composed when ground with KBr powder, mineral oil, or Halocarbon oil in the drybox.) Oxidizing power was determined iodometrically. X-Ray powder patterns of the final product were obtained with a 114.59-mm diameter Philips camera and copper K α radiation.

Results and Discussion

Figure 1A shows the infrared spectrum from 300 to 1200 cm^{-1} of the solid at the end of the first 3 hr of fluorination. The band at 673 cm^{-1} is ascribed to $Ni(ClF_2)_2$ and the band at 758 cm⁻¹ to $Ni(ClF_4)_2$. The diffuorochlorate anion, CIF_2^- , absorbs at 635, 636, and 661 cm⁻¹ in the compounds NOClF₂, CsClF₂, and RbClF₂, respectively.² The tetrafluorochlorate anion, ClF_4 , absorbs at 742 and 745 cm⁻¹ in $CsClF_4$ and RbClF₄, respectively.³ At this stage of fluorination, the solid had an oxidizing power of approximately 0.45 equiv of iodine/mol of nickel. The solid fumed on exposure to air, and the initial brown color faded quickly to pale yellow. Henkel and Klemm⁴ obtained a similar product from the fluorination of nickel dichloride, which they considered to be a mixture of NiF2 and NiF3 or NiF₄. Although the brown color is indicative of at least a small percentage of nickel(III) in the product at this stage, the oxidizing power and the low nickel content⁴ can be more readily ascribed to the presence of CIF₂⁻ and CIF₄⁻.



Figure 1.—Infrared spectra of solids obtained from the fluorination of nickel dichloride at 150–200°: (A) product after 3 hr of fluorination; (B) product after 9 hr of fluorination (dry powders).

After 6 hr more of fluorination, the oxidizing power dropped to approximately 0.07 equiv of iodine/mol of nickel, and the solid no longer fumed in air. Broad bands at 855 and 1045 cm⁻¹ became more prominent in the infrared spectrum, as shown in Figure 1B, whereas the fluorochlorate bands disappeared. In both Figures 1A and 1B, the major product, nickel difluoride, pro-

duced the very strong band from 400 to 550 cm⁻¹ (off scale in the figures). The following equations show the formation and decomposition of the transient nickel fluorochlorate compounds

$$\begin{split} \operatorname{NiCl}_2 &+ 2\operatorname{F}_2 \longrightarrow \operatorname{Ni}(\operatorname{ClF}_2)_2 \\ \operatorname{Ni}(\operatorname{ClF}_2)_2 &+ 2\operatorname{F}_2 \longrightarrow \operatorname{Ni}(\operatorname{ClF}_4)_2 \\ \operatorname{Ni}(\operatorname{ClF}_2)_2 \longrightarrow \operatorname{NiF}_2 &+ 2\operatorname{ClF} \\ \operatorname{Ni}(\operatorname{ClF}_4)_2 \longrightarrow \operatorname{NiF}_2 &+ 2\operatorname{ClF}_3 \end{split}$$

The infrared bands at 855 and 1045 cm^{-1} disappeared when the solid was exposed to humid air for several minutes and reappeared when the solid was again fluorinated. X-Ray powder photographs of the solid showed only lines of the major phase, tetragonal nickel difluoride.5 The compound producing the 855- and 1045-cm⁻¹ bands has not been identified thus far. It appears unlikely that this compound is nickel trifluoride, since the frequencies of both bands are too high to be ascribed to nickel-fluorine stretching vibrations. In the complex salts K_3NiF_6 and K_2NiF_6 (which have anions of O_h symmetry), vibration ν_3 occurs at 580 and 663 cm⁻¹, respectively, and in cobalt trifluoride, ν_3 occurs at 565 cm⁻¹. Since stretching vibrations of doubly bound oxygen generally occur in the region 800-1100 cm⁻¹ and since bending modes of hydrogen fluoride in acid salts also occur in this region, an unstable oxyfluoride or acid fluoride of nickel(III) is a much more probable source of the two bands.

Acknowledgment.—We are greatly indebted to B. Tani for X-ray powder photographs of the solids.

(5) J. W. Stout and S. A. Reed, J. Am. Chem. Soc., 76, 5279 (1954).

Contribution from the Transuranium Research Laboratory, Chemistry Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831

The Crystal Structure of Cesium Tetrakis(hexafluoroacetylacetonato)europate and -americate. Isomorphism with the Yttrate¹

BY JOHN H. BURNS AND M. D. DANFORD

Received December 2, 1968

The publication of a preliminary report on the structure of $CsY(HFA)_4$ (where HFA = hexafluoroacetylacetone) by Lippard, Cotton, and Legzdins² led us to extend the study of this type of compound to some lanthanide and transuranic elements³ and to a complete analysis of the crystal structures⁴ of CsEu(HFA)₄ and

(4) J. H. Burns and M. D. Danford, Abstracts, American Crystallographic Association Meeting, Buffalo, N. V., Aug 11–16, 1968, Paper D10.

⁽²⁾ K. O. Christe, W. Sawodny, and J. P. Guertin, Inorg. Chem., 6, 1159 (1967).

⁽³⁾ K. O. Christe and J. P. Guertin, ibid., 5, 473 (1966).

⁽⁴⁾ P. Henkel and W. Klemm, Z. Anorg. Allgem. Chem., 222, 73 (1935).

⁽¹⁾ Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corp.

⁽²⁾ S. J. Lippard, F. A. Cotton, and P. Legzdins, J. Am. Chem. Soc., 88, 5930 (1966).

 $^{(3)\,}$ M. D. Danford, J. H. Burns, O. L. Keller, J. R. Stokely, and W. H. Baldwin, to be submitted for publication.

	, c	BSE	CRVE	D A	ND 1	CAL	COL	ATE	101	RU	eru	RE	ГA	510	K9 I	OR	CSI	Su	111.1	n)4	ON 1	AIN	лвэ	υLι	DIE.	SCA	LE			
L CHBS CA	. L 085	CAL	1 08S	CAL	L 085	CAL	L ØBS	CRL L	CBS C	PL L	085	CAL	L 085	CAL	L 885	CAL	L 885	C,AL,	L 085	CAL	L 085	CRL	L 085	CAL	L 585	CAL	L 685	CRL	L 885	CAL
					อตระดูเปมะ ตุดระพง-อนิงตระพระโดยงาตระพระอนจะสงระพระดูที่จากสดาคระพระดีสดาคระพระอนทระพระอนจะสงระพระอนจายกระพระอ พระพระคระพระสงระทระดีสดาคระทระระตร์และอาการใช้งานสงระมระสงระกระทระสงระกระทระระกระทระราชระหระราชระทราชระทราช สงรีสดอนสงร์มีชื่อนระอนจากสังกระกระระกระสงออกอาการใช้งานสงร์มาร์มากสาวารรัฐสอสตร์มาณีรัสวจราย สารารระกรรรรรรรรร		นี้นี้สาวีธุต งคนรมง สู้สีสันกับริษาย์หายง เวลาะมีกำกับดง งคนรมง สู้นสีมันกับการคราย เป็นสีมันกับการครายง เกิดสาวีมาก สาวารคราย เป็นสาวารคราย เป็นสีมันการคราย เป็นสีมันการคราย เป็นสีมันการคราย เป็นสีมันการคราย เป็นสีมันการคราย เร สองเพื่อให้เสรีมราย เป็นสีมันการคราย เป็นสาวารครายสาวัยชีมว่าใช้ชีมว่าใช้ชีมรียายาย เป็นสีมันการคราย เป็นสีมันก	a-awwaige_darafii.usia.usia.awi.usia.awi.usia.awi.usia.awi.usia.awi.usia.awi.usia.waia.usia.usia.usia.usia.usia.usia.awi.usia.usia.usia.awi.usia.usia.usia.usia.usia.usia.usia.usi			นะเมาะ โยนะเมา-วตะวยแนนการของสะยนการของสะยนการของสะยนาย การวอสะกฐนรมหารู้ประมาณ และสะยนการการทางสามาณระหารารา เป็นสะวัรษ์ เป็นสะยนการระสามารรรรรรรรรรรรรรรรรรรรรรรรรรรรรรรร	รับเซารีตรีระดาสารครามการการการการการการการการการการการการการก	สวนรับสี่งสวนระนคนครับสายคนครับสายคนที่สุนสวนระนายายายคนคนที่สวนรับสายคนคนครับสายคนคนคนคนคนคนคนคนคนคนคนคนคนคนคน สวนรียนคนคนคนคนคนคนคนคนคนคนคนคนคนคนคนคนคนคนค		านอน เป็นการและ เป็นการและ เป็นการและ และ เป็นของ เป็นการและ เป็ เป็นการและ เป็นการและ เป็นการและ เป็นการและ เป็นการและ เป็นการและ เป็นการและ เป็นการและ เป็นการและ เป็นการและ เป		เสียงการแล้วแล้วแล้วแล้วแล้วแล้วแล้วแล้วแล้วแล้ว	อาการการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบกา เป็นกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระบบการกระ	๛ะ๛รู้หวัดประการในสนะครายครามารู้จะครายครามารู้ว่าจะรายระบา-อรู้ถ้าจะสายหรายาะรู้หวัดจะสายครามารู้จำว่าจะสายระจะรู้จำว่าจะ และการรู้รายสายครามการรู้จะสายการรู้จะสะสายครามารู้ว่าจะสายระบา-อรู้ถ้าจะสายครามการรู้จะการระบาทรามารู้จำว่าจะสา	ชายในชี้น รอง เรื่องชน จิตรีวี่หวัน เพละ อัสรีรรรรรรรรรรรรรรรรรรรรรรรรรรรรรรรรรรร	าดวิธีมีสายครามการรับสายครามการรับสายครามการรับสายครามการรับสายครามการรับสายครามการรับสายการรับสายครามการรับสาย เป็นสายครามการรับสายครามการรับสายครามการรับสายครามการรับสายครามการรับสายครามการรับสายครามการรับสายครามการรับสาย เป็นสายครามการรับสายครามการรามการรับสายครามการรับสายครามการรับสายครามการรับสายครามการรับสายครามการรับสายครามการ		ณายานเป็นระเรียน เรียน เป็นของความ เป็นของความ เป็นของความ เป็นของความ เป็นของความ เป็นการสาวาน เป็นที่มีของความ เป็นที่มีข 1.1210 เป็นที่มีเป็นที่มีเป็นที่มีเป็นที่มีเป็นที่มีเป็นที่มีเป็นที่มีเป็นที่มีเป็นที่มีเป็นที่มีเป็นที่มีเป็นที		ดรู้นั้นสายหระพระรู้มีของกระพระดูรีโตสายหระพระดูดีเวียนจากระพระรู้มีเวียนสายกระพระดูสามารรณระทระรู้มีเวียนจากกระพระร 1. 1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.		๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛		อน้องการในการเป็นการเป็นสมครั้งการเป็นสรรมการในสรรมการในสรรมการในสรรมการในสรรมการในสรรมการในสรรมการในสรรมการใน 2011 มีสรรมการให้สร้างการเป็นสรรมการใช้สรรมการให้สร้างการเป็นเรื่อมาณาการเป็นการเป็นการการในการการในสรรมการการก	ระกับสร้างสร้างเราในการในขณะที่วนชังชังชังชังชังชังชังชังชังชังชังชังชังช
	4 *			111	• •		2 0	Th O						C			C 1 1 T		1 1	1 .				C.						

 TABLE I

 Observed and Calculated Structure Factors for CsE11(HFA), on an Absolute Scale^a

^{*a*} Column headings: L, Miller index *l*; OBS, observed structure factor; CAL, calculated structure factor.

 $CsAm(HFA)_4$. A subsequent paper by Bennett, Cotton, Lippard, and Legzdins⁵ presented the details of a more precise determination of the crystal structure of $CsY(HFA)_4$ based on counter-measured X-ray data. Our independently determined structures are in close agreement with theirs, indicating that the compounds are isomorphous; hence we are presenting our results in abbreviated form in order that the three structures may be compared.

Experimental Section

Compound Preparation.—The compounds were prepared by reaction of EuCl₃ and AmCl₃, respectively, with Cs(HFA) in aqueous ethanol, as described previously.⁶ The isotope ²⁴³Am was used in the preparation of CsAm(HFA)₄ and glove boxes were required for all of its manipulations. The original

precipitate from ethanol was monoclinic CsAm(HFA)₄·H₂O, which was shown³ to have isomorphous analogs when the central ion is Pr, Nd, or Cm; but for Eu only the anhydrous, orthorhombic CsEu(HFA)₄ was obtained. Suitable crystals for X-ray study of the orthorhombic form of CsEu(HFA)₄ and CsAm-(HFA)₄ were prepared by recrystallization from 1-butanol followed by washing with toluene; these crystals were in the form of thick plates and were pale yellow and pale rose, respectively. The α -active ²⁴⁸Am was contained by sealing its compound in a thin-walled glass capillary tube.

Data Collection.—Precession photographs were used to obtain the pattern of systematic absences: hk0 for $h + k \neq 2n$, 0klfor $k \neq 2n$, and h0l for $l \neq 2n$, which are characteristic of space group Pben and indicated isomorphism of the compounds with CsY(HFA)₄. Unit-cell and intensity data were collected by a computer-controlled Picker X-ray diffractometer using Mo K α radiation and a scintillation-counter detector. Intensities were collected by θ -2 θ scans and the backgrounds were measured at the two ends of the scans and averaged. A reference reflection was measured frequently to monitor the beam intensity and to follow the effect of self-radiolysis, which diminished the scattering power of the radioactive sample by about 25% during the

⁽⁵⁾ M. J. Bennett, F. A. Cotton, P. Legzdins, and S. J. Lippard, *Inorg. Chem.*, 7, 1770 (1968).

⁽⁶⁾ S. J. Lippard, J. Am. Chem. Soc., 88, 4300 (1966).



Figure 1.—Comparison of bond lengths and angles in CsY- $(HFA)_4$, CsEu $(HFA)_4$, and CsAm $(HFA)_4$. Average standard errors of these quantities are given in the text.

several days of data collection. Some 1893 independent reflections were measured for $CsEu(HFA)_4$ and 1036 for $CsAm(HFA)_4$.

Calculations.—Absorption corrections were calculated with the ORABS program.⁷ For this purpose the crystals were described as being bounded by planes. Seven planes were used to describe the platelike crystal of CsEu(HFA)₄ which had maximum and minimum dimensions of 0.26 and 0.11 mm, respectively. The CsAm(HFA)₄ sample, also a thick plate having maximum and minimum dimensions of 0.15 and 0.30 mm, was described by nine planes. It was necessary to use an estimate for the mass absorption coefficient of Am; a value of 60 cm² g⁻¹ was extrapolated from the known values for U and Pu.⁸ Linear absorption coeffi-

cients are 32.4 and 42.7 cm⁻¹ for the Eu- and Am-containing compounds, respectively. Calculated transmission factors for the two crystals were in the range 0.55-0.65.

The intensities were corrected for absorption and reduced to structure-factor amplitudes on an absolute scale (see Tables I and II). The three-dimensional Patterson function calculated from the CsEu(HFA)₄ data was used to locate Cs and Eu atoms: the positions of the other atoms (excluding H) were obtained from a succession of difference Fourier maps. Refinement of the positions of the 28 independent atoms, each with anisotropic thermal parameters, was carried out by the iterative full-matrix leastsquares method using a modified version of the program ORFLS.⁹ Each observation was weighted as the reciprocal of its variance, which was estimated as described previously.10 For CsAm-(HFA)₄ the light atoms were less well determined, and it was necessary to constrain the thermal motion of the C atoms to be isotropic. The refined parameters of both structures are listed in Table III. Conventional R indices were 0.085 and $0.06~for~CsEu(HFA)_4$ and $CsAm(HFA)_4,$ respectively.

Results and Discussion

The orthorhombic unit cells have the following dimensions at 23° based on λ 0.70926 Å for Mo K α_1 : for CsEu(HFA)₄, a = 8.660 (4) Å, b = 21.75 (2) Å, and c = 17.43 (2) Å; for CsAm(HFA)₄, a = 8.62 (2) Å, b = 21.93 (6) Å, and c = 17.45 (5) Å. The space group indicated by systematic absences and confirmed by the structure determination is Pbcn.

It is seen that there are significant differences between the entries of Table III and the corresponding parameters for CsY(HFA)₄ as well as between the two compounds of the table; but these are to be expected from, among other things, the presence of different metal ions in the three compounds. The differences¹¹ in the trivalent metal radii are reflected, for example, in the average bond length of 2.41 Å found for Am-O compared to 2.38 Å for Eu–O and 2.32 Å for Y–O. Nevertheless, the compounds are clearly isomorphous and exhibit the same qualitative features of symmetry and packing previously described,⁵ namely, that the chelate ligands are essentially planar but folded along the $0 \cdots 0$ line by about 8° with respect to the O-M-O plane, that the type of span by the ligands and the dodecahedron of O atoms results in approximately D_2 symmetry for the anions, and that the terminal F atoms execute large thermal motions with anisotropies indicative of large oscillations of the CF₃ groups. Bennett, et al.,⁵ stated that for CsV(HFA)₄, Laue photographs indicated variable amounts of disorder in different samples but they did not describe how this disorder was reflected in the films. Our precession photographs of CsEu(HFA)₄ and CsAm(HFA)₄ appeared normal; the only suggestion of disorder is in the large amplitudes of thermal motion of the CF₃ groups.

A comparison of the bond distances and angles among the three compounds is given in Figure 1. These distances are uncorrected for thermal motion, although a correction would be appreciable in the C-F

⁽⁷⁾ D. J. Wehe, W. R. Busing, and H. A. Levy, "ORABS, a Fortran Program for Calculating Single-Crystal Absorption Corrections," Report ORNL-TM-229, Oak Ridge National Laboratory, Oak Ridge, Tenn., 1962.

⁽⁸⁾ R. B. Roof, Phys. Rev., 113, 820 (1959).

⁽⁹⁾ W. R. Busing, K. O. Martin, and H. A. Levy, "ORFLS, a Fortran Crystallographic Least-Squares Program," Report ORNL-TM-305, Oak Ridge National Laboratory, Oak Ridge, Tenn., 1962.

⁽¹⁰⁾ J. H. Burns, R. D. Ellison, and H. A. Levy, Acta Cryst., **B24**, 230 (1968).

⁽¹¹⁾ Although the significance of the difference between the first two bond lengths is doubtful, the expected trend is seen when all three are considered.

ŧ

TABLE II

Observed and Calculated Structure Factors for CsAm(HFA)4 on an Absolute Scale⁴

JAL	1. OBS	CA.,	L OBS	CRL	L 085	CAL	L CBS	CAL	L 085	CAL	L OBS	CAL	L 089	CAL	L CBS	CRL	L OBS	CAL	L đes	ÇAL	LOBS	CAL	L 085	CAL	L, 0665	CAL	L OBS	CRC.	L 085	CAL
4 61 60 9 5 131 125 6	60 9 125 6	000	9 52	10 64	11 155 ##1 8	145 Çan	6 195 7 91	185 91	3 189 4 274	193 298	##2 7 1 11	Laa 15	5 73 6 72	78 72	3 80 4 69	75 56	4 5 8 5 221	52 222	4 170 5 70	169	анц ц П 15	Lan	10 21	10	5 26	26	1 170	170	2 99	96
7 71 64 8 81 71	64 71		8 0	5 9 6	2 37	39 88	8 140 9 57	135 49	5 217	219	2 85	80 45	7 64	69 34	5 134 6 21	128	6 13 7 231	12	6 151 7 64	152	1 312	295 48	0 48	51	8 19	24 3	3 154	156	4 51 5 180	45
9 27 32 10 31 10 46 45 11 19	32 10 31 45 11 19	10 31		3ŭ	5 89	31	1 21	Lag	8 219 9 158	225	5 11	19 1 34	10 39	35 Las	8 23	58 12 37	9 195 10 39	185	8 125 ••3 14	125	3 269 4 130 5 208	265 137 262	2 58 3 78	57 78	10 22 **5 3	11	5 144	150	6 10 7 145	153
11 50 57 12 29 20 5 51 53 2 0 0 1018, 179 7 59 2 12 47 47 441 3 Law 7 13 13 3 0 14 11 131 130 8 15 1 awn 12 Law 0 14 113 8 31 23 1 0 14 11 21 130 0 15	57 12 29 20 5 51 53 2 0 0 10 18, 179 7 59 6 47 ×*1 3 L== 7 13 13 3 0 14 11 131 130 8 15 1 	12 29 20 5 51 53 2 0 0 10 184 179 7 59 6 **1 3 Law 7 13 13 3 0 14 11 131 130 8 15 1 0 114 113 8 31 23 4 0 19 12 131 130 8 15 1	20 6 51 53 2 0 0 10 184 179 7 59 6 Lami 7 13 13 3 0 14 11 131 130 8 16 1 113 8 31 23 1 0 14 10 12 123 129 0 15	5 51 53 2 0 0 10 184 179 7 59 6 7 13 13 3 0 14 11 131 130 8 16 1 8 31 23 5 0 19 19 133 130 8 6 1	53 2 0 0 10 184 179 7 59 6 13 3 0 14 11 131 130 8 16 1	2 0 0 10 184 179 7 59 6 3 0 14 11 131 130 8 16 1 4 0 14 12 131 130 8 16 1	0 10 184 179 7 59 6 14 11 131 130 8 16 1	10 184 179 7 59 6 11 131 130 8 16 1	179 7 59 6 130 8 16 1	7 59 6		3	2 13	27		9	11 143 12 18	135	2 21	21	6 65 7 214	68 217	5 59	56 67	1 31 2 171	30 165	8 104 **5 10	109	1 29	21
2 86 88 1 0 6 9 16 13 5 0 5 13 89 84 10 0 20 4 0 6 13 0 4 3 115 108 2 254 252 10 20 9 6 0 29 14 102 10 11 18 6 5 10 15 13 3 14	88 1 0 6 9 16 13 5 0 5 13 89 84 10 0 20 4 0 6 13 0 4 109 2 254 252 10 20 9 6 0 29 14 102 100 11 18 6 5 10 5 13 1 1	1 0 6 9 16 13 5 0 5 13 89 84 10 0 20 4 0 6 13 0 4 12 30 3 2 254 252 10 20 9 6 0 29 14 02 100 11 18 6 5 10 15 13 1 4	6 9 16 13 5 0 5 13 89 84 10 0 20 4 0 6 13 0 4 252 10 20 9 6 0 29 14 102 100 11 18 6 5 10 15 13 3 14	9 16 13 5 0 5 13 89 84 10 0 20 4 0 6 13 0 4 10 20 9 6 0 29 14 102 100 11 18 6 5 10 15 13 0 4	13 5 0 5 13 89 84 10 0 20 4 0 6 13 0 4 9 6 0 29 14 102 100 11 18 6 5 10 15 3 3 4	5 0 5 13 89 84 10 0 20 4 0 6 13 0 4 6 0 29 14 102 100 11 18 6 5 10 15 13 3 14	5 13 12 132 123 3 51 12 3 16 4 12 30 3 5 13 89 84 10 0 20 4 0 6 13 0 4 29 14 102 100 11 18 6 5 10 15 13 3 1	13 132 123 3 31 12 3 16 4 12 30 3 13 89 84 10 0 20 4 0 6 13 0 4 14 102 100 11 18 6 5 10 15 13 3 1	123 3 31 12 3 16 4 12 30 3 84 10 0 20 4 0 6 13 0 4 100 11 18 6 5 10 15 5 3 3 1 5	3 31 12 3 16 4 12 30 3 10 0 20 4 0 6 13 0 4 11 18 6 5 10 15 3 3 1		3 16 4 12 30 3 4 0 6 13 0 4 5 10 15 13 3 14	4 12 30 3 6 13 0 4	12 30 3	3		1 54 2 54	43 43	4 0 5 11	20	8 53 9 132	59 147	7 58	50 47	3 24	26 169	1 24	11	3 26	29
4 79 78 3 138 129 11 22 35 7 0 15 12 12 12 3 6 0 2 0 155 151 3 5 130 128 4 300 306 14 9 13 23 2 7 0 1 1 37 42 4	78 3 138 129 11 22 35 7 0 15 **2 3 1 ** 12 12 3 6 0 2 0 155 151 3 128 4 310 306 **1 9 1** 8 0 6 1 45 43 13 23 2 7 0 1 1 37 42 4	3 138 129 11 22 35 7 0 15 **2 3 1 ** 12 12 3 6 0 2 0 55 151 3 4 310 306 **1 9 1** 8 0 6 1 45 43 13 23 2 7 0 1 1 37 42 4	129 11 22 35 7 0 15 #2 3 L 12 12 3 6 0 2 0 155 151 3 306 #1 9 L 8 8 0 6 1 45 43 13 23 2 7 0 1 1 37 42 4	11 22 35 7 0 15 **2 3 L** 12 12 3 6 0 2 0 155 151 3 **1 9 L** 8 9 6 1 45 43 13 23 2 7 0 1 1 37 42 4	35 7 0 15 **2 3 L** 12 12 3 6 0 2 0 155 151 3 L** 8 0 6 1 45 43 13 23 2 7 0 1 1 37 42 4	7 0 15 ##2 3 L## 12 12 3 6 0 2 0 155 151 3 8 0 6 1 45 43 13 23 2 7 0 1 1 37 42 4	15 **2 3 L** 12 12 3 6 0 2 0 155 151 3 6 1 45 43 13 23 2 7 0 1 1 37 42 4	**2 3 L** 12 12 3 6 0 2 0 55 51 3 1 45 43 13 23 2 7 0 1 37 42 4	43 13 23 2 7 0 1 1 37 42 4	12 12 3 6 0 2 0 155 151 3 13 23 2 7 0 1 1 37 42 4			2 0 155 151 3	0 155 151 3 1 37 42 4	151 3 42 4	34	29	18	7 13	1	11 116	114	**4 11 1 12	122 21	6 103 7 28	100	3 34	11	5 31 6 24 7 13	35 9
0 30 23 5 07 69 0 272 259 9 7 6 2 48 49 882 8 188 8 0 4 2 234 234 5 2 (7 95 97 6 145 156 1 368 350 881 15 188 3 39 38 0 333 334 9 0 15 3 105 116 6 0 1	23 3 07 09 0 222 239 9 7 6 2 48 49 mm2 8 0 4 2 234 234 5 2 0 97 6 145 156 1 368 350 mm1 15 Lmm 3 39 38 0 333 334 9 0 15 3 105 116 6 0 1 66 7 35 31 2 240 251 0 66 0 1	5 17 59 02/2 259 9 7 6 2 48 49 ##2 8 Law 8 0 4 2 234 234 5 2 (5 145 156 1 368 350 ##1 15 L## 3 39 38 0 333 334 9 0 15 3 105 116 6 0 1	B9 0 2/2 299 9 7 6 2 48 49 ##2 8 Law 8 0 4 2 234 234 5 2 (156 1 368 350 ##1 15 Law 3 39 38 0 333 334 9 0 15 3 105 116 6 0 1 31 2 254 251 0 51 0 51 16 6 0 1	0 272 259 9 7 6 2 48 49 ##2 8 L## 8 0 4 2 234 234 5 2 4 1 368 350 ##1 15 L## 3 39 38 0 333 334 9 0 15 3 105 116 6 0 1	259 9 7 6 2 48 49 ##2 8 L## 8 0 4 2 234 234 5 2 0 350 ##1 15 L## 3 39 38 0 333 334 9 0 15 3 105 116 6 0 1	9 7 6 2 48 49 ##2 8 Law 8 0 4 2 234 23 5 2 (##1 15 Law 3 39 38 0 333 334 9 0 15 3 105 116 6 0 1	6 2 48 49 48 8 6 48 8 0 4 2 234 234 5 2 0 Las 3 39 38 0 333 334 9 0 15 3 105 116 6 0 1	2 48 49 **2 8 L** 8 0 4 2 234 234 5 2 1 3 39 38 0 333 334 9 0 15 3 105 116 6 0 1	49 ##2 8 Le# 8 0 4 2 234 235 5 2 0 38 0 333 334 9 0 15 3 105 116 6 0 1	##2 8 L## 8 0 4 2 234 234 5 2 0 0 333 334 9 0 15 3 105 116 6 0 1	Len 8 0 4 2 234 234 5 2 0 334 9 0 15 3 105 116 6 0 1	8 0 4 2 234 234 5 2 0 9 0 15 3 105 116 6 0 1	4 2 234 234 5 2 0 15 3 105 116 6 0 1	2 234 234 5 2 0 3 105 116 6 0 1	234 S 2 (5 2 0	1	j	0 44 1 185	41 159	1 28	34 32	2 30 3 18	28	8 113 9 30	111 31	ē 19	28	*#6 6 0 68	L
9 63 62 6 129 121 3 204 206 1 184 181 5 63 51 2 195 190 0 211 187 5 0 4 6 23 21 10 29 30 9 32 36 4 224 227 2 76 75 6 13 14 3 37 37 2 5 2 5 5 10 0 5 10 10 10 10 10 10 10 10 10 10 10 10 10	62 6 129 121 3 204 206 1 184 181 5 63 51 2 195 190 0 211 187 5 0 4 8 23 21 30 9 32 36 4 224 227 2 76 72 6 1 1 14 3 31 32 1 23 1 6 5 10 1 16 10 1 10 1 10 1 10 10 10 10 10 10 10 10	6 129 121 3 204 206 1 184 181 5 63 51 2 195 190 0 211 187 5 0 4 8 23 21 9 32 36 4 224 227 27 72 6 13 14 3 31 32 195 190 0 211 187 5 0 4 8 23 21	121 3 204 205 1 184 181 5 63 51 2 195 190 0 211 187 5 0 4 8 23 21 36 4 224 227 2 76 72 6 13 14 3 31 3 2 2 2 3 16 5 160 1 5 0 4 8 23 21	3 204 216 1 184 181 5 63 51 2 195 190 0 211 187 5 0 4 8 23 21 4 224 227 2 76 72 5 13	206 1 184 181 5 63 51 2 195 190 0 211 187 5 0 4 8 23 21 227 2 76 72 6 13 14 3 31 32 1 2 1 3 19 2 1 2 1 187 5 0 4 8 23 21	1 184 181 5 63 51 2 195 190 0 211 187 5 0 4 8 23 21 2 26 72 6 13 14 3 31 22 19 23 19 2 19 5 190 0 21	187 9 0 10 1 92 91 92 10 192 91 197 9 181 5 63 51 2 195 190 0 211 187 5 0 4 8 23 21 72 5 13 14 3 31 32 1 23 19 19 19 19 19 19 19 19 19	5 63 51 2 195 190 0 211 187 5 0 4 8 23 21 5 13 14 2 195 190 0 211 187 5 0 4 8 23 21	51 2 195 190 0 211 187 5 0 4 8 23 21 14 3 31 32 19 23 19 24 197 1 23 19	2 195 190 0 211 187 5 0 4 8 23 21 3 31 32 1 2 1 2 1 187 5 0 4 8 23 21	91 92 92 93 99 99 99 99 99 99 99 99 99 99 99 99	0 211 187 5 0 4 8 23 21	187 5 0 4 8 23 21	4 198 197 7 23 9 5 0 4 8 23 21	19/ / 23 9 4 8 23 21	8 23 21	51		2 43 3 147	146	3 35	33	4 40 5 21	34 g	10 88 ##5 4	93	0 183	189	1 184	173
11 60 62 10 149 151 5 221 219 3 161 153 7 79 56 4 105 108 2 170 164 7 29 22 10 13 ••0 4	62 10 149 151 5 221 219 3 161 153 7 79 56 4 105 108 2 170 164 7 29 22 10 13 41 10 23 5 199 199 4 52 59 8 31 25 5 83 81 3 2 7 8 148 138 11 34	10 149 151 5 221 219 3 161 153 7 79 56 4 105 108 2 170 164 7 29 22 10 13 11 0 23 5 199 199 4 52 59 8 31 25 5 83 81 3 2 7 8 108 11 30	151 5 221 219 3 161 153 7 79 56 4 105 108 2 170 164 7 29 22 10 13 23 5 199 199 4 52 59 8 31 25 5 83 81 3 2 7 8 108 138 1 30	5 221 219 3 161 153 7 79 56 4 105 108 2 170 164 7 29 22 10 13 5 199 199 4 52 59 8 31 25 5 83 81 3 2 7 8 108 138 11 34	219 3 161 153 7 79 56 4 105 108 2 170 164 7 29 22 10 13 199 4 52 59 8 31 25 5 83 81 3 2 7 8 108 11 30	3 161 153 7 79 58 4 105 108 2 170 164 7 29 22 10 13 4 52 59 8 31 25 5 83 81 3 2 7 8 148 138 11 34	153 7 79 58 4 105 108 2 170 164 7 29 22 10 13 59 8 31 25 5 83 81 3 2 7 8 148 138 11 34	7 79 58 4 105 108 2 170 164 7 29 22 10 13 8 31 25 5 83 81 3 2 7 8 148 38 1 30	58 4 105 108 2 170 164 7 29 22 10 13 25 5 83 81 3 2 7 8 10 13 1	4 105 108 2 170 164 7 29 22 10 13 5 83 81 3 2 7 8 198 38 11 34	108 2 170 164 7 29 22 10 13 81 3 2 7 8 19 136 13	2 170 164 7 29 22 10 13 3 2 7 8 148 138 11 34	164 7 29 22 10 13 7 B 148 138 11 34	7 29 22 10 13 B 148 138 11 34	22 10 13 138 11 34	10 13		11	5 130	131	6 27	25	5 13 7 7 8 27		2 17	15	2 192	194	3 136 4 73	139
19155 153 12 122 125 7 291 190 5 131 131 9 37 41 6 105 100 4 120 121 9 34 30 4 1 38 25 41 4 54 0 172 177 5 57 57 10 29 10 7 24 22 5 0 11 10 120 111 0	153 12 122 125 7 191 190 5 131 131 9 37 41 6 105 108 4 120 121 9 34 30 *** 25 ***1 4 *** 9 172 177 6 57 57 10 29 10 7 24 22 5 0 11 10 120 111 0	12 122 125 7 191 190 5 131 131 9 37 41 6 105 108 4 120 121 9 34 30 44 *1 4 4 4 5 8 172 177 6 57 57 10 29 10 7 24 22 5 0 11 10 120 111 0	125 7 191 190 5 131 131 9 37 41 6 105 108 4 120 121 9 34 30 44 9 172 177 6 57 57 10 29 10 7 29 22 5 0 11 10 120 111 0	7 191 190 5 131 131 9 37 41 6 105 108 4 120 121 9 34 30 *** 8 172 177 6 57 57 10 29 10 7 24 22 5 0 11 10 120 111 0	190 \$ 131 131 9 37 41 6 105 108 4 120 121 9 34 30 44 127 6 57 57 10 29 10 7 24 22 5 0 11 10 120 111 0	5 131 131 9 37 41 6 105 108 4 120 121 9 34 30 *** 6 57 57 10 29 10 7 24 22 5 0 11 10 120 111 0	131 9 37 41 6 105 108 4 120 121 9 34 30 mm; 57 10 29 10 7 24 22 5 0 11 10 120 111 0	9 37 41 6 105 108 4 120 121 9 34 30 44 10 29 10 7 24 22 5 0 11 10 120 111 0	41 6 105 108 4 120 121 9 34 30 mm 10 7 24 22 5 0 11 10 120 111 0	6 105 108 4 120 121 9 34 30 mm 7 24 22 5 0 11 10 120 111 0	22 5 0 11 10 120 111 0	4 120 121 9 34 30 xx 5 0 11 10 120 111 0	121 9 34 30 mm	9 34 30 mm7 10 120 111 0	30 mm; 111 0	0	3 9 184	181	**3 16 1 0	Las	8 27	35	**¥ 12 0 32	UAR 3B	9 16 5 25	22	4 180 5 57	187	6 73	75
2 32 155 1 26 38 3 135 139 / 141 136 11 21 17 8 102 101 6 109 111 11 9 16 3 22 8 2 304 305 10 107 107 8 58 58 12 21 18 9 38 35 7 22 14 12 80 90	135 1 38 38 31 135 139 7 141 136 11 21 17 8 102 101 6 109 111 11 9 16 8 2 304 305 10 107 107 8 58 58 12 21 18 9 38 35 7 22 14 12 80 90	1 38 38 3135 139 7 141 136 11 21 17 8 102 101 6 109 111 11 9 16 2 304 305 10 107 107 8 58 58 12 21 18 9 38 35 7 22 14 12 80 90	305 3 135 139 7 141 136 11 21 17 8 102 101 6 109 111 11 9 16 305 10 107 107 8 58 58 12 21 18 9 38 35 7 22 14 12 80 90	9 135 139 / 141 135 11 21 17 8 102 101 6 109 111 11 9 16 10 107 107 8 58 56 12 21 18 9 38 35 7 22 14 12 80 90	139 / 141 136 11 21 17 8 102 101 6 109 111 11 9 16 107 8 58 58 12 21 18 9 38 35 7 22 14 12 80 90	7 141 136 11 21 17 8 102 101 6 109 111 11 9 16 8 58 58 12 21 18 9 38 35 7 22 14 12 80 90	135 11 21 17 8 102 101 6 109 111 11 9 16 58 12 21 18 9 38 35 7 22 14 12 80 90	11 21 17 8 102 101 6 109 111 11 9 16 12 21 18 9 38 35 7 22 14 12 80 90	17 8 102 101 6 109 111 11 9 16 18 9 38 35 7 22 14 12 80 90	8 102 101 6 109 111 11 9 16 9 38 35 7 22 14 12 80 90	101 6 109 111 11 9 16 35 7 22 14 12 80 90	6 109 111 11 9 16 7 22 14 12 80 90	111 11 9 16 14 12 80 90	11 9 16 12 80 90	16 90		1 238 2 210	231 206	2 13 3 0	15	10 26	19	ĩ 57 2 60	57 67	6 0 7 24	32 19	6 159 **5 12	171	2 4	15
5 31 11 4 20 14 12 82 58 1 0 0 14 19 7 11 0 2 *2 15 L* *3 4 L** 41 1 5 31 11 4 20 14 12 82 58 1 0 0 14 19 7 11 0 2 *2 15 L** *3 4 L** 41 1 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0	11 4 20 14 12 82 68 1 0 0 14 19 7 11 0 2 215 Law was 4 Law 4 1 122 51 19 10 10 10 10 10 10 10 10 10 10 10 10 10	4 20 14 12 82 58 1 0 0 14 19 7 11 0 2 **2 15 Lat **3 4 Lat 4 1 5 11 19 **1 10 Lat 2 0 2 **2 15 Lat **3 4 Lat 4 1	10 11 10 11 10 137 44 15 14 15 0 1 10 95 101 8 89 90 13 0 1 31 14 12 82 58 1 0 0 14 19 7 11 0 2 42 15 Law and 4 Law 41 19 41 10 Law 2 0 2 42 4 14 12 83 89 10 20 10 10 10 10 10	12 82 68 1 0 0 14 19 7 11 0 2 #215 Law #3 4 Law 41		1 0 0 14 19 7 11 0 2 215 Law and 4 13 1 2 0 2 42 15 Law and 4 13 1	0 14 19 7 11 0 2 **2 15 L** **3 4 L** 4 1 2 **2 15 L** **3 4 L** 4 1	14 19 7 11 0 2 xx2 15 Law xx3 4 Law 4 x2 Law 20 12 xx2 15 Law xx3 4 Law 4 x2 Law 20 12 x3 89 1 19 20 1 00 100 10	7 11 0 2 ##215 LAR ##3 4 LAR 4 1 7 11 0 2 ##215 LAR ##3 4 LAR 4 1	10 96 101 6 89 90 13 0 1 3 1 11 0 2 ##2 15 L## ##3 4 L## 4 1 12 83 89 1 19 20 1 00 00 02 5	101 0 89 90 13 0 1 31 2 ##2 15 L## ##3 4 L## 4 1 89 1 19 20	89 90 13 0 1 3 1 ##2 15 Las ##3 4 Las 4 1	90 13 0 1 3 1 Las xa3 4 Las 4 1	13 D 1 31	1 3 1 Las 4 1	31	75 63	184	4 3 RA4 0	20	0 139	La# 134	3 76	82 59	8 17 9 0	22	2 13	17	3 19 4 27	22
7 26 18 6 23 32 1 0 30 3 0 25 0 114 124 ••2 9 L•• 2 28 26 2 75 75 6 14 8 114 116 7 68 05 2 52 45 4 0 21 1 257 270 1 0 5 1 0 11 2 28 26 2 75 75 6 14	18 6 23 32 1 0 30 3 0 25 0 14 124 ••2 9 L•• 2 28 26 2 75 75 6 14 116 7 68 05 2 52 45 4 0 21 1257 270 1 0 5 3 28 16 2 75 75 6 14	6 23 32 1 0 30 3 0 25 0 114 124 ••2 9 4•• 2 28 26 2 75 75 6 14 7 68 05 2 52 45 4 0 21 1 257 270 • 1 0 5 3 0 11 2 26 27 75 6 14	32 1 0 30 3 0 25 0 14 124 ••2 9 (•• 2 20 26 2 75 75 6 4 05 2 52 45 4 0 21 1 257 270 1 0 5 3 0 1 2 25 2 5 7 5 6 4	1 0 30 3 0 25 0 1 4 124 **2 9 L** 2 28 26 2 75 75 6 14 2 52 45 4 0 21 1 257 270 1 0 5 3 0 1 3 25 27 1 5	30 3 0 25 0 14 124 **2 9 L** 2 28 26 2 75 75 6 4 45 4 0 21 1257 270 1 0 5 3 0 1 3 25 27 75 75	3 0 25 0 114 124 **2 9 L** 2 28 26 2 75 75 6 14 4 0 21 1 257 270 1 0 5 3 0 11 3 25 275 75	25 0 114 124 **2 9 L** 2 28 26 2 75 75 6 14 21 1 257 270 1 0 5 3 0 1 2 28 26 2 75 75 6 14	0 114 124 •••2 9 L••• 2 28 26 2 75 75 6 14 1 257 270 1 0 5 3 0 11 3 35 57 16	124 ma2 9 Lina 2 28 26 2 75 75 6 14 270 1 0 5 3 0 1 13 20 2 75 75 6 14	**2 9 L** 2 28 26 2 75 75 6 4	Lim 2 28 26 2 75 75 6 14	2 28 26 2 75 75 6 4	26 2 75 75 6 14	2 75 75 6 4	75 6 14	6 14	5	151	8 232	244	2 95	97	6 32	31	10 25 **5 5	18	1 0	17	5 25 6 11	15
9 0 7 8 0 14 3 0 1 5 0 31 2 72 70 2 90 89 4 26 29 4 128 121 6 149 1 •0 16 4. 9 14 8 4 47 54 6 0 12 3 314 327 3 10 4 5 32 2: 5 5 9 135 1	7 8 0 14 3 0 1 5 0 31 2 172 170 2 90 89 4 26 29 4 128 121 6 149 1 Lat 9 14 18 4 47 54 6 0 12 3 314 327 3 10 4 5 32 21 5 0 5 9 135 1	8 0 14 3 0 1 5 0 31 2 172 170 2 90 89 4 26 29 4 126 121 6 149 1 9 14 8 4 47 54 6 0 12 3 314 327 3 10 4 5 32 2: 5 5 9 13 1	14 3 0 1 5 0 31 2 172 170 2 90 89 4 26 29 4 126 121 6 49 1 _8 4 47 54 6 0 12 3 314 327 3 10 4 5 32 21 5 5 5 9 13 1	3 0 1 5 0 31 2 172 170 2 90 89 4 26 29 4 128 121 6 149 1 4 47 54 6 0 12 3 314 327 3 10 4 5 32 21 5 5 5 9 1 121	1 5 0 31 2 172 170 2 90 89 4 26 29 4 128 121 6 149 1 54 6 0 12 3 314 327 3 10 4 5 32 21 5 0 5 9 135 1	5 0 31 2 172 170 2 90 89 4 26 29 4 128 121 6 149 1 6 0 12 3 314 327 3 10 4 5 32 2: 5 5 5 13 13	31 2 172 170 2 90 89 4 26 29 4 126 121 6 149 1 12 3 314 327 3 10 4 5 32 2: 5 5 9 135 1	2 172 170 2 90 89 4 26 29 4 126 121 6 149 1 3 314 327 3 10 4 5 32 2: 5 0 5 9 135 1	170 2 90 89 4 26 29 4 126 121 6 149 1 327 3 10 4 5 32 21 5 5 5 5 9 135 1	2 90 89 4 26 29 4 126 121 6 149 1 3 10 4 5 32 21 5 5 9 135 1	89 4 26 29 4 128 121 6 149 1 4 5 32 2: 5 0 5 9 135	4 26 29 4 128 121 6 149 1 5 32 2: 5 0 5 9 135	29 4 128 121 8 149 1 21 5 0 5 9 135 1	4 128 121 8 149 1 5 D 5 9 135	121 8 149 1	8 149 1	i	50	12 182	174	4 77 5 170	80	*¥4 [3	12	1 179	183	-513	136	0.18	115
0 82 83 10 40 27 5 9 10 7 0 6 4 91 89 4 61 63 6 15 27 6 34 27 10 4 1 112 104 11 34 32 6 0 3 mil 17 4mil 5 394 396 5 18 20 7 5 17 7 27 25 11 11	. 83 10 40 27 5 9 10 7 0 6 4 91 89 4 61 63 6 15 27 6 34 27 10 4 194 11 34 32 6 0 2 matrix 127 4matrix 5 394 396 5 18 20 7 5 17 7 27 25 11 11	10 40 27 5 9 10 7 0 6 4 91 89 4 61 63 6 15 27 6 34 27 10 4 11 34 32 5 0 2 mil 17 4mil 5 394 396 5 18 20 7 5 17 7 27 25 11 11	27 5 9 10 7 0 6 4 91 89 4 61 63 6 15 27 6 34 27 10 14 32 5 0 2 3 10 17 19 39 396 5 18 20 7 5 17 7 27 25 11 11	5 9 10 7 0 6 4 91 89 4 61 63 6 15 27 6 34 27 10 14 6 0 2 4 11 12 1 1 5 39 39 396 5 18 20 7 5 17 7 27 25 11 11	10 7 0 6 4 91 89 4 61 63 6 15 27 6 34 27 10 14 2 mai 17 4ma 5 394 396 5 18 20 7 5 17 7 27 25 11 11	7 0 6 4 91 89 4 61 63 6 15 27 6 34 27 10 14 **1 17 4** 5 394 396 5 18 20 7 5 17 7 27 25 11 11	6 4 91 89 4 61 63 6 15 27 6 34 27 10 14 Las 5 394 396 5 18 20 7 5 17 7 27 25 11 11	4 91 89 4 61 63 6 15 27 6 34 27 10 4 5 394 396 5 18 20 7 5 17 7 27 25 11 11	89 4 61 63 6 15 27 6 34 27 10 14 396 5 18 20 7 5 17 7 27 25 11 11	4 61 63 6 15 27 6 34 27 10 14 5 18 20 7 5 17 7 27 25 11 11	63 6 15 27 6 34 27 10 14 20 7 5 17 7 27 25 11 11	6 15 27 6 34 27 10 14 7 5 17 7 27 25 11 11	27 6 34 27 10 14 17 7 27 25 11 11	6 34 27 10 14 7 27 25 11 11	27 10 14 25 11 11		í	148 104	2 77	43	6 79 7 121	82 126	2 2B 3 35	14 36	3 220 4 102	216	1 78	82	2 100 3 14	រភូទ្ន័
2 120 122 12 32 19 7 0 4 0 59 53 6 115 110 6 20 19 **2 15 L** 8 31 31 **3 3 113 114 **1 5 L** 8 24 11 1 104 100 7 280 269 7 14 20 0 155 161 9 21 11 1	122 12 32 19 7 0 4 0 59 53 6 115 110 6 20 19 **2 16 Lem 8 31 31 **3 114 **1 5 Lem 8 24 11 1 104 100 7 280 259 7 14 20 0 155 161 9 21 11 1	12 J2 19 7 0 4 0 59 53 6 115 110 6 20 19 **2 16 L** 8 31 31 **3 **1 5 L** 8 24 11 1 104 100 7 280 259 7 14 20 0 155 161 9 21 11 1	L9 / 0 4 0 59 53 6 115 110 6 20 19 **2 16 L** 8 91 91 **3 L** 8 24 11 1 104 100 7 280 269 7 14 20 0 155 161 9 21 11 1	7 0 4 0 59 53 6 115 110 6 20 19 **2 16 L** 8 31 31 **3 8 24 11 1 104 100 7 260 259 7 14 20 0 155 161 9 21 11 1	4 0 59 53 6 115 110 6 20 19 **2 16 L** 8 31 31 **3 11 1 104 100 7 280 259 7 14 20 0 155 161 9 21 11 1	0 59 53 6 115 110 6 20 19 **2 16 L** 8 31 31 **3 1 104 100 7 200 259 7 14 20 0 155 161 9 21 11 1	53 6 115 110 6 20 19 **2 16 L** 8 31 31 **3 100 7 280 269 7 14 20 0 155 161 9 21 11 1	6 115 110 6 20 19 **2 16 L** 8 31 31 **3 7 280 269 7 14 20 0 155 161 9 21 11 1	110 6 20 19 **2 16 Len 8 31 31 **3 269 7 14 20 0 155 161 9 21 11 1	6 20 19 **2 16 L** 8 31 31 **3 7 14 20 0 155 161 9 21 11 1	19 **2 16 L** 8 31 31 **3 20 0 155 161 9 21 11 1	**2 16 L** 8 31 31 **3 0 155 161 9 21 11 1	Las 8 31 31 sa3 161 9 21 11 1	8 31 31 ##3 9 21 11 1	31 **3 11 1	**3 1	10 27	LAN 33	3 26 4 28	0 3	8 43 9 114	91 111	4 19 5 0	3 13	5 119 5 56	119 68	3 64 ••6 0	59 L	ų 97 5 36	92 31
5 65 56 1 273 265 10 17 24 3 97 100 9 214 216 9 0 13 2 115 123 11 23 10 3	50 1 273 265 10 17 24 3 97 100 9 214 216 9 0 13 2 115 123 11 23 10 3	1 273 265 10 17 24 3 97 100 9 214 216 9 0 13 2 115 123 11 23 10 3	265 10 17 24 3 97 100 9 214 216 9 0 13 2 115 123 11 23 10 3	10 17 24 3 97 100 9 214 216 9 0 13 2 115 123 11 23 10 3	24 3 97 100 9 214 216 9 0 13 2 115 123 11 23 10 3	3 97 L00 9 214 216 9 0 13 2 115 123 11 23 10 3		9 214 216 9 0 13 2 115 123 11 23 10 3	216 9 0 13 2 115 123 11 23 10 3	9 0 13 2 115 123 11 23 10 3	13 2 115 123 11 23 10 3	2 115 123 11 23 10 3	101 10 41 44 2	10 41 44 2	10 3	3	6	3	S 37	38 19	10 41	39 100	6 19 **4 14	5 Lan	7 119 8 52	126	0 268 2 316	248 298	■#6 9 1 14	5
7 54 64 3 229 230 12 22 19 5 10 10 11 169 165 11 27 16 4 100 91 13 0 1 5 6 ••0 18 19 19 19 19 19 19 19 19 19 19 19 19 19	G4 3 229 230 12 22 19 5 10 10 11 69 165 11 27 16 4 100 91 13 0 1 5 16 H 140 140 140 140 140 14 15 16 11 169 165 11 27 16 4 100 91 13 0 1 5 16							11 169 165 11 27 16 4 100 91 13 0 1 5 16 12 24 29 17 16 4 100 91 13 0 1 5 16	165 11 27 16 4 100 91 13 0 1 5 16 29 12 0 16 5 06 91 13 0 1 5 16	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	16 4 100 91 13 0 1 5 16 9 5 66 91 13 0 1 5 16	4 100 91 13 0 1 5 16 5 6 91 13 0 1 5 16	91 13 0 1 5 16		1 5 16	5 16		۵ğ	é 10	12	**4 /	10	1 16	132	10 83	79	6 209	222	3 18	19
0 32 7 5 310 309 0 268 264 1 0 12 13 103 104 12 10 L 6 95 93 0 94 83 7 1 1 134 139 6 191 183 1 62 59 2 0 23 12 L 6 0 44 42 10 L 10 6 95 93 0 94 83 7 1	17 5 310 309 0 268 264 1 0 12 13 103 104 2 10 Lat 6 95 93 0 84 83 7 1 139 6 191 183 1 62 59 2 0 23 27 5 1 1 1 2 10 Lat 6 95 93 0 84 83 7 1	5 310 309 0 268 264 1 0 12 13 103 104 2 10 Law 6 96 93 0 84 83 7 1 6 191 193 1 62 59 2 0 23 92 5 1 1 1 1 2 2 1 1 1 2 3 1 2 5 1 1 1 2 3 1 2 5 1 1 1 2 3 1 2 5 1 1 1 2 3 1 2 5 1 2 5	309 0 268 264 1 0 12 13 103 104 2 10 L 6 95 93 0 84 83 7 1 183 1 62 59 2 0 23 22 5 1 0 4 2 10 L 2 2 2 17 1 2 2 2 2 1 1 2 2 2 2 1 1 2 2 2 2	0 268 264 1 0 12 13 103 104 2 10 Las 6 96 93 0 84 83 7 1 62 59 2 0 23 82 5 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	264 L 3 12 13 103 104 22 10 L 6 95 93 0 84 93 7 1 59 2 0 23 92 5 L 6 0 44 22 20 L 7 L 7 1 218 335 8 13	L 3 12 13 103 104 - 2 10 L = 6 96 93 0 84 83 7 1 2 0 23 - 25 L = 0 44 42 - 217 13 138 335 8 13	12 13 103 104 = 2 10 L= 6 96 93 0 84 83 7 1 23 = 2 5 L= 0 44 42 = 2 17 L= 1 348 335 8 13	13 103 104 = 2 10 L = 6 95 93 0 84 83 7 1 = 2 10 L = 6 95 93 0 84 83 7 1 = 1 248 335 8 13	104 = 2 10 L = 6 95 93 0 84 83 7 1 (= 0 44 42 = 2 17 1 348 335 8 13	##2 10 L## 6 96 93 0 84 83 7 1 0 44 42 #2 17 L## 1 348 335 8 13	L= 6 96 93 0 84 83 7 1 42 = 217 1 = 1 348 335 8 13	6 95 93 0 84 83 7 1	93 0 84 83 7 1	0 84 83 7 1 1 348 335 8 13	83 7 1 335 8 13	7 1		16	10 0	ģ	3 27	10	3 10	13	1 29	30	••6 1	- 50	- 3 lõ	- 19
2 34 29 7 73 186 2 324 413 3 0 8 1 20 21 1 73 74 1 0 6 2 53 160 9 0 5 3 132 138 6 115 125 3 48 51 **2 0 L** 2 29 35 2 89 88 2 0 0 3 160 165 10 26 6	29 7 573 186 2 324 313 3 0 8 1 20 21 1 73 74 1 0 6 2 159 160 9 0 5 138 6 115 125 3 48 51 **2 0 L** 2 29 35 2 89 88 2 0 0 3 160 165 10 26 6	7 173 186 2 324 313 3 0 8 1 20 21 1 73 74 1 0 6 2 159 160 9 0 5 6 115 125 3 48 51 **2 0 L** 2 29 35 2 89 88 2 0 0 3 160 165 10 26 6	186 2 324 313 3 0 8 1 20 21 1 73 74 1 0 6 2 159 160 9 0 5 125 3 48 51 == 2 0 L== 2 29 35 2 89 88 2 0 0 3 160 165 10 26 6	2 324 313 3 0 8 1 20 21 1 73 74 1 0 6 2 159 160 9 0 5 3 48 51 **2 0 4** 2 29 35 2 89 88 2 0 0 3 160 165 10 26 6	313 3 0 8 1 20 21 1 73 74 1 0 6 2 159 160 9 0 5 51 **2 0 L** 2 29 35 2 89 88 2 0 0 3 160 165 10 26 6	3 0 8 1 20 21 1 73 74 1 0 6 2 159 160 9 0 5 **2 0 1** 2 29 35 2 89 88 2 0 0 3 160 165 10 26 6	8 1 2C 21 1 73 74 1 0 6 2 159 160 9 0 5 L= 2 29 35 2 89 88 2 0 0 3 160 165 10 26 5	1 2C 21 1 73 74 1 0 6 2 59 160 9 0 5 2 29 35 2 89 88 2 0 0 3 160 165 10 26 6	21 1 73 74 1 0 6 2 159 160 9 0 5 35 2 89 88 2 0 0 3 160 165 10 26 6	1 73 74 1 0 6 2 59 160 9 0 5 2 89 88 2 0 0 3 60 65 10 26 6	74 1 0 6 2 159 160 9 0 5 88 2 0 0 3 160 165 10 26 6		6 2 159 160 9 0 5 0 3 160 165 10 26 6	2 L59 160 9 0 5 3 160 165 10 26 6	160 9 0 5 165 10 26 6	9 0 S	ŝ		12 25	i Las	5 23	Ĩ,	5 0	i	3 23	29	2 54	52	1 65	65
1 0 1 m 9 129 119 4 336 326 0 405 384 3 37 37 3 91 91 3 0 22 4 161 165 133 11 1 m 2 58 56 10 114 103 5 13 67 2 535 509 4 15 4 4 111 111 4 0 16 5 196 200 0 295 302	1.** 9 129 119 4 336 326 0 405 384 3 37 37 3 91 91 3 0 22 4 161 165 **3 11 L** 56 10 114 103 5 13 67 2 535 509 4 15 4 4 111 111 4 0 16 5 196 200 0 295 302	9 129 119 4 336 326 0 405 384 3 37 37 3 91 91 3 0 22 4 161 165 43 11 144 10 114 103 5 73 67 2 535 509 4 15 4 4 111 111 4 0 16 5 196 200 0 295 302	119 4 336 326 0 405 384 3 37 37 3 91 91 3 0 22 4 161 165 483 11 Las 103 5 13 67 2 535 509 4 15 4 4 111 111 4 0 16 5 196 200 0 295 302	4 336 326 0 405 384 3 37 37 3 91 91 3 0 22 4 161 165 183 11 184 5 73 67 2 535 509 4 15 4 4 111 111 4 0 16 5 196 200 0 295 302	325 0 405 384 3 37 37 3 91 91 3 0 22 4 161 165 183 11 LNN 67 2 535 509 4 15 4 4 11 11 4 0 16 5 196 200 0 295 302	0 405 384 3 37 37 3 91 91 3 0 22 4 61 65 483 11 Leve 2 535 509 4 15 4 4 111 111 4 0 16 5 196 200 0 295 302	384 3 37 37 3 91 91 3 0 22 4 61 65 43 11 Lwi 509 4 15 4 4 11 11 4 0 16 5 196 200 0 295 302	3 37 37 3 91 91 3 0 22 4 161 165 4x3 11 Lwi 4 15 4 4 111 111 4 0 16 5 196 200 0 295 302	37 3 91 91 3 0 22 4 161 165 183 11 Lwi 4 4 111 111 4 0 16 5 196 200 0 295 302	3 91 91 3 0 22 4 161 165 mm3 11 Lmm 4 111 111 4 0 16 5 196 200 0 295 302	91 3 0 22 4 161 165 4x3 11 Lx4 111 4 0 16 5 196 200 0 295 302	3 0 22 4 161 165 **3 11 L** 4 0 16 5 196 200 0 295 302	22 4 161 165 ***3 11 L** 16 5 196 200 0 295 302	4 161 165 **3 11 L** 5 196 200 0 295 302	165 **3 11 L** 200 0 295 302	0 295 302	L = 1 302		0 223	209 2 8 5	7 18	11 3	1 20	13	5 11 6 34	-7 30	4 30 5 18	35	2 72	26
4 208 202 11 153 148 5 248 240 4 292 310 5 0 10 5 125 118 **3 0 L** 6 122 128 1 37 4 5 10 13 **1 6 L** 7 32 26 5 467 473 6 0 9 6 18 13 2 86 79 7 174 179 2 280 28	202 11 153 148 5 248 240 4 292 310 5 0 10 5 125 118 **3 0 U** 6 122 128 1 37 4 13 **1 6 4** 7 32 26 6 467 473 6 0 9 6 18 13 2 86 79 7 174 179 2 280 28	11 153 148 5 248 240 4 292 310 5 0 10 5 125 118 ##3 0 L## 6 122 128 1 37 4 #1 5 L## 7 32 25 5 467 473 6 0 9 6 18 13 2 85 79 7 174 179 2 280 28	148 5 248 240 4 292 310 5 0 10 5 125 118 **3 0 L** 6 122 128 1 37 4 L** 7 32 26 6 467 473 6 0 9 6 18 13 2 86 79 7 174 179 2 280 28	6 248 240 4 292 310 5 0 10 5 125 118 ××3 0 L×× 6 122 128 1 37 4 7 32 26 6 467 473 6 0 9 6 18 13 2 86 79 7 174 179 2 280 28	240 4 292 310 5 0 10 5 125 118 **3 0 L** 6 122 128 1 37 4 26 6 467 473 6 0 9 6 18 13 2 86 79 7 174 179 2 280 28	4 292 310 5 0 10 5 125 118 **3 0 L** 6 122 128 1 37 4 6 467 473 6 0 9 6 18 13 2 86 79 7 174 179 2 280 28	310 5 0 10 5 125 118 ##3 0 L## 6 122 128 L 37 4 473 6 0 9 6 18 13 2 86 79 7 174 179 2 280 28	5 0 10 5 125 118 **3 0 L** 6 122 128 1 37 4 6 0 9 6 18 13 2 86 79 7 174 179 2 280 28	10 5 125 118 ##3 0 L## 6 122 128 1 37 4 9 6 18 13 2 86 79 7 174 179 2 280 28	5 125 118 **3 0 L** 6 122 128 1 37 4 6 18 13 2 86 79 7 174 179 2 280 28	118 ##3 0 L## 6 122 128 L 37 4 13 2 86 79 7 174 L79 2 280 28	2 86 79 7 174 179 2 280 28	79 7 174 179 2 280 28	6 122 128 1 37 4 7 174 179 2 280 28	128 L 37 4 179 2 280 28	2 280 28	28 28	0 IS	2 245 3 210	245 206	9 8 10 16	1	3 11 **5 0	- 6 L	7 19	13	6 26 7 38	23	4 22	14
10 23 17 1 67 68 8 183 176 8 318 333 7 63 33 7 54 54 4 58 57 8 97 97 3 84 81 10 25 16 2 52 62 62 9 28 32 10 240 229 8 15 21 8 47 43 6 6 30 9 127 128 4 232 232	17 1 57 58 8 183 175 8 318 333 7 53 33 7 54 54 4 58 57 8 97 97 3 84 81 16 2 52 52 52 52 9 28 32 10 240 229 8 15 21 8 47 43 5 5 5 30 9 127 128 4 232 232	1 67 68 8 183 176 8 318 333 7 63 33 7 54 54 4 58 57 8 97 97 3 84 81 2 62 62 62 9 28 32 10 240 229 8 15 21 8 47 43 6 6 30 9 127 128 4 232 232	68 8 183 176 8 318 333 7 63 33 7 54 54 4 58 57 8 97 97 3 84 81 62 9 28 32 10 240 229 8 15 21 8 47 43 6 6 30 9 127 128 4 232 232	8 183 176 8 318 333 7 63 33 7 54 54 4 58 57 8 97 97 3 84 81 9 28 32 10 240 229 8 15 21 8 47 43 6 6 30 9 127 128 4 232 232	176 8 318 333 7 53 33 7 54 54 4 58 57 8 97 97 3 84 81 32 10 240 229 8 15 21 8 47 43 6 6 30 9 127 128 4 232 232	8 318 333 7 63 33 7 54 54 4 58 57 8 97 97 3 84 81 10 240 229 8 15 21 8 47 43 6 6 30 9 127 128 4 232 232	333 7 63 33 7 54 54 4 58 57 8 97 97 3 84 81 229 8 55 21 8 47 43 6 6 30 9 127 128 4 232 232	7 53 33 7 54 54 4 58 57 8 97 97 3 84 81 8 15 21 8 47 43 6 6 30 9 127 128 4 232 232	33 7 54 54 4 58 57 8 97 97 3 84 81 21 8 47 43 6 6 30 9 127 128 4 232 232	7 54 54 4 58 57 8 97 97 3 84 81 8 47 43 6 6 30 9 127 128 4 232 232	54 4 58 57 8 97 97 3 84 81 43 6 6 30 9 127 128 4 232 232	4 58 57 8 97 97 3 84 81 6 6 30 9 127 128 4 232 232	57 8 97 97 3 84 81 30 9 127 128 4 232 232	9 127 128 4 232 232	97 3 84 81 128 4 232 232	3 84 81 4 232 232	81 232		4 332 5 125	320 130	11 30 ##4 8	10	2 O	:5	9 23	14	8 18 ×8 2	ĻMĄ	0 51	36 67
14 0 17 4 39 37 11 38 38 14 142 135 10 27 4 10 32 28 10 23 17 11 97 93 6 194 14 0 17 4 39 37 11 38 38 14 142 135 10 27 4 10 32 28 10 23 17 11 97 93 6 194	17 4 39 37 11 38 38 14 142 135 10 27 4 10 32 28 10 23 17 11 97 93 6 194 18 5 19 10 10 10 10 10 10 10 10 10 10 10 10 10	4 39 37 11 38 38 14 142 135 10 27 4 10 32 28 10 23 17 11 97 93 6 194 5 38 14 14 142 135 10 27 4 10 32 28 10 23 17 11 97 93 6 194	37 11 38 38 14 142 135 10 27 4 10 32 28 10 23 17 11 97 93 6 194 19 10 12 14 10 12 14 10 12 135 10 27 1 10 32 28 10 23 17 11 97 93 6 194	11 38 38 14 142 135 10 27 4 10 32 28 10 2 17 11 97 93 6 194	143 12 161 171 9 20 20 9 51 56 6 141 16 50 81 74 5 25 38 14 142 135 10 27 4 10 32 28 10 23 17 11 97 93 6 194 10 12 14 10 32 28 10 23 17 11 97 93 6 194 10 12 14 10 32 28 10 23 17 11 97 93 6 194	14 142 135 10 27 4 10 32 28 10 23 17 11 97 93 6 194	171 9 20 20 9 51 58 6 14 18 20 81 74 5 25 135 10 27 4 10 32 28 10 23 17 11 97 93 6 194	10 27 4 10 32 28 10 23 17 11 97 93 6 194	4 10 32 28 10 23 17 L1 97 93 6 194	9 51 56 6 14 16 20 81 74 5 25 10 32 28 10 23 17 11 97 93 6 194	28 10 23 17 11 97 93 6 194	10 23 17 11 97 93 6 194	16 10 81 74 5 25 17 11 97 93 6 194	L1 97 93 6 194	93 6 194	6 194		200	6 228 7 119	122	0 114	26	8 24	37	1 243	22 238	0 232	124	2 17	39
0 143 130 6 10 11 1 31 31 1 28 26 12 15 25 142 11 Las xa3 6 Las 8 174 1 1 185 164 7 0 9 2 0 5 193 199 13 0 11 1 3 2 0 50 0 19 13 0 1	130 6 10 11 1 31 31 1 28 25 12 15 25 **2 11 L** **3 1 L** **3 6 L** 8 174 17 154 7 0 9 2 0 5 2 193 199 13 0 11	5 10 11 1 31 31 1 28 25 12 15 25 **2 11 Law **3 1 Law **3 6 Law 8 174 17	11 1 31 31 1 28 25 12 15 25 **2 11 L** **3 1 L** **3 6 L** 8 174 17 9 2 5 2 133 19 13 0 1	1 31 31 1 28 25 12 15 25 **2 11 Las **3 1 Las **3 6 Las 8 174 17 2 0 5 2193 199 13 0 11 1 3 2 0 50 19 19 13 6 Las	31 1 28 26 12 15 25 **2 11 L** **3 1 L** **3 6 L** 8 174 17 5 2 193 194 13 0 11 1 3 2 0 50 12 15 50 0 1	1 28 25 12 15 25 **2 11 Las **3 1 Las **3 6 Las 8 174 17	25 12 15 25 **2 11 L** **3 1 L** **3 6 L** 8 174 17	12 15 5 **2 11 L** **3 1 L** **3 6 L** 8 174 17	25 ##2 11 L## ##3 1 L## ##3 6 L## 8 174 17	1 3 2 1 4 4 5 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Las and 1 Las and 6 Las 8 174 17 2 0 50 13 1 48 49 6 Las 8 174 17	нязііян жазбіжн 8174 17 ПСП Цзі се со о о і	Las and 6 Las 8 174 17	##3 6 L## 8 174 17	Lan 8 174 17	8 174 17	17	8	9 107	115	3 41	43	• S 1	1.48	3 237	232	3 .46	140	M 7 2	18
2 111 106 6 0 15 3 28 29 3 36 31 ••2 6 L•• 2 40 26 1 21 19 2 52 50 10 155 1 3 190 186 9 37 21 4 0 6 4 25 24 0 43 46 3 13 9 2 99 96 3 18 •• 17 1	108 8 0 15 3 28 29 3 36 31 4 2 6 L 2 40 26 1 21 19 2 52 50 10 15 1 186 9 37 21 4 0 6 4 25 24 0 43 46 3 13 9 2 99 98 3 18 16 16 17 1	6 0 15 3 28 29 3 36 31 42 6 Let 2 40 26 1 21 19 2 52 50 10 155 1 9 37 21 4 0 6 4 25 24 0 43 46 3 13 9 2 99 96 3 18 16 16 17 17	15 3 28 29 3 36 31 4 2 6 Lat 2 40 26 1 21 19 2 52 50 10 155 1 21 4 0 6 4 25 24 0 43 46 3 13 9 2 99 96 3 18 16 4 2 7	3 28 29 3 36 31 = 2 6 L= 2 40 26 1 21 19 2 52 50 10 155 1 4 0 6 4 25 24 0 43 46 3 13 9 2 99 96 3 18 16 = 3 12 12	29 3 36 31 **2 6 L** 2 40 26 1 21 19 2 52 50 10 155 1 6 4 25 24 0 43 46 3 13 9 2 99 98 3 18 16 *3 2 2	3 36 31 = 2 6 L = 2 40 26 1 21 19 2 52 50 10 155 1 4 25 24 0 43 46 3 13 9 2 99 96 3 18 16 16 153 1	31 •••2 6 L••• 2 40 26 1 21 19 2 52 50 10 155 1 24 0 43 46 3 13 9 2 99 96 3 18 16 •••3 17 1	ANZ 6 LAN 2 40 26 1 21 19 2 52 50 10 155 1 0 43 46 3 13 9 2 99 96 3 18 16 10 155 1	Las 2 40 26 1 21 19 2 52 50 10 155 1 46 3 13 9 2 99 96 3 18 16 13 12 1	2 40 26 1 21 19 2 52 50 10 155 1	26 I 21 I9 2 52 50 10 155 1			2 52 50 10 155 1	50 10 155 1	10 155 1	ł	64		105	5 39	3G	1 76	73	5 203	ะเดี	\$ 130	121	2 22	ii.
4 82 87 10 25 23 5 13 20 5 46 59 1 197 4 24 26 3 83 85 4 20 4 1 1 5 25 33 11 35 9 6 0 8 6 51 32 2 75 77 5 12 1 4 131 131 5 26 26 2	87 10 25 23 5 13 20 5 46 59 1 197 197 4 24 26 3 83 85 4 20 4 1 1 33 11 35 9 6 0 8 6 51 32 2 75 77 5 12 1 4 131 131 5 26 26 2	10 25 23 5 13 20 5 46 59 1 197 197 4 24 26 3 83 85 4 20 4 1 1 11 35 9 6 0 8 6 51 32 2 75 77 5 12 1 4 131 131 5 26 26 2 0	23 5 13 20 5 46 59 1 197 197 4 24 26 3 83 85 4 20 4 1 1 9 6 0 8 6 51 32 2 75 77 5 12 1 4 131 131 5 26 26 2 0	5 13 20 5 46 59 1 197 197 4 24 26 3 83 85 4 20 4 1 1 6 0 8 6 51 32 2 75 77 5 12 1 4 131 131 5 26 26 2 1	20 5 46 59 1 197 197 4 24 26 3 83 85 4 20 4 1 1 8 6 51 32 2 75 77 5 12 1 4 131 131 5 26 26 2 1	5 46 59 1 197 197 4 24 26 3 83 85 4 20 4 1 1 6 51 32 2 75 77 5 12 1 4 131 131 5 26 26 2 0	59 1 197 197 4 24 26 3 83 85 4 20 4 1 1 32 2 75 77 5 12 1 4 131 131 5 26 26 2 0	1 197 197 4 24 26 3 83 85 4 20 4 1 1 2 75 77 5 12 1 4 131 131 5 26 26 2 0	197 4 24 26 3 83 85 4 20 4 1 1 77 5 12 1 4 131 131 5 26 26 2 0	4 24 26 3 83 85 4 20 4 1 1 5 12 1 4 131 131 5 26 26 2 0	26 3 83 85 4 20 4 1 1 1 4 131 131 5 26 26 2 0	3 83 85 4 20 4 1 1 4 131 131 5 26 26 2 0	85 4 20 4 1 10 131 5 26 26 2 0	4 20 4 1 10 5 26 26 2 0	26 2 0	1 10	5	4	**4 3 1 93	Las 88	7 40 8 100	42	3 65	64 90	7 187 8 0	174	7 130	138	• 7 3 0 100	
15 68 73 mml 7 Lmm 7 37 46 7 61 63 3 323 333 6 28 20 5 176 180 6 14 10 3 (2 84 63 0 97 99 8 0 6 8 34 14 4 88 94 7 0 2 6 97 100 7 17 25 4 0	_73 xxt 7 Lxx 7 37 46 7 61 63 3 323 333 6 28 20 5 176 180 6 14 10 3 (83 0 97 99 8 0 6 8 34 14 4 88 94 7 0 2 6 97 100 7 17 25 4 0	net 7 Lee 7 37 46 7 61 63 3 323 333 6 28 20 5 176 180 6 14 10 3 (0 97 99 8 0 6 8 34 14 4 88 94 7 0 2 6 97 100 7 17 25 4 0	L## 7 37 46 7 61 63 3 323 333 6 28 20 5 176 180 6 14 10 3 (_99 8 0 6 8 34 14 4 88 94 7 0 2 6 97 100 7 17 25 4 0	-7 37 46 7 61 63 3 323 333 6 28 20 5 176 180 6 14 10 3 (8 0 6 8 34 14 4 88 94 7 0 2 6 97 100 7 17 25 4 (- 46 7 61 63 3 323 333 6 28 20 5 176 180 6 14 10 3 (6 8 34 14 4 88 94 7 0 2 6 97 100 7 17 25 4 (-7 61 63 3 323 333 6 28 20 5 176 180 6 14 10 3 (8 34 14 4 68 94 7 0 2 6 97 100 7 17 25 4 (63 3 323 333 6 28 20 5 176 180 6 14 10 3 (14 4 68 94 7 0 2 6 97 100 7 17 25 4 (3 323 333 6 28 20 5 176 180 6 14 10 3 (4 88 94 7 0 2 6 97 100 7 17 25 4 0	333 6 28 20 5 176 180 6 14 10 3 (94 7 0 2 6 97 100 7 17 25 4 0	6 28 20 5 176 180 6 14 10 3 (7 0 2 6 97 100 7 17 25 4 (20 5 176 180 6 14 10 3 0 2 6 97 100 7 17 25 4 0	5 176 180 6 14 10 3 (6 97 100 7 17 25 4 (180 6 14 10 3 (100 7 17 25 4 (6 14 10 3 (7 17 25 4 (25 4 0	3 0	5	11	2 23 3 84	13 86	9 0 10 76	19 85	5 76 6 65	81 62	9 144 ⊪≈5 B	136	**6 3 22	10	1 28 2 11U	105
8 75 74 1 320 337 9 26 4 9 0 15 5 170 176 8 0 1 7 84 77 8 25 29 5 9 99 98 2 57 58 10 21 0 10 28 28 6 121 124 9 0 3 8 86 82 9 19 21 6	14 1 320 337 9 26 4 9 0 15 5 170 176 8 0 1 7 8 27 8 25 29 5 98 2 57 58 10 21 0 10 28 28 6 121 124 9 0 3 8 86 82 9 19 21 6	1 320 337 9 26 4 9 0 15 5 170 176 8 0 1 7 84 77 8 25 29 5 2 57 58 10 21 0 10 28 28 6 21 124 9 0 3 8 86 82 9 19 21 6	337 9 26 4 9 0 15 5 170 176 8 0 1 7 8 25 29 5 56 10 21 0 10 28 28 6 121 124 9 0 3 8 86 82 9 19 21 6	9 26 4 9 0 15 5 170 176 8 0 1 7 84 77 8 25 29 5 10 21 0 10 28 28 6 21 124 9 0 3 8 86 82 9 19 21 6	4 9 0 15 5 170 176 8 0 1 7 84 77 8 25 29 5 0 10 28 28 6 21 124 9 0 3 8 86 82 9 19 21 6	9 0 15 5 170 176 8 0 1 7 84 77 8 25 29 5 10 28 28 6 121 124 9 0 3 8 86 82 9 19 21 6	15 5 170 176 8 0 1 7 84 77 8 25 29 5 28 6 121 124 9 0 3 8 86 82 9 19 21 6	5 170 176 8 0 1 7 84 77 8 25 29 5 6 121 124 9 0 3 8 86 82 9 19 21 6	176 8 0 1 7 84 77 8 25 29 5 124 9 0 3 8 86 82 9 19 21 6	8 0 1 7 84 77 8 25 29 5 9 0 3 8 86 82 9 19 21 6	1 7 84 77 8 25 29 5 3 8 86 82 9 19 21 6	7 84 77 8 25 29 5 8 86 82 9 19 21 6	77 8 25 29 5 82 9 19 21 6	8 25 29 5 9 19 21 6	29 5 21 6	5	0	11	4 43 5 31	48 24	*#4 9 1 33	Laa 35	7 85 8 28	83 35	1 27	33	3 0	39	3 Ö	iu L∎∎
.0 59 58 3 322 328 11 13 20 11 26 13 7 156 147 10 30 17 9 100 95 10 33 20 11 58 54 4 57 55 ***1 13 2*** 12 13 5 8 143 142 11 0 5 10 58 45 11 30 26	58 3 322 328 11 13 20 11 25 13 7 156 147 10 30 17 9 100 95 10 33 20 54 4 57 65 *** 13 13 14* 12 13 5 8 143 142 11 0 5 10 58 45 11 30 26	3 322 328 11 13 20 11 26 13 7 156 147 10 30 17 9 100 95 10 33 20 4 57 55 == 1 13 29 13 5 8 143 142 11 0 5 10 58 45 11 30 25	328 11 13 20 11 25 13 / 156 14/ 10 30 1/ 9 100 95 10 33 20	11 13 20 11 26 13 7 156 147 10 30 17 9 100 95 10 33 20 aal 13 Laa 12 13 5 8 143 142 11 0 5 10 58 45 11 30 26 a 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	20 11 26 13 7 156 147 10 30 17 9 100 95 10 33 20	11 26 13 7 156 147 10 30 17 9 100 95 10 33 20 12 13 5 8 143 142 11 0 5 10 58 45 11 30 26	13 7 156 147 10 30 17 9 100 95 10 33 20 5 8 143 142 11 0 5 10 58 45 11 30 26	7 156 147 10 30 17 9 100 95 10 33 20 8 143 142 11 0 5 10 58 45 11 30 26	147 10 30 17 9 100 95 10 33 20 142 11 0 5 10 58 45 11 30 26	10 30 17 9 100 95 10 33 20 11 0 5 10 58 45 11 30 26	17 9 100 95 10 33 20 5 10 58 45 11 30 26	9 100 95 10 33 20 10 58 45 11 30 26	95 LO 33 20 45 L1 30 26	10 33 20 11 30 26	20 26		/ 32 8 .4	26	6 13 7 15	11	2 44	45 11	9 48 10 52	43 62	3 15 4 23	10	4 22 5 34	15	2 37	12
.4 53 444 5 377 3074 0 231 232 13 0 4, 9 147 1470 ≉82 12 0 49 12 46 38 ×83 7 181 2 0.4 6 16 16 1 138 137 14 19 6 10 55 52 0 49 49 12 46 38 ×83 7 1 29 20 2 329 216 221 218 -2 2 1 - 11 10 13 1 15 115 115 115 12 69 51 0 100	-44 5 3/7 304 0 231 232 13 0 4 9 147 148 ≊212 L≊≊ 11 61 63 12 19 L≪≊ 6 16 16 1 138 137 14 19 6 10 55 52 0 49 49 12 46 38 ∞3 7 20 2 309 316 2 301 3 23 2 1 110 110 110 115 13 69 61 0 00	53:07 3014 U 231, 232 13 U 4, 91447 140 ##212 L## 1, 51 53 12 19 6 16 16 1, 138 137 14 19 6 10 55 52 0 49 49 12 46 38 ##3 7 2019 216 227 213 = 2 2 1 10 13 14 116 116 116 116 5 6 0 00	304 0.231 232 13 0 4 9 147 148 **2.12 L*** 13 61 63 12 19 16 1 138 137 14 19 6 10 55 52 0 49 49 12 46 38 **3 7 216 2 220 332 2 1 110 110 12 1116 115 13 62 61 0 100	U 231 232 13 U 4 914/140 **2 12 L** 11 51 53 12 19 1 138 137 14 19 6 10 55 52 0 49 49 12 46 38 **3 7	232 13 0 4 9147 148 ##212 L## 11 51 53 12 19 137 14 19 6 10 55 52 0 49 49 12 46 38 ##3 7	13 0 4 9 147 148 ##2.12 L## (1.61 53 12.19 14 19 6 10 55 52 0 49 49 12 46 38 ##3.7 	4 9147 148 mm2 12 Lmm 11 61 53 12 19 6 10 55 52 0 49 49 12 46 38 mm3 7	9147 148 ##212 L## 11 61 63 12 19 10 55 52 0 49 49 12 46 38 ##3 7	148 ##2.12 L## (1.61.60 12.19 52 0 49 49 12 46 38 ##3.7	##2 12 L## 11 51 53 12 19 0 49 49 12 45 38 ##3 7	49 12 46 38 × 3 7	12 46 38 × 3 7	63 12 19 38 ×=3 7	12 19 ##3 7		12	9 0 **3 13	13	9 22	21	5 0	17	1 56	50	5 23 6 0	8 31	6 16 7 0	17	0 73	80
2 12 7 8 0 13 113 101 0 258 259 12 65 47 2 85 80 ××3 2 1××1 388 3 3 41 10 10 10 10 10 10 10 10 10 10 10 10 10	30 / 308 310 ∠ 224 313 101 0 258 259 12 65 47 2 85 80 × 83 2 1××× 1 388 3 101 9 247 26 13 3113 101 0 258 259 12 65 47 2 85 80 × 83 2 1××× 1 388 3 101 9 247 261 1 235 217 1 318 377 13 76 75 3 164 155 1 01 33 2 20	7 300 310 2 224 313 882 2 088 11 110 113 1 110 113 10 09 31 0 109 1 8 0 13 3 113 101 0 258 259 12 65 47 2 85 80 883 2 188 1 388 3 9 201 2 21 0 251 0 13 13 17 13 78 75 3 150 155 1 0 33 3 3 3	310 2 224 313 882 2 088 11 110 113 110 115 10 05 51 0 105 1 13 3 113 101 0 258 259 12 65 47 2 85 80 883 2 188 1 388 3 221 0 255 217 1 378 777 13 76 75 3 154 155 1 00 33 5 20	2 244 413 MM2 4 UMM 11 110 110 110 110 10 00 01 0100 3 113 101 0 258 259 12 65 47 2 85 80 MM3 2 1MM 1 388 3 0 225 217 1 378 377 13 78 75 3150 155 1 00 33 0 01	101 0 258 259 12 65 47 2 85 80 ##3 2 1.## 1 388 3 101 0 258 259 12 65 47 2 85 80 ##3 2 1.## 1 388 3	0.258.259.12.65 47 2.85 80 ##3.2 1,## 1.398.3 1.328.259.12.65 47 2.85 80 ##3.2 1,## 1.398.3	259 12 65 47 2 85 80 mm3 2 1,mm 1 388 3 777 13 76 75 3 154 155 1 40 33 2 20	12 10 113 1 10 115 10 09 51 0 105 1 12 65 47 2 85 80 ##3 2 1.## 1 388 3	47 2 85 80 ##3 2 1.## 1 388 3 75 3 554 155 1 40 33 5 20	2 85 80 ##3 2 1## 1 398 3 2 85 80 ##3 2 1## 1 398 3	80 M#3 2 1 0 33 2 20	NW3 5 7WM 1 398 3	Las 1 388 3	1 388 3	1	.01 989	1 116	116	11 0	19	7 21	19	3 31	2:	8 0	13	# 22 #6 4	L	1 /3	58
¥ 100 \$1 10 21 \$3 5 114 112 2 415 416 \$ 7 4 33 67 2 35 55 3 294 309	91 10 21 3 3 114 112 2 415 416 7 7 4 93 87 2 35 55 3 294 309	10 21 3 3 114 112 2 415 416 4 33 87 2 35 55 3 294 309	3 5 114 112 2 415 416 · · · · · · · · · · · · · · · · · · ·	5 114 112 2 415 416 · · · · · · · · · · · · · · · · · · ·	112 2 415 416 4 93 87 2 55 55 3 294 309	2 415 416 4 93 87 2 55 55 3 294 309	418 4 93 87 2 55 55 3 294 309	4 93 87 2 55 55 3 294 309	4 93 87 2 55 55 3 294 309	4 93 87 2 55 55 3 294 309	87 2 55 55 3 294 309	2 35 55 3 294 309	ร์รี่ ว็ 2 จีนี้ 3 0 จี	3 294 309	309		3 92	85	•e 11		ă ŭ	7	5 10	13	0 194	192	1 220	213		

^a The column headings have the same meanings as in Table I.



Figure 2.—A portion of the structure of CsEu(HFA)₄ showing two anion-cation chains. The circles represent in decreasing order of size Cs, Eu, O, F and C, respectively. This drawing is a stereoscopic pair.

separation. Average standard errors for the distances in the figure are shown in Table IV.

A feature of the structure for which our description differs from that of Bennett, *et al.*,⁵ is in the coordination of the Cs⁺ ion. While they describe it as consisting of eight F atoms in CsY(HFA)₄ at pairs of distances of 3.21, 3.27, 3.31, and 3.75 Å, we would rule out the last pair as being too long and instead include six O atoms in pairs at 3.29, 3.40, and 3.50 Å, thus giving the Cs⁺ in CsV(HFA)₄ a 12-fold coordination. In CsEu(HFA)₄ the 12 neighbor distances are, in pairs: Cs–F at 3.16, 3.19, 3.30 Å, Cs–O at 3.29, 3.36, 3.48 Å. In CsAm-(HFA)₄ they are: Cs–F at 3.20, 3.29, 3.34 Å; Cs–O at 3.25, 3.35, 3.46 Å. These contacts are shown in Figure 2, in which a portion of two anion-cation chains is illustrated. The only symmetry exhibited by the

TABLE III Positional and Thermal Parameters for CsEu(HFA)₄ (Top) and CsAm(HFA)₄ (Bottom) and Their Standard Errors^a

Atom	x	У	z	10 ⁴ 3 ₁₁	10 ⁴ 8 ₂₂	10 ⁴ 833	10 ⁴ 8 ₁₂	10 ⁴ 8 ₁₃	10 ⁴ 823
Cs	0.5(0) ^b	0.26957(7)	0.25(0)	118(2)	41(1)	66(1)	0(0)	2(2)	0(0)
Eu	0,0(0)	0.31651(4)	0.25(0)	89(1)	19(1)	L6(1)	0(0)	2(1)	0(0)
01	-0,221(1)	0.3569(5)	0.3179(6)	93(16)	30(3)	45(5)	-3(7)	18(7)	0(3)
02	.084(1)	0.4009(6)	0.3246(7)	109(17)	36(4)	62(6)	2(7)	-9(9)	0(4)
03	-0.139(1)	0.2308(5)	0.3002(7)	127(18)	21(3)	54(5)	7(6)	3(8)	-6(3)
04	0.152(1)	0.2745(5)	0.3495(6)	194(21)	30(3)	43(5)	-21(7)	-15(9)	12(4)
Fl	-0.427(2)	0.4449(9)	0.437(1)	197(22)	106(8)	154(12)	13(11)	60(13)	83(9)
F2	-0.488(2)	0.3671(7)	0.386(2)	259(30)	65(6)	329(25)	82(13)	213(25)	75(11)
F3	-0.181(2)	0.4397(13)	0.331(1)	152(26)	202(16)	140(11)	-121(19)	73(14)	-86(11)
F4	0.220(2)	0.4731(6)	0.438(1)	264(26)	60(5)	107(9)	-15(9)	-53(13)	-30(5)
F5	0.212(2)	0.5139(6)	0.332(1)	502(38)	55(5)	100(9)	-120(12)	74(15)	-13(5)
F6	0.055(1)	0.5385(5)	0.418(1)	194(22)	40(3)	190(12)	0(7)	-3(12)	-48(5)
F7	-0.219(2)	0.1045(10)	0.410(1)	613(55)	108(9)	158(14)	190(19)	-116(22)	-92(11)
78	-0.194(3)	0.0969(9)	0.299(1)	846(88)	77(7)	186(18)	184(24)	86(28)	55(10)
F9	-0.347(1)	0.1503(7)	0.339(2)	195(26)	37(5)	382(26)	52(9)	-57(23)	-67(9)
F10	0.251(2)	C.2462(14)	C.509(1)	339(35)	201(18)	89(10)	60(17)	-85(18)	-46(10)
F11	0.406(2)	0.2359(9)	0,420(1)	157(22)	148(11)	127(10)	-46(13)	-60(13)	96(9)
F12	0.297(2)	0.1642(7)	0.469(1)	347(31)	65(6)	153(13)	-12(12)	-115(17)	35(8)
Cl	-0.409(2)	0.4093(14)	0.396(2)	105(41)	54(1C)	131(19)	-60(16)	-5 ^h (22)	55(11)
C2	-0.242(2)	0.LC50(8)	0.358(1)	157(30)	26(5)	36(7)	-26(10)	37(12)	-4(5)
C3	-0.138(2)	0.4515(7)	0.378(1)	136(30)	18(4)	58(8)	h(10)	-2(13)	-1(5)
C4	0.016(2)	0.4426(8)	0,360(1)	168(37)	26(5)	56(8)	32(16)	-7(19)	1(5)
C5	0.127(2)	0.4952(10)	0.384(1)	191(37)	21(6)	78(13)	-3(1h)	19(19)	6(7)
сę	-0,211(3)	0.1347(16)	0.353(2)	256(54)	63(11)	111(19)	92(22)	-45(26)	-4(13)
C7	-0.099(2)	0.1881(9)	0.346(1)	100(32)	28(6)	76(12)	29(13)	28(15)	18(7)
C5	0.032(2)	0.1781(8)	0.391(1)	131(41)	26(4)	64(9)	17(10)	8(13)	-9(6)
C9	0.144(2)	0,2271(8)	0,388(1)	145(30)	34(6)	36(8)	-3(12)	0(13)	1(6)
C10	0.282(4)	0.2215(15)	0.446(2)	357(66)	51(9)	60(12)	21(22)	8(27)	40(10)
C	0.5(0)	0.26803(9)	0.25(0)	121(4)	38(1)	63(1)	0(0)	1(3)	0(0)
4m	0.0(0)	0 31633(4)	0.25(0)	88(2)	16(1)	43(1)	0(0)	3(2)	0(0)
01	-0.227(2)	0.3554(6)	0.3155(8)	105(26)	20(4)	32(7)	2(9)	9(12)	4(5)
02	0.080(2)	0.3998(7)	0.3255(8)	108(25)	28(4)	4q(8)	-5(9)	12(12)	-30(5)
03	-0.141(2)	0.2294(7)	0.3048(9)	83(28)	33(5)	48(8)	18(9)	=18(12)	-11(6)
04	0.156(2)	0.2735(7)	0.3512(9)	140(31)	23(5)	L5(8)	0(9)	- 79(13)	-5(5)
F1	-0.432(2)	0,443(1)	0,435(2)	150(32)	112(11)	138(16)	12(14)	48(18)	77(13)
F2	-0.490(3)	0.367(1)	0.391(2)	318(43)	54(6)	293(30)	51(18)	217(34)	45(12)
F3	-0.484(3)	0.440(2)	0.333(2)	192(39)	236(23)	107(14)	-122(29)	45(25)	-75(15)
74	0,216(2)	0,476(1)	0,135(1)	250(34)	49(6)	112(13)	-16(11)	-33(20)	-25(7)
F5	0.198(3)	0.515(1)	0.332(1)	588(58)	49(6)	100(12)	-128(17)	79(25)	-23(7)
F6	0.047(2)	0.540(1)	0,419(1)	185(36)	39(5)	167(15)	-16(9)	13(18)	-40(7)
57	-0.213(3)	0.103(1)	0.406(2)	625(77)	110(12)	167(21)	196(27)	-181(34)	-97(15)
F8	-0.182(1)	0.098(1)	0.302(2)	794(105)	64(9)	180(24)	166(27)	66(39)	33(13)
F 9	-0.348(2)	0.149(1)	0.344(3)	225(44)	42(7)	419(40)	37(1l:)	-68(35)	-68(14)
710	0,256(3)	0.243(2)	0.504(2)	425(60)	138(13)	116(14)	51(22)	-97(27)	-39(13)
F11	0,414(2)	0.235(1)	0,423(1)	158(30)	130(12)	113(11)	-48(17)	-74(20)	70(11)
F12	0.305(2)	3,161(1)	3,466(2)	307(44)	84(10)	216(24)	-7(17)	-173(28)	64(14)
C1	-0.419(5)	0,411(2)	0.381(3)	8.0(10) ^e					
C2	-0.241(3)	0.405(1)	0.354(2)	4.2(6)					
С3	-0.142(3)	0.249(1)	0.377(2)	4.2(6)					
CP	0.022(3)	0.141(1)	0.359(2)	3.4(5)	a) Coeff	licients i	n the temp	erature fa	eter:
05	0,113(4)	0.191(2)	0,383(2)	7.5(8)	exp[-	·(s,.h ² +	B22k2 + B3	al ² + 28,0	hk +
C6	-0.225(5)	0,138(2)	0,350(3)	9.1(10)	28.3 ^b	4 + 28 ₂₃ k	.e)].		
C7	-0.096(3)	0.188(1)	0.350(2)	4.9(6)	b) Numbe	rs in par	entheses a	re estimat	ed
C9	0.034(2)	0.177(1)	0.392(1)	h 1(5)	stand	ard error	s for last	digit lis	ted.
C9	C.142(3)	0.225(1)	0.392(2)	5.6(7)	c) For c	arbon ato	ms the coe	fficients	B for
C1?	0.285(6)	0.517(5)	C.142(3)	10,2(11)	isctr	opic tenn	erature fa	ctors are	listed.

^{*a*} Numbering scheme is the same as that of Bennett, *et al.*,⁵ and agrees with that in Figure 1.

	Tabi	LE IV	
	M = Y	M = Eu	M = Am
	Distance	Errors, Å	
MO	0.01	0.01	0.02
C-O	0.02	0.02	0.03
C-C	0.02	0.02	0.03
C-F	0.03	0.04	0.05
	Angle Er	rors, Deg	
O-M-O	0.3	0.4	0.7
M-O-C	0.7	1.0	1.5
0-C-C	1.0	2.0	2.0
C-C-C	1.0	2.0	3.0

polyhedron consisting of these 12 neighbors is the twofold crystallographic axis passing through the Cs⁺ ion. The fact discussed by the previous authors that between chains there are only $\mathbf{F} \cdots \mathbf{F}$ contacts is also apparent in Figure 2.

Contribution from the Physical Chemistry Department, Chemical Research Laboratory, Edgewood Arsenal, Maryland 21010

Proton Magnetic Resonance Studies of Phosphoryl Transition Metal Compounds

BY LAWRENCE S. FRANKEL¹

Received December 4, 1968

The coordination properties of dimethyl methylphosphonate, DMMP = $(CH_3)P(O)(OCH_3)_2$, and trimethyl phosphate,² TMP = $(O)P(OCH_3)_3$, have been investigated. The proton spin–spin relaxation times (T_2) and the phosphorus spin-lattice relaxation times (T_1) of compounds of the type $M(L)_X(ClO_4)_2$ (M is an iron series transition metal, L is a phosphoryl ligand, and X is the coordination number) have been examined in neat solutions of the ligands in an effort to study the ligand-exchange reactions.

The hexamethylphosphoramide, HMPA = (O)P(N- $(CH_3)_2)_3$, complexes were prepared as previously described.³ A similar procedure was used to prepare the DMMP and TMP complexes. Dehydration of M(H₂-O)₆(ClO₄)₂ with triethyl orthoformate was followed by the addition of a slight excess of ligand. The complexes were precipitated, as oils, upon the addition of diethyl ether. Solids were obtained by repeated washing with fresh ether. The solids were dried *in vacuo* over P₂O₅. The compounds isolated are shown in Table I. This procedure did not give pure solids in the following cases: DMMP with Fe²⁺, Co²⁺, and Ni²⁺; TMP with Fe²⁺, Co²⁺, Ni²⁺, and Cu²⁺; and dimethyl hydrogen phosphite, DHP = (H)P(O)(OCH₈)₂, with the entire iron series.

All solutions were made in a nitrogen atmosphere. The nmr data were obtained on a Varian A-60 spectrometer. The effective magnetic moments were determined by the method of Evans⁴ using benzene as an inert reference in a solution of the ligand. Infrared spectra were obtained on a 521 Perkin-Elmer grating spectrometer (Nujol on CsI plates). The concentration of complex used to obtain the relaxation time data was: $Co(HMPA)_4^{2+}$, $(0.67-1.6) \times 10^{-2} M$; $Fe(HMPA)_4^{2+}$, $(0.45-1.3) \times 10^{-2} M$; $Mn(HMPA)_4^{2+}$, $(0.12-3.1) \times 10^{-2} M$; $Mn(DMMP)_6^{2+}$, $(0.14-7.2) \times 10^{-2} M$; $Mn \cdot (TMP)_6^{2+}$, $(2.0-5.3) \times 10^{-2} M$.

The infrared phosphoryl shifts (Table I) clearly show that coordination involves the phosphoryl group. As is typical Fe⁸⁺ gives a much larger shift than Mn^{2+} . The analytical data are tabulated in Table I as are the effective magnetic moments (μ). HMPA, diisopropyl methylphosphonate,⁵ and triphenyl phosphine oxide⁶

⁽¹⁾ Rohm and Haas Co., Research Laboratory 13, Philadelphia, Pa. 19137.

⁽²⁾ V. Gutmann and W. K. Lux, J. Inorg. Nucl. Chem., 29, 2391 (1967).

⁽³⁾ B. B. Wayland and R. S. Drago, J. Am. Chem. Soc., 87, 2372 (1965).
(4) D. F. Evans, J. Chem. Soc., 2003 (1959).

⁽⁵⁾ N. M. Karayannis, C. Owens, L. L. Pytlewski, and M. M. Labes, submitted for publication.

⁽⁶⁾ F. A. Cotton, R. D. Barnes, and E. Bannister, J. Chem. Soc., 2199 (1960).