

ARTS2020

7 fYUhjj Y K f]hjb[

GYa YghYf'Hk c''#'&\$%

7ci fgY Cj Yfj]Yk

`GhUZZ`7cbhUWh'8YhU]`g`

7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`] m	@cWUh]cb	D\cbY
DUi ``8 Uk gcb	dUi `"XUk gcb4 i bgk "YXi "Ui	Vm'Uddc]bha Ybh	FcVYfh	-',)`&&&\$
			KYVghYf*&%	

GWkcc`7cbhJWh =bZcfa Uhlcb

Fcca " %&ž~Yj Y~" FcVYfhK YVqhYf~6i]`X]b[

D\cbY. f\$&Ł'-',) '(,)*

9a U]`. 'gUa 4 i bgk "YXi "Ui

K YVg]hY. \hdg.##qUa "Ufhq"i bgk "YXi "Ui

 $\label{eq:hamber_state} $$HY'GWCC``cZhY'5ftg'UbX'AYX]U'kci`X``]_Y'hc'FYgdYWM\cong \cong m5W_bck`YX[Y'h\Y'HfUX]hjcbU``7i ghcX]Ubgž h\Y'6YXY[U'`fPYbg]b[hcb'WJa di gŁž'; UX][U'`fP]hmUbX'5fh\/ '8Yg][b'7Ua di gYgŁ'UbX'h\Y'B[i bbUk U` dYcd`Y'fbi ghfU`]Ub'8YZYbW': cfW'5WJXYa m]b'7UbVYffUŁ'cZh\Y'`UbXg'k\YfY'YUW\'WJa di g'cZl BGK ']g `cWJhYX''$

5 hyb XUb WY F Yei]fYa Ybhg

5 'ghi XYbhi]g'Yl dYWYX'hc'UhhYbX'U```WUgg'WebhUWi\ci fg'Zcf'U'ZUWY!hc!ZUWY'fl &: Ł'cf'V`YbXYX'Wei fgY'UbX Wea d'YhY'U```UWIjj]hJYg'Zcf'U'V'YbXYX'cf'Z ``mcb`]bY'Wei fgY"

5 'ghi XYbhik \c'Uff]j Ygʻa cfYʻh\Ubʻ%) 'a]bi hYgʻ`UhYʻa UmVYʻdYbU`]gYXʻZcfʻbcb! UhhYbXUbVW"'-⊋gi W\'U'dYbU`hm]gʻ]a dcgYXžʻh\Yʻghi XYbha i ghVYʻ]bZcfa YXʻj YfVU``mUhih\YʻYbXʻcZWUggʻUbXʻUXj]gYXʻ]bʻk f]h]b[ˈk]h\]bʻ&(\ci fg"

⊋Uʻgh XYbhYl dYf]YbWrgʻ]`bYggža]gUXj Ybh fYʻcfʻch\YfʻcWW ffYbWrʻh\Uha U_YgʻUVgYbWʻZfca ʻU WUgg#UWfj]hmi bUj c]XUV`YžcfʻYl dYWgʻhcʻVYʻUVgYbhZfca ʻUʻZcfh\Wda]b[ˈWUgg#UWfj]hmžh\Ymg\ci `XʻgYY_ dYfa]gg]cbʻZfca ʻh\Yʻ7 ci fgYʻ5i h\cf]hmžʻUbXʻk \YfYʻUdd`]WUV`Yžh\Y]fʻfYei Yghg\ci `XʻVYʻUWWda dUb]YXʻVmUb cf][]bUʻʻcfʻWffh]ZJYX`WdmcZUʻa YX]WUʻ`WYffh]ZJWUhYʻcfʻch\YfʻZcfa ʻcZUddfcdf]UhYʻYj]XYbWY"

5.7 ci fgY 5 i h\cf]hma UmYI W gY Ugh XYbhZca "WUggYg cf'UWfj]hJYg Zcf'i d'hc cbY a cbh\" < ck Yj Yfz'h\Ym a UmUgg][b UXX]hJcbU `UbX#cf'U'hYfbUhj Y 'HUg_g hc Ybgi fY 'Wca d`]UbW\" : 5.7 ci fgY 5 i h\cf]hm\Wcbg]XYf]b['th\Y [fUbh]b['cZUVgYbW' a i ghVY 'gUhJgZ]YX 'U gh XYbhk]```gh]```VY 'UV'Y 'hc a YYhh\Y 'Wci fgY'g `YUfb]b['ci h\Xca Yg UbX#cf'j c'i a Y 'cZ'YUfb]b["'5 'gh XYbhgYY_]b['Uddfcj U `hc 'VY 'UVgYbhZcf'a cfY 'h\Ub 'cbY 'a cbh\ 'a i ghUdd`m]b 'k f]hJb['hc 'h\Y '8 YUb 'UbX'dfcj]XY 'U``cf][]bU``cf'\Wfh]Z]YX 'gi ddcfh]b['XcW a YbhUh]cb"

: cf'a cfY]bZcfa Uhcb'UVci hth.Y'UthYbXUbWY'dfchcWc'g]b'th.Y': UW `hmcZ5fhg'UbX'GcW

: cf`YggYbhJU``ghi XYbh`]bZcfa UhJcb`fY`UhJb[`hc.`fYei Yghg`Zcf`Yl hYbg]cb/fYj]Yk `cZa Uf_g/cWW dUhJcbU``\YU`h\UbX`gUZ/hm/Yl Ua]bUhJcb'dfcWXi fYg/gdYVJU``Wcbg]XYfUhJcb`]b`h\Y`Yj YbhcZ]``bYgg`cf`a]gUXj Ybhi fY/ghi XYbhYei]hmUbX`X]gUV]`]hm/UbX`ch\Yf`YggYbhJU``UWUXYa]W]bZcfa UhJcbž gYY`\hdg.#k k k "Ufhg"i bgk "YXi "Ui #W ffYbhghi XYbhg#JWUXYa]W]bZcfa UhJcb#dfchcWc`g![i]XY`]bYg#

hc h Y WfYUhj Y dfc Wgg

•'k cf_g\cdd]b['cZmci f'a Ubi gWf]dhg'hc'[U]b'dYYf'[fci d'ZYYXVUW_'cb'k cf_g

Wgf_'a Xhg'hXWj\g\gg

5ggYgga Ybh

$k cf_g \cdd b[\Vmh Y]f d$	YYfg" H\]g'	Wca a YbHJfmig\ci `X'VY'i d`cUXY	'X'cbhc'AccX'Y'Zcf'YUW
	<u> </u>		<u> </u>

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Gh XYbhg UfY Yl dYWYX hc di hh\Y]f bUa Yg UbX gh XYbhbi a VYfg cb Yj YfmdU[Y cZh\Y]f Ugg][ba Ybhg"

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

#mci YbWci bhYf'U'dfcV'Ya k \Yb'UhYa dhJo['hc'gi Va]hmci f'Ugg][ba Ybhh\fci [\'Hi fb]h]bž'd'YUgY
hY'Yd\cbY'9l hYfbU'Gi ddcfhcb'-',) "''' %cf'Ya U]'h\Ya 'cb'<u>Yl hYfbU'hY'hgi ddcfh4 i bgk "YXi "Ui"</u>"'Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-').\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUfŁ"'#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'Yl hYbg]cbž'Vi hmci
a i ghfYhJ]b'mci f'h]W_Yhbi a VYf'Zfca '9l hYfbU''Gi ddcfhfU'cb['k]h\'Ubmch\Yf'fY'Yj UbhXcW a YbhgŁ'hc
]bWi XY'Ug'Yj]XYbW'hc'gi ddcfhmci f'Yl hYbg]cb'Udd']WUh]cb"'#mci 'Ya U]''9l hYfbU''Gi ddcfhmci 'k]''
Ui hca Uh]WU''mfYWf']j Y'U'h]W_Yhbi a VYfž'Vi h]Zmci 'hY'Yd\cbY'mci 'k]'''bYYX'hc'gdYW]ZJWU''mUg_'Zcf'cbY"
Hi fb]h]b'U'gc'dfcj]XYg'i dXUhYg'cb'h\Y]f'gmghYa 'ghUh' g'cb'Hk]hYf"

; YbYfU``mž'UggYgga YbhitUg_g'a i ghVY'gi Va]hhYX'Y`YWfcb]WU``mj]U'Y]h\Yf'Hi fb]h]b'cf'U'A ccX`Y Ugg][ba Ybh'' =b']bghUbWfg'k \YfY'h\]g']g'bchdcgg]V`Yž']hk]```VY'ghUhYX'cb'mci f'Wci fgY'g'A ccX`Y'g]hY'k]h\U`hYfbUh]j Y'gi Va]gg]cb'XYhU]`g''

@UhY 5 ggYgga YbhDYbU`hJYg

- K cf_'gi Va]hh'X`%\$`hc`% 'XUmg`UZhYf`h\Y`gh]di `UhYX`XYUX`]bY`k]```VY`UggYggYX`UbX`ZYYXVUW_dfcj]XYX`Vi h'U`a Uf_'cZnYfc`k]```VY`fYWcfXYX"`\Zh\Y`k cf_'k ci `X`\Uj Y`fYWf]j YX`U'dUgg`a Uf_'Vi h'Zcf h\Y``UhYbYgg`UbX`h\Y`k cf_']g`U`Wca di `gcfm'Wci fgY`Wca dcbYbh'f\i fX`Y`fYei]fYa Ybh\z`U'gh XYbhk]``VY`XYYa YX`hc`\Uj Y`a Yhih\Uh'fYei]fYa Ybh\
- K cf_'gi Va]hhYX`&\$`cf`a cfY`XUmg`UZhYf`h\Y`gh]di `UhYX`XYUX`]bY`k]```bchVY`UWWdhYX`Zcf UggYgga YbhUbX`k]```fYWY]j Y`bc`ZYYXVUW_ža Uf_'cf`[fUXY"'=Zh\Y`UggYgga YbhHUg_']g`U`Wca di `gcfm Wca dcbYbhcZh\Y`Wci fgY`U'ghi XYbhik]```fYWY]j Y`Ub`l bgUh]gZJWcfmi: U]``fl : Ł`[fUXY`Ug`U`fYgi `hcZ i bgUh]gZJWcfmidYfZcfa UbWY`]b`Ub`YggYbh]U``Wca dcbYbhcZh\Y`Wci fgY"

H\]g^]bZcfa Uh]cb^]g^U^gc^Uj U]^\$

‰fm

‰ ‰

‰

5 WUXYa]W<cbYghmUbX D`U[]Uf]ga

D`U[]Uf]ga `]g`i g]b['h\Y`k cfXg`cf`]XYUg`cZch\Yfg`UbX`dfYgYbh]b['h\Ya `Ug`mci f`ck b"'\lefi\Wb'hU_Y`a Ubm Zcfa gžZfca `XY`]VYfUhY`W\YUh]b['hc`UVW]XYbhU`mWcdm]b['Zfca `U`gci f\W' k]h\ci hUW_bck `YX[Ya Ybh'

IBGK [fcidgdu[]Uf]ga]bhch\YZc``ck]b[WUhY[cf]Yg.

7 cdm]b[.'i g]b['h\Y'gUa Y'cf'j Yfmg]a]`Uf'k cfXg'hc'h\Y'cf][]bU`hYl h'cf']XYU'k]h\ci h'UW_bck `YX[]b['h\Y gci fW'cf'i g]b['ei chUh]cb'a Uf_g"'H\]g'U`gc'Udd`]Yg'hc']a U[Ygž'Ufh'UbX'XYg][b'dfcYWhgž'Ug'k Y``'Ug dfYgYbhUh]cbg'k \YfY'gca YcbY'dfYgYbhg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci h'WfYX]h'

⇒ Uddfcdf]UhY 'dUfUd\fUg]b[...7\Ub[]b['U'ZYk 'k cfXg'UbX'd\fUgYg'k \]'Y 'a cghmfYhJ]b]b['h\Y'cf][]bU` ghfi Wh fY 'UbX#cf'dfc[fYgg]cb'cZ]XYUg'cZh\Y'cf][]bU'žUbX']bZcfa Uh]cb'k]h\ci hUW_bck `YX[Ya Ybh'H\]g'U`gc Udd`]Yg']b'dfYgYbhUh]cbg'k \YfY'gca YcbY'dUfUd\fUgYg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci hWfYX]hUbX'hc d]YW]b['hc[Yh\Yf'ei chYg'UbX'dUfUd\fUgYg']bhc'U'bYk 'k \c`Yžk]h\ci hUddfcdf]UhY'fYZYfYbW]b["

 $7c^{i}$ g]cb. 'k cf_]b['k]th. 'cth. Yfg'Vi h'dUgg]b['c\Zth. Y'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U''k cf_"'7c''i g]cb'U'gc

 $i\ bXYfgfUbX`mci\ f`f][\ \ \ bX`fYgdcbg]V]`]fJYg`Ug`U`gfi\ XYbfiUfi]\ BGK$

	6fYhi9Ughcb '9``]gž"A cfb]b["'Zfca '3_	_ Wo([US` BekUZa

	Hi lcf]U`	k YY_`miYl YfW]gYg
K YY_'(.'%'5i[igh!'%	@YWhi fY	A cbXUm% h\'5i [i gh
5i [i gh		G\ck]b['UbX'HY``]b['
		dWSV[Ye
		-gUVY``Y`5``YbXYž"D\Ubhca `DU`U\\"
		>UffYth:?cVY_zcdYb]b['hc'[ZSfWfZW['fWt Wf
		K UmbY'A UWUi `Ymž " H\Y'5ZZJ]* 5Z+

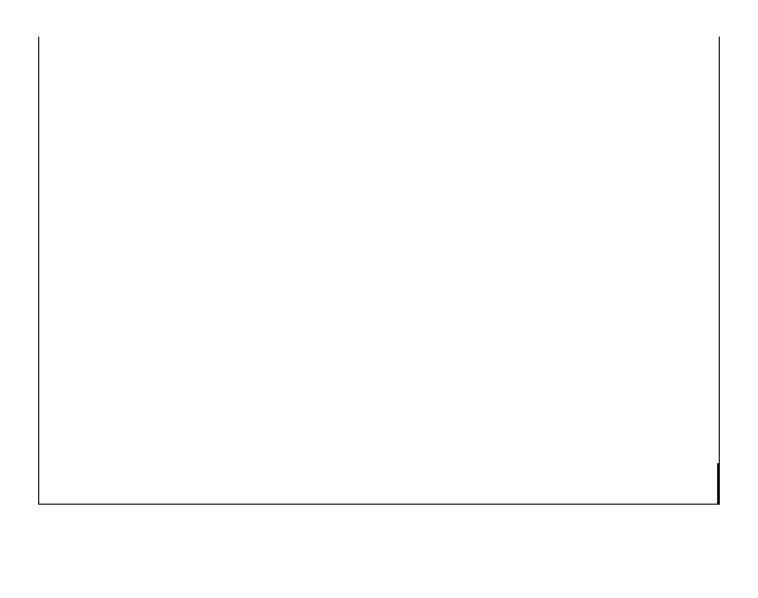
‰

1		dNSV[Ye
		DUi ``8Uk gcbž"H\ca UgʻDYbb]b[hcb'gʻ: Yh]W\"
	Hi hcf]U`	K cf_g\cdd]b[
K YY_'+.'' 'GYdhYa VYf'!'-		A cbXUm' fX GYdhYa VYf
GYdhYa VYf		<pre><ck 'h\y'k="" 'k="" cf_g<="" cf_g\cd'k="" f]h]b[="" pre=""></ck></pre>
		K YXbYgXUm) h\ GYdhYa VYf
		8 m]b[']b 'h\Y':]fgh'DYfgcb
	Hi hcf]U`	K cf_g\cdd]b[
K_YY_', .'%\$'GYdhYa VYf'! %*'GYdhYa VYf	@YWn fY	A cbXUm%\$h\ GYdhYa VYf
		H\Y``mf]W'='UbX`]hg`Ch\Yfg`
		dNSV[Ye
		5bbY GYI hcbž "H\Y 5XX]WN"/"H\Y 6U``UX cZh\Y
I	I	l

		K YXbYgXUm'‰h\ GYdhYa VYf
		DcYlfmiZfca 'h\Y'A Uf[]bg#DcYlfmcZGcWJU``DfchYghi
		dN&V[Ye
		5Xf]YbbY`F]W\ž'"FUdY"
		;]['F mUbž'″-Z='\UX'U'; i b″
•	•	•

I		@]cbY``: c[Uflmž'"I fVUb'6`UW <u>"</u>
		Gi gUb G]bWU]fž:"B][\hF]XYf"
		>cf]Y`; fU\Ua ž"I dXfUZi"
		>c\b`ldX]_Yž"BYk Mcf_`7]mvž""¥Wlfig"
		7 \ Uf`Yg`A Ufh]bž " 5 Z hYf`- #%%"
		K YXbYgXUm% h\ GYdhYa VYf
		DcghacXYfb^91\Uigh]cb.^AU[]WFYU^]ga^UbX AYhUZ]Wh]cb^
		DWSV[Ye
		DYHYf'7UfYmž'"8c'Mci'@cjY'AY3"
		>YUbYHY'K]bhYfgcbžYlHfUWhZfca'FZWBSee[a`
		>i `]U`G`Uj]bž:"8YbfUd\]`]U"
		8 Uj]X': cghYf'K U``UWYž"C WhYh"
		H]a 'C'6f]Ybž" <ck 'hc'hy``'u'hfi="" td="" uf'ghcfm'<="" y'k=""></ck>
K YY_'%\$. '%'C WcVYf'! '+	Hi hcf]U` @YWhi fY	K cf_g\cdd]b[A cbXUm%ghC WhcVYf
C WcVYf		BC'@97HIF9'-'DI6@=7' <c@=85m< td=""></c@=85m<>
		K YXbYgXUm' fX`C WhcVYf
		<]ghcf]WU``:]Wh]cb'
		dWSV[Ye
		; U]``>cbYgž"Cb"h\Y`D]hYcig"8YUh\"cZAUfm Kc``cbghcbYWfUZh'
		A]WXY`: UVYfž'cdYb]b['hc'FZW5d[_ea` BWfS^S`V fZWI Z[fW
I		I

		G]acb^@Ymgz*cdYb]b[^hc^FZW6WSfZaX@SbaWa`
		9Xk UfX`D"`>cbYgžcdYb]b['hc`FZW=`ai ` I adV
		@Ui fYbh6]bYhžcdYb]b[hc : : Z:
	Hi hcf]U`	K cf_g\cdd]b[
K YY_"%%", "C WhcVYf"!"%(C WhcVYf	@YWhi fY	AcbXUmi, h\'CWhcVYf
		H\Y`7 cbhYa dcfUfmJ c]WY.`A]b]a U`]ga 'hc A UI]a U`]ga '
		dMSV[Ye
		; Ui hJa "A U_U`b]žcdYb]b['hc'>a` Va` efS` [
		7\]a]a UbXU'B[cn]'5X]WX]Yž'">i a d]b['A cb_Ym<]`'"
		NUX]Y`Ga]h\žcdYb]b[`hc`l Z[fWFWWfZ
		5XUa 'H\]fk Y``ž'cdYb]b['hc'Ba'[f[Ue
		B]Wc`U'6Uf_Yfž'cdYb]b['hc'5 WSd
		G\Y]`U' <yh]žcdyb]b['hc': ai="" ezag^vsbwdea`4w1<="" td=""></yh]žcdyb]b['hc':>
		K YXbYgXUmi%\$h\ CWcVYf
		H\Y'7cbhYa dcfUfmGYbhYbVV
		dMSV[Ye
		7 cfa UWA W7 Ufh\mžcdYb]b['hc'FZWDaSV
		>Ua Ygʻ9``fcmžcdYb]b[ˈhc˙3_Wd[US` FST′a[V
		GU`a Ub`Fig\X]YžcdYb]b[`hc`ESfS`[UHWbeWe
		8Uj]X:cghYfKU``UWYž"@W_]`mh\Y`5WWcibh FYdfYgYbhUh]jY?bYk`7DF"
	Hi hcf]U`	K cf_g\cdd]b[
K YY_'%&.'%) 'CWhcVYf'! &%'CWhcVYf	@YVVi fY	A cbXUm%) h\ CWcVYf
		DcYlfmZcf'h\Y'DYcd`Y. 'dYfZcfa UbWY'dcYlfm#gdc_Ybk cfX#dcYlfmig`Ua#\]d!\cd'



FYgci fWfg

DfYgWf]VYX F Ygci fWYg

 $k YY = mfYUX]b[g'k] \sim VY'UjU] \sim VY'Cb'A ccXY$

FYWca a YbXYX FYgci fWYg

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

@f]YZmci h]bY`\ck 'gh' XYbhZYYXVUW_flVch\ 'Zcfa U``UbX`]bZcfa U`Łcb'h\Y`Wci fgY`k]```VY`[Uh\YfYXž\ck ']h k]``VY`UbU`mgYX`UbX`\ck ']hk]```VY`UbWYX`i dcb'hc']a dfcj Y`h\Y'ghi XYbh`YUfb]b['YI dYf]YbW''': cf'YI Ua d`Yž mci 'a][\hX]gW gg`k \Uhk Ug`]XYbh]Z]YX`]b'dUghZYYXVUW_UbX`\ck 'h\]g'Wci fgY`k Ug'W\Ub[YX`hc'UXXfYgg`h\Y]ggi Y"Q

a U[Y'7fYX]h

6cX]Yg'/ *bhYfZJWYg'&\$%*

7F = 7CG

7F = 7 C G 'Dfcj]XYf'7cXY. '\$\$\$-,;