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North American Pleistocene cheetah Acinonyx trumani. Reconstruction based on the living cheetah, Acinonyx jubatus, and skeletons of A. trumani from Natural Trap Cave, Wyoming. See page 1155. [Drawing by Dawn A. Adams]
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Education for the 21st Century

Education stands out as the best basis for hope that this country and
 others will somehow manage to avoid enormous trauma during the transi-
tions that lie ahead. But are young people being well counseled in prepara-
tion for the 21st century? What will be the shape of the future and the corre-
sponding demands for trained people?

We have lived in an era of conspicuous consumption, rising expecta-
tions, and exponential growth. We have entered a period of uncertainty, conflicts
in value systems, and possible decline in living standards. We face the ne-
cessity of creating an economy based on less oil, less energy, and changed
raw materials. Society will not and cannot return to the Stone Age or even to
a universal simple agrarian existence. It will not abandon knowledge nor
the ability to harness it. There will be no shortage of people ready to tell the
politicians what should be done. There will be no shortage of instant solu-
tions. But there may be a shortage of trained people capable of meeting
society's physical needs.

In many ways the educational system is excellent, but in at least one
respect it can be faulted. Its overall performance in counseling the young
has been mediocre. Universities have practiced a policy of conducting an
intellectual smorgasbord.

Since the students have not received adequate guidance from the educa-
tional institutions, their decisions have been based on other sources of infor-
mation, notably the media. In the past this has resulted in some tragic wastes
of talent. The hoopla of the "space age" led to career decisions that brought
later disappointments. A lesser example was a vogue in oceanography. Cur-
rently it is fashionable to attempt to go to medical school. The pressures are
easy somewhat but an enormous wastage continues. Stories appearing in
the media can now attenuate the flow. A notable example a decade ago was
the impact of a few stories about engineers driving taxicabs. Only now have
enrollments in engineering recovered from the slump.

A basic problem in providing career guidance is that no one knows pre-
cisely what will be needed decades hence. In addition, at the universities
and campuses politics gets in the way. At a time of budget squeezes and of depart-
mental support based on enrollments, the fight for survival makes it difficult
for faculty to be objective in advice. Another problem is that neither indi-
vidual students nor their potential counselors can accurately gauge apti-
tudes, talents, drive, and judgment at the time of entry into the university.
Few students are aware of their own potentials or are in command of them-
selfs. An additional complication for potential scientists and engineers is
that many curricular decisions are, in practice, irreversible. Basic courses
in mathematics, chemistry, and physics must be taken in a timely fashion or
options are foreclosed.

Whatever the changing shape of society, scientists and engineers will
have essential roles. The uncertainties, though, make it advisable to caution
against excessive specialization. In contrast, it seems desirable to adopt
policies of maximum flexibility, of preservation of options, of being able
to pursue lifelong learning.

For those who are capable of handling mathematics and abstract reason-
ing, this means building the necessary foundation in mathematics, chemis-
try, physics, and engineering design as well as obtaining adequate compe-
tence in verbal and written communications. Those with the necessary apti-
tudes should also be exposed to biology, earth sciences, behavioral sci-
ences, and the humanities.

One cannot insist that students with no aptitude for the hard sciences take
the fundamental courses, but it is difficult to visualize how they could be
comfortable in the world of tomorrow without some inkling of the forces
shaping their lives.

For their part, the universities should have a searching look at their coun-
seling policies. There must be better ways than entrusting young lives to a
hit-or-miss system.—PHILIP H. ABELESON