PROBLEM SESSION

J. Berman : Let $F_S(n)$ denote the free join semilattice on n free generators. It is known that $F_S(n)$ is isomorphic to the set of all nonvoid subsets of $\{1, 2, \ldots, n\}$ with the operation of union. By the result of Freese & Nation it is known that $Con(F_S(n))$ satisfies no lattice identities.

Problem: Determine or estimate the size of $Con(F_S(n))$. The motivation for this question comes from the theory of relational databases, since there is a one-one-correspondence between congruences θ on $F_S(n)$ and closed sets of functional dependencies in a relational database with n attributes.

R. Wille : A lattice L is order-polynomially-complete iff every order preserving n-ary operation on L is a polynomial-function on L.

Problem: Is every order-polynomially-complete lattice finite?

R. Freese : It can be effectively decided whether a word ω in a finitely presented lattice has a lower cover.

Problem: Is there an algorithm doing this in polynomial time?

R. Wille : **Problem:** For which partial lattices P is the free lattice FL(P) generated by P finite?

Solutions: Jezek & Slavik for semilattices.
Wille for partially ordered sets.

G. Lallement: **Theorem:** For any word $w \in \{a, b\}^*$ the word problem for the semigroup $<a, b; a=bwa>$ is decidable. (Oganesyan 1987)

Problem 1: Is there a reasonable algorithm for this?

Problem 2: Is the word problem for $<A; u=v>$ decidable, where $u, v \in A^*$?

(for further references, see Semigroups, Theory and Applications, Lecture Notes in Mathematics 1320, p.176-182, Springer-Verlag).

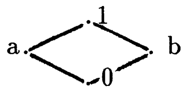
P. Higgins: Let $A=(a_{ij})$ be a real matrix such that $\forall i,j\ a_{i,j} > 0$ and $\forall\ x \neq 0$ $xAx^T > 0$.

Problem: Is $A^{(k)} := (a_{ij}^k)$ positive definite as well?

True if k is a positive integer or if $k \geq B$, for some number B which depends on A. It is also true if the order of A is less than four.

This problem came from Dr. Alan Russel of the University of Melbourne.

I. Loureiro: De Morgan algebras are generated by the four-element lattice



with the negation $\sim$:

x	$\sim$x
0	1
a	a
b	b
1	0 .

Considering the unary operation ∇ on De Morgan algebras, that satisfies:

A_5) $\sim x \vee \nabla x = 1$
A_6) $\sim x \wedge x = \sim x \wedge \nabla x$,

we obtain a variety that coincides with congruence permutable De Morgan algebras (see papers from I. Loureiro and from M. Adams).

Problem: Is it possible to define a unary operation ∇ on MS-algebras (see papers from J. Varlet and from T. Blyth) such that we have a generalization of the last result?

R. Wille: **Problem:** How many "essentially different" diagrams of B_n exist with n slopes ?

Example: For B_3 there exist exactly two:

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