

study any divisible semigroup, we need consider all congruences of  $\bar{R} = \prod_{\alpha} R_{\alpha}$ . For this purpose the following general result is used: A congruence of a commutative cancellative semigroup  $S$  is determined by a system of ideals of  $S$  and a system of subgroups of the quotient group of  $S$ .

#### REFERENCES

1. L. Fuchs, *Abelian groups*, Publishing House of the Hungarian Academy of Sciences, Budapest, 1958.
2. V. R. Hancock, *Commutative Schreier extensions of semi-groups*, Dissertation, Tulane University of Louisiana, New Orleans, La., 1960.
3. L. Ya. Kulikov, *On the theory of Abelian groups of arbitrary power*, Mat. Sb. (N.S.) **16**(58) (1945), 129–162. (Russian)
4. T. Tamura and D. G. Burnell, *A note on the extension of semigroups with operators*, Proc. Japan Acad. **38** (1962), 495–498.
5. ———, *Extension of groupoids with operators* (to appear).
6. T. Tamura, *Commutative divisible semigroups* (to appear).

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## ALMOST LOCALLY FLAT EMBEDDINGS OF $S^{n-1}$ IN $S^n$

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**1. Introduction.** In this paper we use the terminology introduced by Brown in [2]. We consider an  $(n-1)$ -sphere  $S$  embedded in  $S^n$  and try to determine if the components of  $S^n - S$  have closures that are  $n$ -cells (i.e. if  $S$  is flat). Brown has shown that if  $S$  is locally flat at each of its points, then  $S$  is bi-collared [2]. Hence, in this case,  $S$  is flat. The principal result of this paper is that if  $S$  is not flat in  $S^n$ ,  $n > 3$ , and  $E$  is the set of points at which  $S$  fails to be locally flat, then  $E$  contains more than one point. This is a fundamental point at which the embedding problems for  $n > 3$  differ from those for  $n = 3$ . Throughout this paper we will assume that  $n > 3$ .

**2. Outline of proof of principal result.** By combining Theorem 1 of [2] and Theorem 2 of [1] one can establish the following.

**LEMMA 1.** *Let  $S$  be an  $(n-1)$ -sphere in  $S^n$  and  $G$  a component of  $S^n - S$ . If  $S$  is locally collared in  $\text{Cl } G$ , then  $S$  is collared in  $\text{Cl } G$  and  $\text{Cl } G$  is an  $n$ -cell.*