`g`UbX`cb`U`j`Uf]YmicZ
hcd]Wg`
&`7`ca`dcgY`g`lcfhYggUm]g`]b`7\]bYgY`cb`U`[]j`Yb`hcd]Wk`]h`Wcb`Z`XYbW`"``
'`" `h]h]U]h]Y`j`YfmXUmWcb]j`YfgU]h]cb]g`UbX`Yb[U[Y`]b`X]gW`gg]cb]g`]b`7\]bYgY`"``
(`"8`Ya`cbghfUHY`W]h]W]U`ddfYW]U]h]cb`UbX`bi`UbW`X`_bck`YX[Y`cZ7\]bYgY`"b[i]gh]WVY`U`j`]ci`fž
gc`VY`hm`UbX`W`h`fY`"``

HYUWX`]b[`GhfUHY`[]Yg`

H\Y`Wci fgY`Wca`df]gYg`hk`c`Wca`dcbYbHg`cZ]Z]W`!hc`Z]W`hYUWX]b[`UbX`YUfb]b[`dYf`k`YY`_`fP`E`H\Y`Y`W`h`fYg
dfcj`]XY`Ub`]b]fcXi`W]h]cb`hc`[fUa`a`Ufž`_Ym`Ub[i U[Y`UbX`W`h`fU`]ggi`Yg`]b`YUWX`Y`ggcbž`k`]h`dfUW]W]g`hc
Wcbgc`]XU]h`bYk`_bck`YX[Y`]b`Ub[i U[Y`UWei`]g]h]cb/f&E`H\Y`h`hc]f]U`g`ZcW`g`cb`k`cf`_Vcc`_Yi`YfW]gYgž`k`]h
cddcfh`b]h]Yg`Zcf`ghi XYbHg`hc`dfUW]W]c`fU`7\]bYgY`UbX`UXXfYgg`]ggi`Yg`]b`fYUX]b[`UbX`k`f]h]b["Mci`g`lci`X
dfYj`]Yk`hY`bYk`k`cfXg`VY`ZcfY`YUWX`Y`W`h`fY`UbX`Xc`hY`Yi`YfW]gYg`]b`hY`k`cf`_Vcc`_VY`ZcfY`YUWX`h`hc]f]U`
Mci`UfY`Yi`dYW]X`hc`U`c`W]h`UXX]h]cbU`h]a`Y`Zcf`gY`Z`ghi`XmiUbX`dUf]bYf`Ub[i U[Y`dfUW]W]ž`k`]W]k`j`"VY
WX`Y`W`Y`X`k`YY`_m]b`Y`W`h`fYg`UbX`h`hc]f]U`g`"9b[U[Ya`Ybhk`]h`hY`Wci fgY`Wcb`hY`bhk`j`"VY`Z`f`hY`f`UggYggYX
Vmi`U`a`]X]hYfa`hYgh]UbX`Ub`YbX`!cZ]hYfa`Z]bU`hYgh`

5ggYgga Ybh

5ggYgga YbhHUg_g`

5ggYgga YbhHUg_	K Y][\h	8i Y'8UHŸ	Gh XYbh@YUfb]b[Ci hWta Yg'5ggYggYX
7cbj YfgUŸ]cb`YI YfW]gYg`	&&\$i	K YY_`m	%ž
A]X!gYa YghŸf`Ÿgh	%) i	K YY_`)	%ž&ž(%ž&ž(
ŸbU`Ÿgh	') i	K YY_`-	%ž&ž(
DfYgYbhUŸ]cb`	' \$i		

5 hYbXUbW'F Yei]fYa Ybhg

5 hYbXUbW'cZ@YWhi fYg#hi hcf]U'g]g'a UbXUhcfm]b'h]g'Wci fgY"i bYI W gYX'UVgYbW'Zfca 'a cfY'hUb'%'\$i cZ@YWhi fYg#hi hcf]U'g'k]''fYgi 'h]b'hY'Uk UfX'U'ZU]'[fUXY''#b '@YWhi fY#hi hcf]U'g'mci 'k]''UW]j Y'mYb[U[Y k]h'Wc'fY'Wci fgY'Wc'bhYbZ'YbUV'j]b['mci 'hc'U'htU]b.'

- % " 5dd'mYZZ'W]j Y'ghfUHY []Yg'Zcf'fYUX]b['7\]bYgY'hYI hg'Zfca 'j Uf]ci g'gci fWg'UbX'cb'U'j Uf]YmicZ hcd]Wg'
- &" 7ca dcgY'g\cfhYggUm]j]b'7\]bYgY'cb'U'[]j Yb'hcd]Wk]h'Wc'bZ]XYbW''''
- ' " #]h]U]UHY 'Yj YfmXUmWc'bj YfgU]cbg'UbX'Yb[U[Y]b'X]gW'gg]cbg]b'7\]bYgY''''
- (" 8Ya cbghfUHY'W]h]W'UddfYV]U]cb'UbX'bi UbW'X'_bck'YX[Y'cZ7\]bYgY'']b[i]gh]WVY\Uj]ci fz gcV]YmUbX'W'h'fY'

7 ci fgY'GWXYXi `Y

[J \]Yk 'WUgg'Ha YhUVY](#)

H]a YhUV'Y'

8UH	HmdY	7cbhYbh
K YY_% '%* 'GYdhYa VYf! &\$ 'GYdhYa VYf	@YWhi fY Hi hcf]U'	#hfcXi W]cb/HYI hVcc_'@Yggcb'%% Bc'h hcf]U'g
K YY_& '&' 'GYdhYa VYf! &+ 'GYdhYa VYf	@YWhi fY Hi hcf]U'	HYI hVcc_'@Yggcb'%'& K cf_Vcc_'@Yggcb'%%
K YY_' ' ' \$'GYdhYa VYf! ('C WtcVYf	@YWhi fY Hi hcf]U'	HYI hVcc_'@Yggcb'%' K cf_Vcc_'@Yggcb'%'&
K YY_(' + 'C WtcVYf!' '% C WtcVYf	@YWhi fY Hi hcf]U'	HYI hVcc_'@Yggcb'%'(K cf_Vcc_'@Yggcb'%'
K YY_) ' '%('C WtcVYf!' '% C WtcVYf	@YWhi fY Hi hcf]U'	HYI hVcc_'@Yggcb'%' A]XhYfa 'HYgh
K YY_* ' '&% 'C WtcVYf!' '& C WtcVYf	@YWhi fY Hi hcf]U'	HYI hVcc_'@Yggcb'%' + K cf_Vcc_'@Yggcb'%'((
K YY_+ ' '& 'C WtcVYf!' '% Bcj Ya VYf	@YWhi fY Hi hcf]U'	HYI hVcc_'@Yggcb'%' K cf_Vcc_'@Yggcb'%'
K YY_ , ' (' Bcj Ya VYf!' , Bcj Ya VYf	@YWhi fY Hi hcf]U'	HYI hVcc_'@Yggcb'%' - K cf_Vcc_'@Yggcb'%' +
K YY_- ' ' %' Bcj Ya VYf!) ' Bcj Ya VYf	@YWhi fY Hi hcf]U'	K cf_Vcc_'@Yggcb'%' ' :]bU' 'HYgh
K YY_ %\$ ' '% ' Bcj Ya VYf! && ' Bcj Ya VYf	@YWhi fY Hi hcf]U'	DfYgYbh]h]cb F Yj]g]cb

F Ygci fWg

DfYgWf]VYX`F Ygci fWg`

%":bH[fUHx`7\]bYgYzJc`i a Y`(`z(`h`9X"zHYI hcc_`fDUdYfVUW_z`G)a d`]ZYX/`HfUX]hcbU`L"GG6B.
- +, %* &&- %%) %* Q

&":bH[fUHx`7\]bYgYzJc`i a Y`(`z(`h`9X"zK cf_Vcc_`fDUdYfVUW_z`G)a d`]ZYX/`HfUX]hcbU`L"GG6B.
- +, %* &&- %%) &` Q

F YWca a YbXYX`F Ygci fWg

BchUj U]UV`Y

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

Gh XYbHg`UfY`YbWci fU[YX`hc`Ya U]`hY`Wcbj Ybcf`k]h`Ubmigi [[Ygh]cbg`cf`ZYXVUW_`fY`Uh]b[`hc`hYUW]b[
ghmYz`Yggcb`dUWz`WcbhYbhz`Dck YfDc]bhg]XYgz`YfW
: YXVUW_`]g`U`gc`[UhYfYX`Zca`gh XYbHg`i`g]b[`a n9l dYf]YbVW"Gh XYbHg`UfY`YbWci fU[YX`hc`Wca d`Yh
hY]f`gi`fj Ymg`VmUWVgg]b[`hY`dYfgcbU]gYX`k YV`]b_`j]U`hY`A ccX`Y`Wci fgY`g]h"

Gi Va]gg]cb`cZ5ggYgga YbhHUg_g

Gi Va]gg]cb`cZ5ggYgga YbhHUg_g

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

Ẓmci `YbWci bhYf`U`dfcV`Ya `k \Yb`U`H`Ya dh]b[`hc`gi Va]hmc i f`Ugg][ba YbhHfci [\`Hi fb]h]bžd`YUgY
H`Yd\cbY`9I H`fbU`Gi ddcfhcb`-` ,) `` `` %cf`Ya U]`H`Ya `cb`YI H`fbU`H`hgi ddcfh4 i bgk "YXi "Ui ``Gi ddcfh
\ci fg`UfY` , .\$\$Ua `--`%\$. \$\$da `cb`k YY_XUmg`UbX`- . \$\$Ua `--`) . \$\$da `cb`k YY_YbXg`fI *) `XUmg`U`m`Y`UfL` Ẓmci
UfY`i bUV`Y`hc`gi Va]hmc i f`Ugg][ba YbhXi Y`hc`U`ZU`i`hik]H`Hi fb]h]b`mci `a UmiUdd`miZc`f`Ub`YI H`bg]cbžVi hmc i
a i ghfY`H]b`mci f`h]W`Yhbi a VYf`Zca `9I H`fbU`Gi ddcfhfU`cb[`k]H`Ubmch`Yf`fY`Yj UbhXcW a Yb`hgL`hc
]bWi XY`Ug`Yj]XYbW`hc`gi ddcfhmci f`YI H`bg]cb`Udd`]W]h]cb" Ẓmci `Ya U]`9I H`fbU`Gi ddcfhmci `k]`

5 WUXYa]W<c bYghmiUbX`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" `hWUb`hU`Y`a Ubm
Zcfa gZ`Zca `XY`]VYfUHY`WXYU]b[`hc`UWV]XYbhU`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.

7 cdm]b[.`i g]b[`hY`gUa Y`cf`j Yfmg]a]Uf`k cfXg`hc`hY`cf][]bU`hYI`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`UfhUbX`XYg][`b`dfc`YWgZ`Ug`k Y`Ug`
dfYgYbhU]cbg`k \YfY`gca YcbY`dfYgYbh]`Ubc`hYf`g`]XYUg`cf`k cfXg`k]h`ci hW`YX]h`

hUddfcdf]UHY`dUfUd`fUg]b[.`7`U`b[]b[`U`ZYk`k`cfXg`UbX`d`fUgYg`k`Y`a`cghmiFYhU]b]b[`hY`cf][]bU`
ghfi`W`fY`UbX`#`f`dfc[`fYgg]cb`cZ]XYUg`cZ`hY`cf][]bU`Z`UbX`]bZcfa`U]cb`k]h`ci hUW_bck`YX[Ya Ybh`H\]g`U`gc`
Udd`]Yg`]b`dfYgYbhU]cbg`k \YfY`gca YcbY`dUfUd`fUgYg`Ubc`hYf`g`]XYUg`cf`k cfXg`k]h`ci hW`YX]hU`bX`hc`
d]YW]b[`hc[Y`hYf`ei`chYg`UbX`dUfUd`fUgYg`]bhc`U`bYk`k`c`Y`Z`k]h`ci hUddfcdf]UHY`fYZYfYbW]b["

7 c`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_]`7`c`i g]cb`U`gc`
]bWi`XYg`dfcj`X]b[`mci`f`k`cf_]hc`Ubc`hYf`gh`XYbhVYZc`fY`hY`Xi`Y`XUHY`Zc`f`Zc`f`hY`di`fdcgY`cZ`hY`a

- i bXYfghUbx'mci f'f][\hg'UbX'fYgdcbg]V]h]Yg'Ug'U'gh XYbhUhl BGK
- VY'Uk UfY'cZd'U[]Uf]ga ž'Wc'dmf][\hž' BGK 'Gh XYbh7cXY'cZ7cbXi W'Ubx'5W'W'dhUV'Y'I gY'cZ I BGK '⇒H'F Ygci f'W'g'Dc`]W'h
- VY'Uk UfY'cZ'Y'ghUbxUfXg'cZVY\Uj]ci f'YI dY'W'X'cZYj Yfmcby']b'h'Y'I BGK 'W'a a i b]m
- 'cW'W'h'gYfj]W'g'UbX']bZ'fa U]cb'UVci hl BGK 'UbX'I BGK '@]VfUfm

Gca Y'cZ'Y'gY'UfY'Ug'k]''VY'ZJa]]Uf'hc'mci ž'c'h'Yfg'k]''VY'bYk "; U]b]b['U'gc`]X'i bXYfghUbx]b['cZU''h'Y fY'U'Y'X'UgdY'W'g'cZ9@-G9'k]''\Y'd'mci 'a U_Y'h'Y'a cgh'cZ'mci f'gh X]Yg'Uhl BGK ""

[\h'hd.##gi V'Y'W'i \]X'Yg" \]VfUfm'i bgk "YXi "Ui #' \]gY#UVci h' \]gY](#)

5 WUXYa]WbZcfa Uh]cb`

: cf`YggYbh]U`ghi XYbh]bZcfa Uh]cb`fY`Uh]b[`rc.

- fYei Ygh]Zc`fYI h`bg]cb/
- `Uh]`gi Va]gg]cbg`[i]XY`]bYg/
- fYj]Yk `cZa Uf_g/
- I BGK `<YU`h`UbX`GUZY`midc`]WYg/

