SCIENCE 27 December 1974

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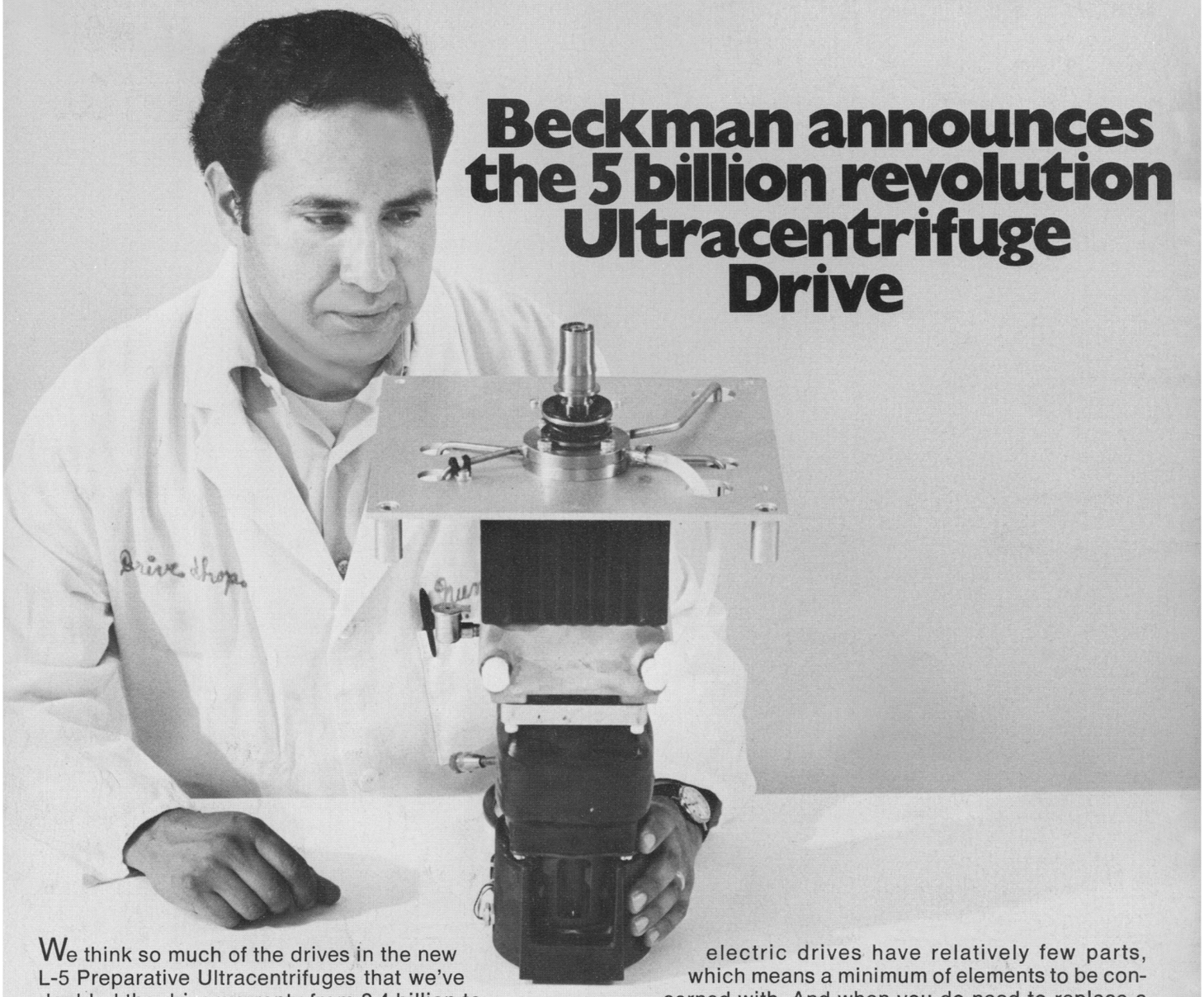
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Beckman announces the 5 billion revolution Ultracentrifuge Drive



We think so much of the drives in the new L-5 Preparative Ultracentrifuges that we've doubled the drive warranty from 2.4 billion to 5 billion revolutions. If the drive doesn't last that long, all you pay for are the revolutions used, and at a cost much less than under the previous warranty.

All L-5 electric drives are now d.c. driven to provide the high torque necessary to get rotors rapidly to speed. For example, the L5-75 accelerates a titanium rotor to 75,000 rpm in just 11 minutes, compared to 19 minutes for the earlier Model L2-75B.

Both L5-65 and L5-75 drives have a new system (patent pending) which collects and reuses oil that would normally be consumed. This system compensates for normal wear and significantly extends drive life. The long-lasting drives in the Models L5-40 and L5-50 are permanently lubricated.

All four Model L-5's now feature a rotor imbalance detector which automatically shuts off the drive if a rotor is significantly out of balance, further protecting the drive system, the rotor, and the ultracentrifuge itself.

Beckman drives bring you more than just long life. When the total drive system is considered, Beckman electric drives have relatively few parts, which means a minimum of elements to be concerned with. And when you do need to replace a Beckman drive, your replacement is not just a portion of the drive, but a complete drive system with a new 5-billion revolution warranty.

In terms of energy requirements, the Beckman electric drives are highly efficient and consume comparatively little power. They have an efficient braking system to bring rotors rapidly and smoothly to rest. And they are so quiet that you can hardly hear an L-5 running.

Superior drives are only one of the reasons to choose a Beckman L-5 Preparative Ultracentrifuge. For the full story of the L-5's, send for Brochure SB-400 to Beckman Instruments, Inc. Spinco Division, 1117 California Avenue, Palo Alto, California 94304.

Beckman

New products

27 December 1974

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Engraving of the Argentierre Glacier (French Alps) made about 1850–1860 showing its front still close to the plain and the village. See page 1163. [From Emmanuel LeRoy Ladurie, *Times of Feast, Times of Famine*, Copyright © and published by Doubleday & Company, Inc., 1971. Translated by Barbara Bray]

Western Electric Reports:

An inside look at crystal growth.

Engineers at Western Electric's Engineering Research Center have developed an improved method for controlling the growth of the crystals used in light emitting diodes (LED's). The new technique represents one more step toward low-cost, mass produced LED's.

LED's have found many uses in telecommunications equipment as illuminators, indicator lamps and numeric displays. They consume very little power and last from 10 to 100 times longer than the devices they replace.

LED's used in the Bell System are made from gallium phosphide (GaP) single crystals. Economical processing using standard-sized fixtures requires crystals of uniform diameter. But because GaP single crystals must be grown inside a high pressure vessel, monitoring and controlling crystal growth has been a problem.

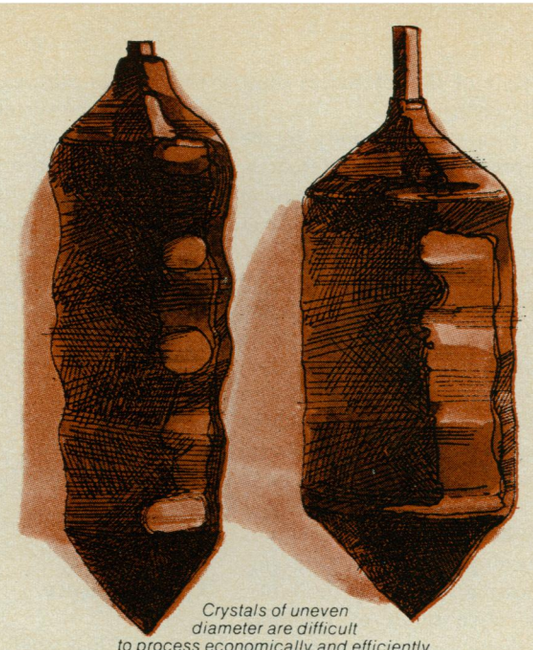
Previously, crystal growth could only be monitored visually. The halo surrounding the growing crystal was observed through closed circuit television. Since the halo would expand and contract with the diameter of the growing crystal, it provided some measure of control. But phosphorous vapors condensing on the viewing window partly obscured the halo, making precise control difficult.

The new monitoring technique is similar to the use of a fluoroscope in medicine. X-ray imaging provides an unobstructed view of the meniscus formed where the solid crystal meets the liquid melt. Western Electric engineers have correlated the height and angle of this meniscus to the crystal's growth condition. This is useful because a change in the shape of the meniscus signals a change in the temperature of the melt *before* it is manifested as a change in the crystal's diameter.

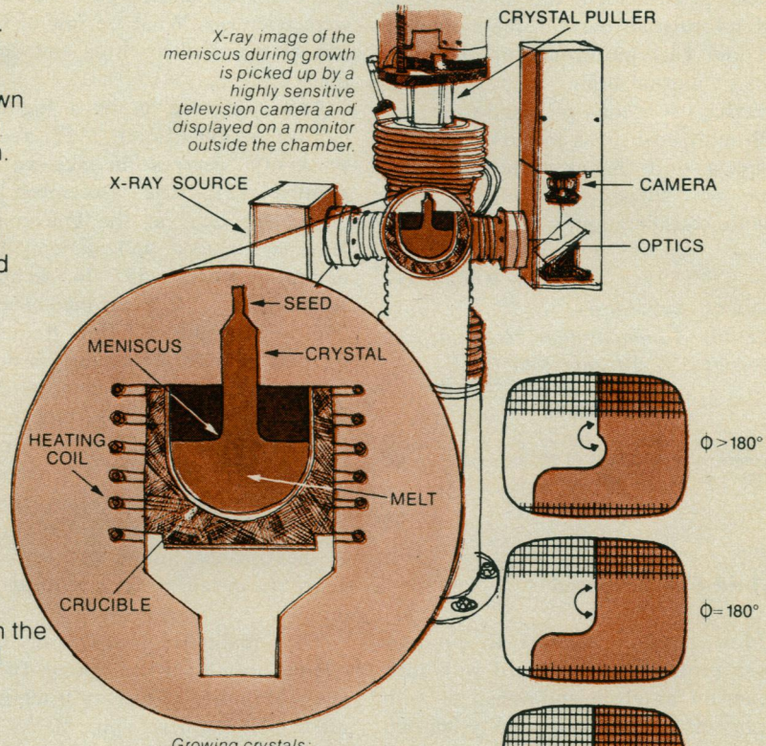
A change of just 4° in the liquid-solid contact angle can be observed, allowing adjustments to be made in either temperature or pulling rate to maintain uniform growth.

X-ray imaging is in production use at Western Electric's plant in Reading, Penn.

Benefit: X-ray imaging of the meniscus of a growing crystal has permitted a marked improvement in the monitoring and control of crystal growth. It helps insure high yields of uniform diameter crystal wafers for processing into LED's.

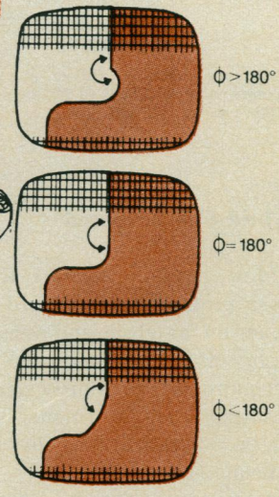


Crystals of uneven diameter are difficult to process economically and efficiently. X-ray imaging now yields crystals of a diameter within a tolerance of ±1/16 inch.



X-ray image of the meniscus during growth is picked up by a highly sensitive television camera and displayed on a monitor outside the chamber.

Growing crystals: seed is dipped into crucible of molten GaP, maintained just above melting temperature. It is rotated and withdrawn at controlled rate, producing cylindrical crystal.



THE LIQUID-SOLID CONTACT ANGLES

X-ray image of the meniscus at various temperatures. The smaller the angle, the lower the temperature. The larger the angle, the higher the temperature. An angle of 180° indicates the desired "steady state" growth condition.

Western Electric

We make things that bring people closer.

27 December 1974, Volume 186, Number 4170 **SCIENCE**

A Sense of the History of Discovery

Far too many physicians and scientists, as well as laymen, look upon the history of discovery as an entertaining pastime, a tiresome academic exercise, or merely the record of egotistical aspirations. But it is essential to understand the successes and failures of others. Take three well-known examples of success.

Alexander Fleming made probably the most important medical discovery of the century, through a combination of almost ludicrous circumstances. He was favored by fortune in have a mycologist working on *Penicillium notatum* on the floor above his laboratory. Fleming's laboratory was primitive, and outside air circulated in a way that only a rugged Scotsman would tolerate. Furthermore, he failed to wash his petri dishes before he went on vacation. Using common sense, Fleming followed up on an observation that many had made before him. He looked at the petri dishes when he returned from vacation and did something about what he saw. Had Fleming been an active committee attender, with plenty of dishwashers and technicians, it is unlikely he would ever have noted the clear zone around the bacterial colony, because a dutiful technician would long since have destroyed the evidence even if it had been allowed to develop.

A second example—the discovery of liver extract for the treatment of pernicious anemia resulted from work by Whipple, Minot, and Murphy. The pathologist Whipple was trying to determine the hematopoietic efficiency of diets. The clinician Minot was broadly enough read not only to know of Whipple's basic work, but to see its applicability. This led to its clinical use by Murphy, and the award of three Nobel prizes.

The discovery of insulin by Banting and Best tells another story. Even though it had been conclusively shown that the pancreas was crucially involved in diabetes, none of the major research centers did much about it. It took a young unknown surgeon with avid curiosity and an equally eager young medical student to do what should long since have been done. Note that government grants and major planning committees representing consumers, economists, sociologists, *et al.* played no part.

Today many investigators fail to appreciate that knowledge of the history of discovery is vital if wise policies are to be generated. Instead the young are being taught, by example, that status and celebrity-seeking promote their careers. Serving on important committees, belonging to the right societies, associating with the right people, and seeking discreet but maximum public exposure pay handsomely—if this is the way of life that is sought.

Government, with the power of money at its disposal, plays a critical part. The power-oriented among us find it easy to accept the hegemony of government over practice and research, forgetting that a sense of the history of discovery is almost wholly absent in those making policy. Are such important decisions to be left in the hands of those so innocent?

I am certain that the conduct of research will ultimately triumph over the business and politics of discovery. I am less certain about the practice of medicine, to the politically powerful a much larger plum. It is especially difficult to disentangle those practicing medicine in the broad sense from those who would control it but without experience to guide them.

Perhaps the most we have the right to expect is that some people may heed a twinge of conscience. But the issue is now clear: if greatness is a goal, it will take great thinking and consummate honesty to achieve it. History has shown us and formulated the guidelines.—IRVING H. PAGE, *former Director, Research Division, Cleveland Clinic, Cleveland, Ohio 44106*

among those executed). Mengistu Haile Mariam, the man who seems to be running the show now, is only 32 years old and was an ordnance officer who had received training at the command general staff college at Fort Leavenworth.

It is particularly dangerous to make generalizations about political factions in Ethiopia, because there politics are carried on at a very personal level, are fraught with intrigue, and allegiances can change overnight. A State Department official characterizes the Dergue as a "nationalist" bunch whose actions were propelled not so much by self-interest as by genuine desire to improve the lot of the Ethiopian people. It appears that there are Marxist and Maoist elements in the cadre now in control. There is talk of nationalizing land, and the group has kept the university closed with the idea of sending faculty and students out into the countryside in order to educate the masses.

According to British journalist Colin Legum, longtime African specialist, the most immediate dangers now are either civil war between a combine of Tigrean and Eritrean provinces and the rest of the country, intensification of war with Eritrea, or outside intervention which would magnify existing conflicts. There is also the possibility that Ethiopia, whose main unifying concept has been allegiance to the emperor, could degenerate into a mass of feuding tribes.

At this point it appears that the United States intends to continue its various programs of military and economic assistance wherever possible, although this may be made difficult by the fact the United States doesn't know who it's supposed to be dealing with.

If a stable and reasonably unreactionary government could be established, there appears to be considerable hope for Ethiopia. Unlike a nation such as Bangladesh, whose only resources are jute and teeming humanity, Ethiopia has an abundance of good agricultural land—the red volcanic soil of East Africa, much of which is in Ethiopia's southwestern lowlands and can be brought under cultivation as the anti-malaria campaign permits more people to move in. It is a major wheat producer in East Africa, and is hospitable to two strains of sorghum that researchers at Purdue University (see *Science,* 12 October 1973) have found to be rich in lysine, necessary to build protein. There are plans (now up in the air) for a major internationally supported agriculture research center devoted to livestock research. The nation has abundant potential for hydroelectric power, and geothermal potential is also likely. The mining of potash (for fertilizer) is on the increase, and Eritrea, with the help of the Japanese, is looking into some promising copper deposits. In addition, Tenneco thinks it has found natural gas and possibly petroleum deposits in southern Harrar province (it is, unfortunately, on terrain disputed by the Somalis). Thus, there appears to be potential for some modest attempts at industrialization.

Last spring no one seemed overly worried by a coup considered inevitable and necessary if the country was to proceed beyond the limited reforms permitted by the emperor. Now it is generally believed that the hotheads have the upper hand. It is hoped that the international protest against the executions will forestall further bloodbaths.

The extent to which U.S. participation in Ethiopian affairs shaped the current situation is impossible to determine. Certainly the United States has had an effect both on the muscle and the thinking of the military. And in large part through the Peace Corps, which in its heyday had some 900 volunteers in Ethiopia, the availability of secondary education has been significantly expanded. Aid from the United States, along with that of other nations, particularly the British (who formed the model for the Harrar Military Academy), the French, and the Swedes, has undoubtedly hastened the day when confrontation between the old and the new came about.

Knowledgeable observers have been surprised at how little the general population has reacted to the deposing of the emperor, although speculation is that they are too demoralized to care. The emperor became a figure on the world stage in 1936 with his famous plea to the League of Nations for help in liberating the country from the Mussolini government. He has remained an international figure ever since, although in recent years he probably more closely resembled those ancient monarchs who were mummified and wheeled through the streets to show the people that the ruler still survived. Now his power is gone, and it is his country that after decades of obscurity has wrestled its way to the world's attention.—CONSTANCE HOLDEN

The author has lived and worked in Ethiopia.