poses. American technicians may have the right of access to the machine at any time, with the right to take "core dumps,"—transcriptions on tape of the computer's memory content. The tapes are then analyzed by the National Security Agency. Although there are a few unresolved suspicions, in no case have the Russians ever been caught cheating.

The Sperry-Univac machine which Carter canceled on 16 July would have been used by the Soviet agency Tass to handle the requirements of the 1980 Olympic games. Even without White House intervention, it is not certain that the sale would have been approved either by the interagency committee or by COCOM. The application has been with

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Post-Apollo Astronauts Train for Shuttle

NASA has 35 new astronauts. The first new class selected in 11 years began training on 1 July at the Johnson Space Center in Houston. They are expected to provide crews for the space shuttle, the aircraft-like sine qua non of NASA's manned program in the 1980's. The new hands join 27 active astronauts including veterans of Gemini, Apollo, and Skylab missions.

In this round of selections, NASA makes more points as an equal opportunity employer than it did in its earlier days. Six of the new astronauts are women, three are blacks, and one is a Japanese-American. Previous crops ran strongly to type—white males with either test-pilot or fighter-pilot backgrounds and a few "scientist-astronauts" with science Ph.D.'s and some flying experience. Women have not yet crashed the pilot-astronaut barrier; all six are "mission specialists," a new nonpilot breed of astronaut.

The new astronauts are divided between the categories. Fifteen will be pilot-astronauts whose duties will be much like those of their predecessors. Twenty are to be trained as mission specialists, who according to NASA's description will actually be a new category of generalists who "will have overall responsibility for the coordination, with the commander and pilot, of space shuttle operations in the areas of crew activity planning, consumables usage, and other space shuttle activities affecting experiment operation."

As with their predecessors, NASA could be highly selective in choosing the new astronauts. Those appointed were picked from among more than 8000 applicants and 208 finalists. The average age of the new group is the early 30's. The mission specialists, typically, have advanced degrees in technical fields; one woman is an M.D. The training program will be similar to that undergone by earlier groups of astronauts. All are in excellent health. But the physical training regimen is not expected to be quite as rigorous since the space shuttle is regarded as providing a somewhat more benign environment than earlier spacecraft.

The 35 face a 2-year program of intensive training. During the first 6 months about half of each working day will be devoted to classes in theory in subjects ranging from orbital mechanics to navigation and electronics. This will be combined with activities aimed at developing flight skills. The group will then move on to training focused on the space shuttle.

The new astronauts should finish their initial training in 1980 at about the time flight testing of the space shuttle is winding up. The first shuttle crews are expected to be drawn from the group of 27 experienced astronauts. When operational flights begin after the turn of the decade the basic shuttle crew will be two pilots and a mission specialist, with as many as seven in the crew for "big" missions. That is when those among the 35 who stick with the program are expected to get their chance.

Detour on the Road to Brave New World

The "test-tube baby" case, which recently went to trial in New York, has given new impetus to the discussion of the rules governing human experimentation.

The civil suit for $1.5 million against Columbia University, Columbia Presbyterian Hospital and its director of obstetrics and gynecology was filed in 1974 in behalf of a Florida couple. John Del Zio and his wife Doris claim they suffered "severe personal injury" when Dr. Raymond Vande Wiele of Columbia intervened in a planned effort by the Del Zios to have a child by "embryo transfer," a process by which a human egg is fertilized outside the body and implanted in a woman's uterus with the expectation that the pregnancy will then proceed normally. Ova were removed surgically from Mrs. Del Zio on 13 September 1973, mixed with sperm from her husband, and stored in a flask in an incubator. The next day Vande Wiele ordered the flask removed from the incubator.

Interest in the case has been heightened by the imminent prospect of the first recorded test-tube baby being born to a British housewife, Lesley Brown of Bristol. The Del Zios have been quoted as saying they had hoped to become the first parents of such a child.

Lawyers for the Del Zios have taken the line that Vande Wiele halted the procedure because of personal animosity toward one of the Del Zios' physicians, Landrum B. Shettles, a veteran of reproduction research who had been on the hospital staff for 27 years, but who retired subsequent to the 1973 incident.

Defense lawyers have questioned the scientific soundness of the methods employed in the case. They also argue that Vande Wiele stopped the procedure because approval had not been given by the committee formed to decide on questions of human experimentation in the hospital. Vande Wiele has also been reported as telling colleagues that National Institute of Health rules prohibited such research.

The official line on in vitro fertilization involving humans, which is the specific technique at issue, appears to be somewhat fuzzy. In 1973 when the incident took place, most major hospitals, including Columbia Presbyterian, had human experimentation review boards, but there was no formal Department of Health, Education, and Welfare (HEW)-NIH requirement that all such research proposals should be submitted to them. It was not until July 1974 that HEW rules requiring such reviews went into effect.

In recent years, NIH has been observing a moratorium on funding of in vitro fertilization studies, but there is no federal rule or law against experimentation with laboratory fertilization. In September, the HEW Secretary's Ethics Advisory Board is scheduled to consider whether or not the department should begin funding in vitro fertilization work on humans.

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the committee since the fall of 1977. A Sperry-Univac official says that the machine "would not have exceeded the present COCOM criteria" and that both Control Data Corporation and IBM have sold larger machines to the Soviet Union. But Carter, in a news conference on 21 July, stated that the machine "would have provided a quantum leap in computer capability, multiplying the speed of the computer I think 20 fold." The President also observed that the capability was "far in excess" of what Tass's stated purpose required.

The White House may have figured that if the sale was going to be nixed anyway, whether by the interagency committee or COCOM, there was nothing to

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Meanwhile, for reproduction researchers, the Del Zio case and the impending blessed event in Britain have brought the ethical and scientific questions surrounding such experimentation to the boil.

NRC Study Tracks Trends in Doctorates

A sort of summa of surveys of doctorates awarded in America has been published by the National Research Council. *A Century of Doctorates* is the seventh in a series of studies done since 1948 on recipients of doctorates and of the institutions which award them. The study actually covers a bit more than a century, because it begins with 1861, when Yale handed out the first doctorates in this country, and extends to 1974.

Since 1875 the number of Ph.D.'s has grown at an average annual rate of 7 percent, so that output has roughly doubled in every decade although fairly heavy fluctuations were caused by the two World Wars and the Depression. Figures for the 1970's show a leveling off at about 33,000 a year, so it appears that after a long run of exponential growth, the curve may be taking a new turn.

The survey includes not only Ph.D.'s but all "third level degrees." The single field in which the largest number of degrees has been awarded annually in recent years has been education—some 7219 in 1974. In the aggregate, a slightly larger number has been awarded in the cluster of disciplines grouped under the "EMP" heading (for engineering, mathematics, and physical sciences)—a total of 7928 in 1974. Doctorates in behavioral sciences numbered 6333 in 1974, in life sciences 5013, and in humanities 5078. Doctorates in professional fields (M.D.'s not included) amounted to 1486.

The survey's authors note that since 1940, the fields growing faster than the 7 percent average rate have been education (11 percent) and engineering and psychology (8 percent). They note that "these three fields have a large 'applied' component relative to that typical of the slower-growing fields." By contrast, since 1970, the proportion of Ph.D.'s in natural sciences has declined.

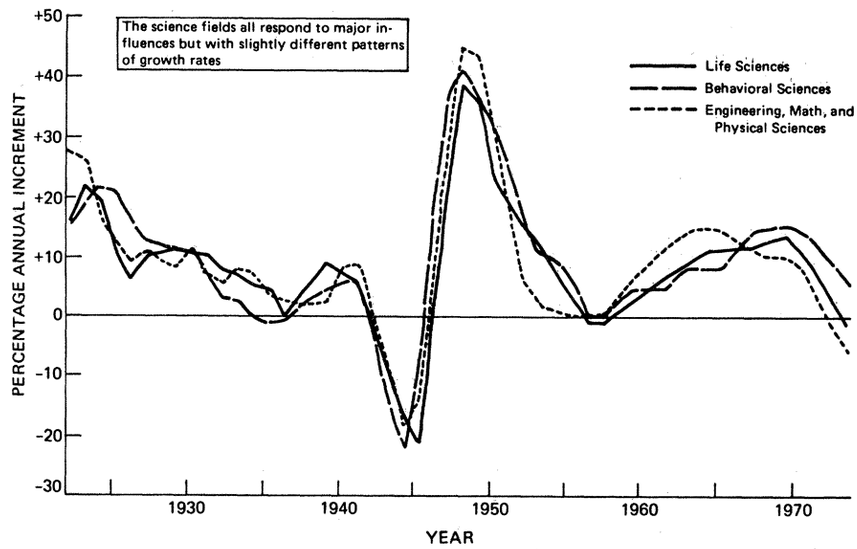
Not surprisingly, the number and percentage of degrees granted to women is shown to have increased rapidly in recent years. From under 10 percent in the years 1950–1954, when the backlog of male World War II veterans was jamming Ph.D. programs, the percentage of doctorates won by women rose to 12 percent in 1965–1969 and then soared from 13.9 to 20.5 percent in 1970–1974, and is still on the rise. Women apparently continue to be drastically underrepresented in EMP fields and dominant in education—the ratio of women to men receiving education doctorates is put at 6 to 1.

Longitudinal data on doctorates earned by members of racial minorities is limited since federal law prohibited racial designations in the keeping of statistics until recently. Available data do show that blacks are severely underrepresented among winners of doctorates except in education.

As for the institutions granting doctorates, their number increased steadily after World War II and their geographic spread became, relatively, much more even. From 107 institutions granting doctorates in the early 1940's the number rose to 208 in the early 1960's and continued to rise. The hegemony of the Northeast was challenged first by Midwestern universities, then by institutions on the Pacific Coast and in the Rocky Mountain states. These in turn have been almost overtaken by institutions in the South.

Hints of shifts in the general economy and in the academic marketplace are found in data showing an upswing of employment of new science Ph.D.'s in business and industry. Through the 1960's the trend of such employment was downward but since the early 1970's there has been a reversal, most sharply it seems for Ph.D.'s in engineering, chemistry, and physics.

The survey cuts off in 1974, so while it hints at the trends associated with energy problems, inflation, and the demographic downturn, it does not fully suggest the traumas in store for Ph.D.'s. The subtitle of *A Century of Doctorates* is Data Analyses of Growth and Change. The next study in the series may well show less growth and more change.



Growth increments in doctorates granted in three science fields. [Source: National Research Council, Commission on Human Resources]

John Walsh