IODINE-125
Protein Iodination Grade

Iodine-125
In 0.1 to 0.5ml of ~0.1M NaOH solution
Carrier-free (~17Ci/mg)
>99% radionuclidic purity (<0.01% ^{126}I)
NEZ-033 $33/0.5-2mCi $50/5mCi
$77/10mCi $110/20mCi $127/25mCi

Iodine-125 High Concentration
In ~0.1M NaOH solution
>350mCi/ml at highest concentration
Carrier-free (~17Ci/mg)
>99% radionuclidic purity (<0.01% ^{126}I)
NEZ-033H $33/1-2mCi $50/5mCi
$77/10mCi $110/20mCi $127/25mCi

Iodine-125 Low pH
In pH 8-10 aqueous solution
>350mCi/ml at highest concentration
Carrier-free (~17Ci/mg)
>99% radionuclidic purity (<0.01% ^{126}I)
NEZ-033L $33/1-2mCi $50/5mCi
$77/10mCi $110/20mCi $127/25mCi

IODINE-131
Protein Iodination Grade

Iodine-131
In 0.1 to 0.5ml of ~0.1M NaOH solution
12-25Ci/mg
>99% radionuclidic purity
NEZ-035A $33/0.5-2mCi $44/5mCi
$51/10mCi $57/20mCi $62/25mCi

Iodine-131 High Concentration
In ~0.1M NaOH solution
500-750mCi/ml at highest concentration
>99% radionuclidic purity
NEZ-035H $33/1-2mCi $44/5mCi
$51/10mCi $57/20mCi $62/25mCi

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Facile Optimism

While I sympathize with the sentiments expressed by Philip H. Abelson in his editorial "Enough of pessimism" (9 Jan., p. 29), I cannot help feeling that uninformed optimism confronts us today with much more serious dangers than the pessimism which he deplores. In discussions of any of the serious problems which we are facing (exhaustions of resources, deterioration of the environment, and so forth) it is all too common to meet with the argument, "Oh well, man's ingenuity has always found an answer in the past, so it is to be expected that solutions to all of these problems will be found in the future." Such blind confidence tends to minimize the urgency of meeting emergencies which may arise before long-range solutions are found. This reinforces the unfortunate reluctance of politicians to give the public bad news and to ask for sacrifices which might be necessary if the seriousness of crises is to be investigated. What we need in place of the paralyzing pessimism described by Abelson is not the facile optimism of our advertising agencies but inspiring leaders who are not afraid to describe the dimensions of the dangers with which we must deal and who are willing to outline the manners in which they will be overcome, even if such programs call for unpopular measures.

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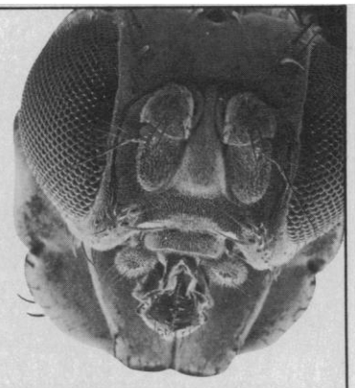
Unsolvable Problems in Mathematics

Most of mathematics can be formalized by means of systems of axiomatic set theory, such as that of Zermelo-Fraenkel (ZF), with specific axioms and rules of inference. Statements in the formalism of ZF set theory may be either "provable" (from its axioms, using only its allowed rules), "disprovable," or "undecidable" (neither provable nor disprovable).

It has been suggested by Lynn Steen (Research News, 18 July 1975, p. 209) that some famous unsettled conjectures, such as Fermat's last theorem, Goldbach's conjecture, and the four-coloring of planar maps, may fall into "the purgatory of perpetual undecidability." The axiom of choice and the continuum hypothesis are known to be undecidable in ZF set theory, provided that theory is consistent (no contradiction can be proved in it). It is indeed possible that some of the above three conjectures are also undecidable in ZF



multi-element trace analysis

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However, when you have an analysis—quantitative or qualitative—that calls for low concentration detection in a small sample mass such as this fruit fly, it's beyond the scope of ordinary X-ray energy spectrometers. Only a **high-intensity** system with a secondary target that emits pure mono-chromatic X-rays with low background can produce results such as shown here. And only KEVEX has a high-intensity (2,000 or 3,000 watt) XES system for trace analysis in the less than **100 parts-per-billion** range for many elements in organic matrices. That's why the man with the fruit fly came to us. It might pay you to do the same. Here's how to go about it:

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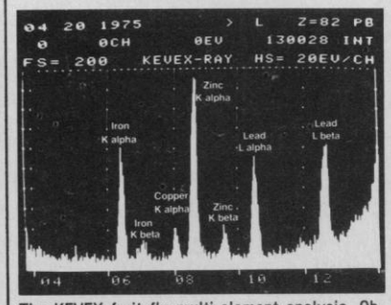

The KEVEX fruit fly multi-element analysis. Object: detect trace amounts of lead. Result: minimum detection for lead was found to be 5 nanograms. Also detected were iron, copper and zinc.

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set theory. But, unlike the axiom of choice and the continuum hypothesis, the three are all of a form such that, if they are not disprovable in ZF set theory, then they are true. To show that this is the case, one can consider the statement

For all $x_1, \ldots, x_m$, $P(x_1, \ldots, x_m)$ holds (1)

where the x_j are positive integer variables and for each fixed $x_1, \ldots, x_m$, the statement $P(x_1, \ldots, x_m)$ is decidable in ZF set theory. To say that statement (1) is false is equivalent to saying "There exist $x_1, \ldots, x_m$ such that $P(x_1, \ldots, x_m)$ fails" and so to "For some $x_1, \ldots, x_m$, $P(x_1, \ldots, x_m)$ is disprovable in ZF set theory" (the latter equivalence is "metamathematical," that is, expressed and proved outside of ZF set theory). Thus, to prove (outside of ZF set theory) that such conjectures are not disprovable in ZF set theory would be to prove them (*1*).

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References and Notes

1. I learned this point from B. Dreben at Harvard University in 1957; it is presumably common knowledge among mathematical logicians.

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Altruism in Mountain Bluebirds?

Harry W. Power (Report, 11 July 1975, p. 142) claims to provide evidence against the existence of altruistic behavior in mountain bluebirds because new males that formed consort relations with widowed parents did not provide either defense or food for the adopted offspring.

I am in full agreement with Power's general views on the evolution of social behavior. Cases of apparent altruism are rare in animal societies and, when examined in detail, usually prove more explainable in terms of kin selection or reciprocal altruism with a time lag than in terms of true altruism. But I feel that ultimate and proximate controlling factors are confused in Power's study, and the results do not actually represent a "test" for the existence of altruistic behavior.

Studies in which breeding birds have been removed from their territories and the occurrence of replacements recorded have been common in ornithology for 25 years (*1*). Such studies frequently have shown that a nonbreeding surplus of individuals, especially males, exists and that these birds are capable of moving into vacated territories. The new slant added by Power is an examination of the degree of parental investment provided by these new consort birds to the offspring of their new mates. In his words, "One way to measure the frequency of true altruism is to give animals the choice of behaving altruistically or selfishly." This logic is sound *provided* that one basic assumption is met: the animal in question must really have a "choice"—it must be equally able to provide parental care or to withhold it.

Intensive studies of the endocrine basis of reproductive behavior in birds have shown a tight interrelationship between parental behavior and hormonal state (*2*). As an individual bird progresses through a breeding cycle, from initial courting through nest-building activities and egg laying to incubation and feeding young, its hormonal state changes sequentially. Visual, auditory, and tactile information available during any one particular phase of the breeding cycle helps produce changes in the underlying hormonal condition of the bird; these hormonal changes, in turn, alter the bird's responsiveness and receptivity to various cues in the nest environment. Thus a bird feeding nestlings has attained a certain physiological state, and passage through the earlier stages of the breeding cycle has played a significant role in leading to the attainment of this state. Individual birds that are not in a comparable hormonal condition would not be expected to provide parental care for nestlings, regardless of genetic relationships. The plasticity of parental behavior has definite limits. In the few studies where nest contents have been experimentally altered [by presenting young prematurely or by exchanging young of various ages for eggs or vice versa (*3*)], results have generally shown: (i) young are often, but by no means always, accepted when presented to mated pairs that have progressed to the incubation phase, and especially the late incubation phase, of the normal breeding cycle; but (ii) young are ignored or attacked if presented either to unmated adults or to pairs that have not advanced through the nest-building or egg-laying stages of breeding.

In interpreting Power's results, we must ask the following. If a parent mountain blubird is collected and a surplus, nonbreeding, bird moves into the vacant territory, would this new bird be expected to be in the appropriate physiological condition to assume a parental role? Since the new consort has not been a territory holder, has not mated, nor has it engaged in any of the previous phases of the nesting cycle, I would say no. Thus the "test" for altruism in this study does not represent a real choice. The maximum "altruistic" response that could be expected would be for the new consort bird to experience an accelerated physiological adjustment so that it