excluded volume approaches the total volume in magnitude as the pressure is increased. However the question still remaining is: are the atoms compressed as the pressure is increased to 100,000 kg/cm²? If the atomic radius could be unbiguously calculated at the various pressures an answer might be forthcoming to the question. However the problem is; what is the arrangement of the atoms at increasing pressure? We have seen that we could assume that at one kg/cm², the atoms are arranged in a body-centered lattice and we could get very good values for the atomic radii compared to the X-ray values. We know something about the atoms at one other point. Here the crystal–array symmetry has been disrupted and the atoms exist as 1-mers. We have calculated the atomic radius at this point under several assumptions: first, we have assumed that their volume is $4/3\pi r^3$. This is undoubtedly wrong because spherical atoms cannot be packed in a volume with no free space so that this value should be too high. Secondly, we have calculated the radius as if body-centered symmetry still existed. This also is wrong because we know that this symmetry does not

Table 3. *Excluded volume,* Б *and atomic radii of the alkali metals.*

Pressure = 1 kg/cm², temperature = 300°K, $N_0 = 6{\cdot}02283 \times 10^{23}$

Metal	Б (cm³)	r (Å) (this paper)	r (Å) (Slater)	r (Å) (Bragg)
Lithium	1·585320*	1·43675*	1·45	1·50
Sodium	0·867506	1·75192	1·80	1·77
Potassium	0·876645	2·09854	2·20	2·07
Rubidium	0·524303	2·29461	2·35	2·25
Cesium low pressure form	0·457988	2·54125	2·60	2·37

* Truncated from 20 digits used in calculation.

Table 4. *Total, excluded and defect volumes at* 1 *and* 100,000 *kg/cm².*

Calculated densities at 1 kg/cm²

Metal	Pressure (kg/cm²)	Total volume (v/g)	Excluded volume (Б/gm)	Defect volume (v–Б/g)	Density calculated = 1/v at 1 kg/cm²	Density rubber handbook*
Lithium	1	1·86351†	1·58532†	0·27819†	0·537†	0·534 (20°C)
	100,000	1·25508	1·21855	0·03652		
Sodium	1	1·00401	0·86751	0·13650	0·996	0·971 (20°C)
	100,000	0·61963	0·60901	0·01062		
Potassium	1	1·18282	0·87664	0·30617	0·845	0·862 (20°C)
	100,000	0·55689	0·55208	0·00481		
Rubidium	1	0·65739	0·52430	0·13308	1·521	1·532 (20°C)
	100,000	0·30814	0·30594	0·00220		
Cesium	1	0·52446	0·45800	0·06647	1·907	1·8785 (15°C)
	23,000	0·33897	0·33074	0·00824		1·873 (20°C)

* *Handbook of Chemistry and Physics*, 45th ed. (1964–65). The Chemical Rubber Co., Cleveland, Ohio.
† Rounded off from 20 digits.