the distances between the rods must have *expanded* from l to

$$l''=l(2-\sqrt{1-v^2/c^2}). \qquad (4)$$

This corresponds exactly to Eqs. (1) and (2) above.

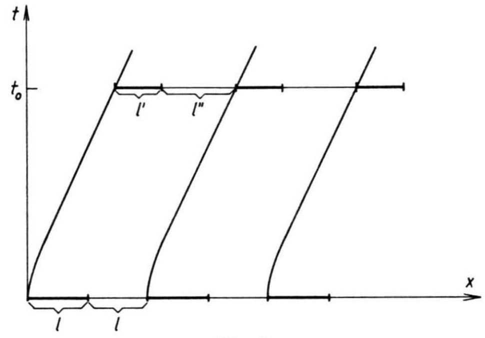

Fig. 2.

Comparing the first and third example, one arrives at the following conclusion. There are two kinds of Lorentz contractions. A rod, being at rest in an inertial system, *appears* contracted if seen by a moving observer. This kind of Lorentz contraction does not imply any real change of the rod, but merely accounts for the different "space-time perspectives" of observers in relative motion. If, however, the rod itself is set moving, one is justified to say that *it gets really contracted.*

Indeed, in the latter case the rod contracts "with respect to the surrounding space", as indicated, e. g., by Eqs. (3) and (4). That this contraction is a real physical process, may also be illustrated by a slight modification of the experimental arrangement of Fig. 2. Imagine neighboring rods to be connected by springs of equilibrium length l, and regard the whole chain of rods together as a model of a single rod. Let the periods of all possible oscillations of the chain be much greater than t_0. Then Fig. 2 remains nearly correct, but the drawn configuration at $t=t_0$ is not yet stable, since the springs are stretched and the chain just starts oscillating. After these oscillations have died away by damping,, the chain as a whole has been shortened by the famous factor $\sqrt{1-v^2/c^2}$.

Although this factor occurs in both types of Lorentz contractions of a rod (and this is not an accident, but simply expresses the invariance of its restlength), they are rather different things.

As clearly indicated by Eqs. (1) and (2), the non-Euclidean geometry on a rotating disc is due to Lorentz contractions of the "real" type. This remark and the above described model should be sufficient to explain why and how the space geometry changes if a disc is set rotating.

Isotope Effect of Thermal Diffusion in Some Pure Molten Salts

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The heat of transport for isotopes of the cations has been determined for the following molten salts: KCl (78 cal/mole), KBr (46 cal/mole), KSCN (52 cal/mole), RbCl (92 cal/mole), and RbBr (49 cal/mole). Thus, the heat of transport is roughly the same for corresponding potassium and rubidium salts, and it is considerably higher for a chloride than for the other ones. In these two aspects the isotope effect of thermal diffusion behaves differently from that of electromigration in molten salts.

Thermal diffusion in solid and molten salts has been investigated in this laboratory for a number of years. One of the main objects has been to study the separation of isotopes of alkali metal ions, for which we have previously given results for sulfates and nitrates [1-4], and for which we now can report on same halides and a thiocyanate.

As in the previous studies a temperature difference was maintained between the bottom and top of narrow glass tubes containing the melt, cf. Table 1. After quenching, the cell was divided into samples for which the isotope abundance ratio was measured. Since thermal diffusion causes only a small change in the isotope abundance, we have always been faced with the problem of how to get significant results without being forced to do a great number of experiments. We have sometimes chosen to divide the whole column into samples, analyse each of them, and then use regression analysis in order to calculate the temperature coefficient of the isotope abundance ratio. Other times we restricted the analysis to samples from the top and the bottom of the cell. An advantage of the first method is that it might be possible to detect a temperature dependence of the thermal diffusion; a disadvantage is that uncontrolled mixing might occur in the tube during solidification, which would cause the measured temperature coefficient to be too low [5]. A comparison

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[1] K. LINDQVIST and A. LUNDÉN, Z. Naturforsch. **16 a**, 626 [1961].

[2] S. GUSTAFSSON and A. LUNDÉN, Z. Naturforsch. **17 a**, 550 [1962].

[3] S. GUSTAFSSON, Z. Naturforsch. **18 a**, 949 [1963]; **21 a**, 842 [1966].

[4] A. LUNDÉN, Z. Naturforsch. **24 a**, 1673 [1969].

[5] cf. V. BACKLUND, J. DUPUY, S. GUSTAFSSON, and A. LUNDÉN, Z. Naturforsch. **22 a**, 471 [1967].

between these two methods of evaluation was made; see below.

Regarding potassium thiosulfate, information is scarce and also contradictory in the literature on the thermal stability of the melt. The melting point is reported to lay between 161 and 179 °C[6]. In our first experiments (12 cells) we tried to have an upper temperature of about 280 °C, but it was evident that the salt decomposed partly. This did not seem to be the case when the temperature was kept below 250 °C for the next series of six cells. Samples from all 18 cells were analysed. For the first 12 ones there is some doubt whether an isotope separation can be detected. Such a result is expected if there is some stirring of the melt due to evolving gas bubbles. On the other hand the 6 cells which were run at a somewhat lower temperature gave a significant isotope separation, see Table 1.

Salt	Number of cells	Temperature top °C	Temperature bottom °C	Duration hours	Soret coefficient $\sigma \cdot 10^5$ degr.$^{-1}$	Heat of transport Q^* cal/equiv.
KCl	4	993	805	280	2.86 ± 0.80	78 ± 22
KBr	3 [a]	966	755	167.5	1.79 ± 0.31	46 ± 8
RbCl	4	948	739	282.5	3.70 ± 0.81	92 ± 20
RbBr	4	917	735	227	2.04 ± 0.51	49 ± 12
KSCN	6	246	188	324	10.8 ± 2.7	52 ± 13

[a] The results for a fourth cell differed significantly from the others.

Table 1. Isotope effect for $^{39}K-^{41}K$ and $^{85}Rb-^{87}Rb$. The quoted errors are the standard deviation of the mean. The distance between the hot and cold plates of the furnace was 4 cm for the halides and 3.5 cm for KSCN.

For each of these cells six samples were analysed, and a regression analysis was made for all six ones as well as for all samples but the end ones. It turned out that the temperature coefficient became significantly less in the latter case. We take this as an indication that some mixing occurred in part of the cell during solidification, and that it should be more reliable to base the evaluation of the experiments only on the top and bottom samples, which we thus have done for KSCN as well as for the four halides[7].

Just as in previous investigations the light isotope was enriched in the top part of the cell. The experimental data and results are summarized in Table 1, where both the Soret coefficients (σ) and heats of transport (Q^*) are given. It is to be noticed that Q^* is larger for the chlorides than for the bromides (or the thiocyanate), and that it appears to be about the same for the separation of ^{39}K from ^{41}K as for ^{85}Rb from ^{87}Rb. The latter observation is surprising since the relative difference in mass ($\Delta m/m$) is 0.050 for the potassium isotopes but 0.023 for the rubidium isotopes. These observed tendencies are completely different from what is established for electromigration in molten salts[8], and it seems as if there are essential differences between the mechanisms of electro- and thermal transport. A more complete discussion will be given when some more experiments have been evaluated completely.

Acknowledgements

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[6] GMELINS Handbuch der Anorg. Chem. **22**, 898 (8th Ed., Verlag Chemie, Berlin 1938).

[7] For the experiments with molten sulfate mixtures[4] the reported results are based on the analysis of samples from the whole column. Recalculations using only the bottom and top samples give agreement within the quoted statistical errors, and there is no evidence that mixing during solidification disturbed the sulfate experiments.

[8] See e. g. A. LUNDÉN and A. EKHED, Z. Naturforsch. **24 a**, 892 [1969].

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