

12-9-97

THE PRESIDENT HAS BEEN
12-8-97

(1) Ann Lewis note on *Shalom Haver* Exhibit in D.C. -- "If you did not already know about this exhibit, named after your farewell to Yitzhak Rabin, I thought you should see this brochure."

We have also received the following item:

Mathews/Audrey Haynes Memo on Mexico City Policy and Global Gag Rule -- Sylvia and Audrey attach a collection of clips, press releases, and letters that show strong support for the Administration's stance on Mexico City Policy and the Global Gag Rule since November 1, 1997.

Collection of Letters and Speeches from Amb. Donald Blinken -- "Vera and I were privileged to serve you in Budapest. We would like you to know what we are most proud of having accomplished." *We have the material in our office if you would like to see it.*

DAN BURKHARDT:

please coordinate the reply.

Chron



Donald Blinken
Ambassador of the United States of America

November 20, 1997

'97 DEC 3 PM 4:31

Copied
Original to Burkhardt
for Reply
Ces

The Honorable
President Bill Clinton
The White House

Dear Mr. President:

Vera and I were privileged to serve
you in Budapest. We would like you to
know what we are most proud of having
accomplished.

Sincerely,

Donald Blinken
Ambassador

DAN BURKHARDT:

please coordinate the
reply.

Matt
Question
12-8-97

Donald Blinken

Articles

Speeches

INTERVIEWS

1978 – 1997

Donald Blinken

Articles
Speeches
INTERVIEWS

1978 - 1997

TO PRESIDENT BILL CLINTON
WITH PROFOUND ADMIRATION
AND RESPECT.

DONALD BLINKEN
BUDAPEST, NOV. 1997

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**ENLARGING NATO:
SOME UNFINISHED
BUSINESS**

**BY
AMBASSADOR
DONALD BLINKEN**

Closing speech delivered during the conference
"NATO Enlargement, Reforms of the European
Union, and the Central European Region" at the
Central European University, Budapest, Hungary

September 13, 1997.

AMERICAN EMBASSY BUDAPEST

GOALS AND ACCOMPLISHMENTS AND RESIDENCE IMPROVEMENTS

1994-1997

Embassy Budapest 1994-1997

Goals and Accomplishments

Ambassador Donald Blinken

Embassy Budapest's goals for the past four years have consistently emphasized several themes. On the bilateral side, our primary goals included: helping Hungary prepare for entering NATO; strengthening Hungary's transition to a free market economy; integrating Hungary into Western institutions; helping Hungary develop its justice and law enforcement capabilities aimed at strengthening democratic institutions; and helping the average citizen understand and share in the democratic process. The major accomplishments of the political, economic, defense attache, USAID, EST, USCS, and USIS sections or agencies describe our success in meeting these mission goals.

Internally, the Embassy was determined to shed its Cold War appearance and outlook, consolidate and modernize its facilities, break down barriers among and between departments and sections, and provide improved services for both Embassy personnel and Embassy clients. The accomplishments of the Administrative and Consular Sections highlight the success of our efforts in these administrative and interpersonal activities.

At the same time, we were determined to turn the Ambassador's Residence into a cheerful and attractive home, making the best possible impression upon our many Hungarian and American guests. In the accompanying memorandum, Mrs. Blinken lists the many improvements made to the interior and grounds.

Political

NATO

Utilizing "Perry points" as benchmarks for NATO eligibility, the Political Section counseled the Parliamentary Defense Committee on civilian control of the military; supported the Ambassador in motivating the GOH to conclude basic treaties with Romania and Slovakia; conceived and concluded the "Omnibus Agreement on Tax and Legal Treatment for U.S. Forces Stationed in Hungary", leveraging prospective NATO eligibility to develop a document which would be valid not only for SFOR but in future for NATO; organized the agenda for semi-annual NATO Enlargement Task Force meetings with Hungarian counterparts.

Jewish Restitution

The Political Section worked closely with the GOH, the Hungarian Jewish Community, the WJRO, and Ambassador Eizenstat on supporting negotiations which led to Parliamentary action establishing the "Hungarian Jewish Heritage Public Foundation." The Foundation, which is the first of its kind in former Communist Europe, will begin in September 1997 to provide modest pensions to Holocaust survivors. The Embassy served as the catalyst in bringing all the parties at issue to a workable solution.

International Law Enforcement Agency

The Political Section coordinated the negotiations leading to the establishment of the ILEA. Since its founding in 1995, the FBI-managed Academy has provided five eight-week training sessions annually for ten Central European and NIS participating countries. The Political Section also coordinates U.S. Government-sponsored courses outside the normal ILEA curriculum. For example, in human dignity training for Hungarian police and customs officials.

Economic

Coordinating U.S.-Hungarian Macro-Economic Assistance

The Economic Section, working closely with the USTR, the Treasury, and the Department of State, as well as with the USOECD, early on defined Hungarian membership requirements for the OECD, identifying potential problems and assisting the Hungarians in policy adjustments leading to their OECD membership in 1996. Their entry came at a time when the GOH sought international recognition for their difficult economic reform efforts, which began in Spring 1995. These policies brought tangible benefits, including better credit ratings, an IMF Standby Agreement, and a dramatic turn around and improvement in Hungarian debt ratios, balance of payments, GDP growth, and massive privatization.

Trade Policies

The Economic Section lobbied the GOH on a wide variety of trade policy items, including WTO agricultural import subsidies, WTO telecom agreements, WTO financial services, civil aviation open skies, and WTO Information Technology Agreements. The principal achievement in these areas was a compromise agreement reached between the GOH and the WTO on agricultural subsidies outside of normal dispute settlement proceedings. The Economic Section was successful in explaining WTO, U.S. and GOH views and limitations to each of the other parties.

Financial Technical Assistance

The Economic Section worked closely with USAID, U.S. Treasury, and the USCS to facilitate and coordinate USG assistance efforts, particularly in telecom; banking and energy privatization; in pension reform; debt management; the creation of a national treasury; bank supervision; energy regulation; and, tax reform.

Military Assistance

Defense Attache Office

Embassy Budapest's Defense Attache Office has played the major role in the transition of the Hungarian Home Defense management structure from the old Warsaw Pact general staff to a U.S.-type joint staff. Currently, the Defense Attache is assisting the Home Defense Forces in establishing two service staff headquarters - Army and Air Defense. The Defense Attache Office has consistently worked to help the Hungarian military to achieve compatibility with NATO and U.S. doctrine through bilateral programs, joint contact team programs, and security assistance supporting IMET and conferences. The Defense Attache Office has successfully expanded U.S.-Hungarian bilateral relations through the establishment of the National Imagery and Mapping Agency, the Ohio National Guard State Partnership Program, legal, medical, environmental, civil defense, and defense resource programs.

ODC Defense Cooperation in Armaments

In 1995, the ODC mission oversaw a Data Exchange Agreement between the U.S.; in 1996, managed the signing of a ACSA Agreement between EUCOM and the MOD. And in 1997, the mission negotiated the Hungarian signing of a Letter of Offer and Acceptance for \$5 million to be used to complete the Air Sovereignty Operation Center under the Regional Air Space Initiative.

U.S. Military Liaison Team

The MLT program provided key assistance in three major Hungarian military modernization initiatives; the downsizing and restructuring of the MOD along Western-style lines compatible with NATO operations; the professionalism of Hungarian Defense Forces; emphasizing modernization of officer training programs, creation of a professional NCO Corps, additions of contracted professional soldiers, and the establishment of a NATO language training center. And the MLT program brought about a dramatic improvement in Hungarian capability as a prospective NATO member, featuring a document generation capability compatible with NATO modeled after the U.S. system.

USAREUR Liaison Team

The American Embassy USAREUR Liaison Team helped identify and negotiate the acquisition for U.S. Forces, the former Hungarian military facilities in Taszar, Kaposujlak, Kaposvar, and Tabor Falva to support the operations of the intermediate staging base in support of Operation Joint Endeavor. The team played a key role in planning and coordinating the deployment of U.S. IFOR Forces into Hungary. A key achievement was the joint effort of the team, the Political Section and the Ambassador, in gaining permission from the GOH for use of Hungarian bases in 72 hours - from request to Parliamentary approval. The Liaison Team played a major role in designing, negotiating and implementing the Omnibus Agreement between the U.S. and Hungarian Governments, in close collaboration with Embassy Budapest Political Section.

U.S. Military Assistance to Hungary and Economic Impact of U.S. Forces

Some sense of the breadth and depth of U.S. military assistance to Hungary during the past three years may be gained from the following summary table:

<u>Program</u>	<u>U.S. Contribution</u>
IMET	\$ 5,100,000
Foreign Military Financing (Warsaw Initiative)	\$12,700,000 thru FY97
PFP Initiatives	\$ 5,400,000
Humanitarian Assistance	\$ 341,000
Excess Defense Articles	\$ 1,200,000
MLT Programs	\$ 3,600,000
Defense Resource Management	\$ 600,000
Defense Mapping and Imagery	\$ 1,200,000
PFP Information Management	\$ 1,500,000
Command and Control Interoperability Study	\$ 600,000

Above and beyond these ongoing assistance programs, as of September 1997, the direct expenditures of U.S. SFOR operations in Hungary for goods and services totalled approximately \$212,000,000.

Commercial Section

Advocacy

Launched aggressive campaigns on behalf of U.S. business interests to win contracts and ensure ongoing business interests. The United States is the leading foreign investor in Hungary (approximately \$6 billion by mid-1997) with most major U.S. investors expanding and reinvesting over the period 1997-1997; bilateral trade levels over this period grew to over \$1 billion. CS actively intervened in the following major areas:

- Telecom (Motorola - \$100,000,000 equipment purchase).
- Finance (GE Capital's purchase of Budapest Bank).
- Automotive (Ford/GM/Alcoa concerns over corporate taxation).
- Energy (El Paso Energy - securing their license and forcing open competition in energy distribution/AES - up to \$500 million in investment).
- Medical Sector (Embassy was catalyst for multi-lateral action on discriminatory drug reimbursement system).
- Manufacturing (Ross Mould operations in Miskolc - \$10 million current investment with \$30 million in contracts).

Regional Initiatives

Promoted Hungary as a regional center for commercial activity through targeted programs and joint program with European/Central European posts.

- Initiated Ambassador's 1995 Trade & Investment Mission to London, Brussels, Frankfurt.
- Initiated PowerGen Exhibition & Trade Show in Budapest, Orlando and Madrid (1996).
- Provided publications on environment and energy - focused on Central Europe and the region.

New Commercial Service Facilities

Established CS Budapest in the leading financial/commercial complex in Hungary - Bank Center.

Established the joint USIS-CS information resource center to respond to business inquiries in a one-stop shop concept utilizing state-of-the-art information technologies/on-line business services, etc.

USAID

Hungary's Privatization Success and U.S. Assistance

Hungary is indisputably the region's leader in privatization progress. By mid-1997, cumulative direct foreign investment in Hungary exceeded \$16 billion and the percentage of GDP generated by the private sector was nearly 75%, compared to less than 30% in 1989. This outstanding performance reflects both the political commitment on the part of Hungarian post-1989 administrations and the practical assistance funded by a highly flexible, well-targeted \$11 million U.S. privatization assistance package.

USAID assistance was pivotal in the establishment of the Hungarian State Privatization Agency (SPA). USAID assistance was targeted at two key areas: establishment of a recognized, competent SPA as the primary institution in the privatization process and providing direct technical assistance in privatizing the first way of enterprises through writing tender offers, finding buyers, evaluating bids, structuring and negotiating deals.

By July 1995 alone, the SPA, with direct USAID long-term advisor input, sold 42 enterprises and closed 20 other postponement, bankruptcy and liquidation deals, bringing \$620 million to the transactions: \$241 million in sales proceeds and \$379 million in new capital subscribed.

By the end of 1995, approximately 200 companies were privatized through USAID-designed ESOP plans employing over 75,000 Hungarians.

Hungary's success in privatization and U.S. assistance in these efforts are inseparable; a point most Hungarian policy makers make when referring to our assistance program.

Assistance to the Development of Small- and Medium-Size Enterprises

The Prime Minister and key cabinet ministers publicly announced the GOH SME development policy at a conference held in the Parliament Building on May 9, 1997. The strategy they presented closely parallels the USAID/Hungary strategy for SMEs.

USAID actively supports the GOH SME policy initiative through a number of channels which include: 1) conducting ongoing policy and strategy dialogue with the Ministry of Finance; 2) participant training in micro finance; 3) policy round tables; 4) agribusiness integration and regional development activities; and 5) several activities designed to strengthen systems and practices in SMEs.

Democracy Network (DemNet) Hungary

The USAID funded Democracy Network (DemNet) program began operating in September 1995. DemNet serves the USAID objective of strengthening and broadening the NGO sector by providing small grants, aiming to support innovative programs which have the potential to become self-supporting.

To date, DemNet has completed three rounds of funding to local PVOs focusing on developing democratic institutions, filling social welfare niches, and promoting cooperation between NGOs and local governments which have benefited hundreds of organizations throughout Hungary.

DemNet's results are visible in hundreds of towns and villages throughout Hungary, where citizens are rediscovering the benefits of civic cooperation through functional ventures. USAID is providing the kind of active and visible support at the community level which will mark the legacy of American development assistance long after USAID/Hungary has closed its doors.

USAID/RIG

Functions

RIG/Budapest is responsible for audits of USAID activities in Central/Eastern Europe and the New Independent States of the former Soviet Union. As of September 30, 1996, programs in these regions included 129 active projects involving \$6.6 billion in USAID-funded obligations and \$5.1 billion in expenditures.

Major Accomplishments

Began RIG/Budapest office operations. In September 1995, RIG/Budapest immediately began to meet the administrative and logistics challenges of organizing a new audit office, and during the past two years issued fourteen audit reports. These reports included several recommendations to improve USAID management and identified \$407,000 that USAID could recover from host governments and contractors, as well as an additional \$190,000 that USAID could deobligate, reprogram, or use more efficiently.

Concurrent Audits

RIG/Budapest's most ambitious effort to date has been its concurrent audits of two major USAID programs in Bosnia-Herzegovina. Audit coverage of the Municipal Infrastructure and Services (\$182 million) and Bosnian Reconstruction Finance Facility (\$278 million) programs began in August 1996. USAID considers these audits very important because, in addition to Congressional interest, there is an urgent need to ensure accountability over U.S. support in Bosnia-Herzegovina.

Audit Coverage of NIS

In March 1997, the RIG assumed responsibility over the geographic areas transferred by the deactivated RIG/Frankfurt office. With no immediate increase in staff, RIG/Budapest is making plans to assess the risk and audit needs of this newest area of responsibility.

World Bank Loan for Higher Education

A World Bank loan of \$150 million to Hungary for higher education restructuring was approved in the Autumn of 1997. Commencing in 1995, the Ambassador strongly supported these Hungarian education officials seeking World Bank assistance for restructuring and urged World Bank President James Wolfensohn to give favorable consideration to this proposal.

Administrative Section

Bank Center Building

Embassy Budapest relocated five agencies into the Bank Center Building, negotiated the lease, and coordinated modification of the office space to meet security, communications, and workspace requirements. We have achieved "one-stop shopping" in a modern, secure office building.

Regional Hub

Former Assistant Secretary Holbrooke recommended that Embassy Budapest become a regional hub. We have done this - two regional AID offices, Defense Mapping, ILEA, and SFOR have been established, and DAO and ODC increased staff. In all, the Administrative Section supported an increase in other-agency presence of over 35%, while streamlining its own operations and absorbing significant budget cuts.

IFOR/SFOR, ILEA and Visit Support

While supporting the transition of Budapest to a regional hub, we also accommodated a 14 person IFOR team within the Embassy, assisted in the establishment of ILEA and supported several thousand visitors, the majority of whom came because of IFOR and ILEA.

GSO Consolidation

Four years ago, the GSO operation was scattered over four different sites. This decentralization hampered operational effectiveness, internal controls, and was expensive in rent alone. The Ambassador approved the GSO move to one central location. This has enhanced effectiveness, oversight, customer accessibility, and saved \$15,000 a year in lease costs.

Consular Section

Organized Crime

The Consular Section reports to Washington on major Russian organized crime family led to the revocation of visas for key members.

Established official information exchange within the Embassy to facilitate exclusion of organized crime family members from travel to the United States.

Consular Section's Role in Organizing a Smooth IFOR Transition

The Consular Section advised IFOR soldiers and contractors of services available to them through the Embassy.

Assisted in development of defining the Embassy's role during the initial stages.

Practical Solutions to the Large Increase in Non-Immigrant Visa Applications

The Section introduced ten year multiple entry tourist visa program, and effected a smooth transition to the congressionally mandated \$20 processing fee.

Embassy's Leadership on Unethical Business Practices

Embassy's leadership role concerning unethical business practices by restaurants led to the creation of a Hungarian tourist police, started public debate and discussion on business ethics in the tourist industry, and revitalized the Hungarian tourist office. This interest attracted worldwide press attention. Partly as a consequence of these initiatives, Consul General Teddy Taylor was named worldwide Consular Officer of the Year of 1996.

EST Section

Environment Conference

Organized the first meeting of environmental diplomats in Hungary. Diplomats from 16 embassies and the European Union Delegation exchanged information on the environmental activities of their embassies.

Parliamentary Training

The office arranged for the Environmental Committee of the Parliament to receive Internet training at no cost through the Regional Environmental Center.

Joint Fund

The Ambassador and EST Officer lobbied successfully for an additional year of funding for the U.S.-Hungary Science and Technology Joint Fund.

USIS

Assisting the Developments of Independent Media

Through a broad range of programs, including the International Media Fund, the American Journalism Center in Budapest, and SEED-funded journalism training in the United States, USIS Budapest has helped Hungarian journalism, particularly print journalism, to become an independent force in Hungarian democracy, calling politicians to account and providing citizens with fact-based reporting.

Supporting the Growth of a Western-Style Democracy

Through democracy grants, an active Fulbright program, support for higher education reform, and an extensive exchange visitors program, USIS has provided opportunities for a wide range of Hungarians to observe the benefits of democratic discourse, civic education, and citizen involvement in public life. USIS NATO tours for Hungarians, as well as its work hosting incoming NATO groups, have played an important role in Hungary's preparations to join the Western alliance, as well as helping to build strong parliamentary and public support for enlargement.

Building Electronic Information Resources

By establishing an Information Resource Center equipped with on-line capabilities and extensive CD-ROM data bases, and by creating and managing an Embassy website, USIS provided an invaluable source of information for Embassy officers, and for Hungarian ministries and other important institutions.

The following pages list the improvements that we have made to the Budapest residence. We are proud that it now represents the United States more appropriately to the increased number of Hungarian and American guests enjoying American hospitality.

Vera Blinken

IMPROVEMENTS TO THE AMBASSADOR'S RESIDENCE IN BUDAPEST, HUNGARY
BY AMBASSADOR AND MRS. DONALD BLINKEN

Entrance Hall

1. Removed beige rayon curtains and curtain track covering stained glass window.
2. Removed bolt locks from doors and installed locks in cylinders at keyholes.
3. Removed several excess electrical outlets and relocated them from eye-level to baseboard.
4. Installed dimmer for chandelier.
5. Polished marble floors.
6. Removed wooden sashes and replaced with marble to match floor.
7. Acquired flags: U.S. and Ambassador.

Office and Maids' Room

1. Installed new wall-to-wall carpet.

Cloak Room

1. Acquired matching wood hangers.
2. Installed mirror.
3. Installed new ceiling light fixtures.
4. Reupholstered bench with blue velvet fabric (from U.S.).
5. Moved security system to Residence office.

Stairway

1. Installed carpeting with lining and tackless stripping.
2. Installed brass handrail.
3. Installed three recessed lights.

Upstairs Entry

1. Removed excess eye-level electric outlets.
2. Installed dimmer for chandelier.
3. Installed signs for Ladies/Mens rooms.
4. Refinished table.

Garden Room

1. Removed floor-to-ceiling beige rayon curtains and tracks.
2. Removed shag rug and linoleum floor and installed beige Italian tile floor.
3. Restored bamboo furniture with touch-up paint from manufacturer acquired from New York.
4. Reupholstered bamboo furniture with blue ribbed cotton fabric (from New York).
5. Bought flower pots, baskets and plants.
6. Installed "call" system to kitchen.

Central Hall

1. Repaired and cleaned antique rug. Replaced torn fringe.
2. Replaced thermostat.
3. Polished wood paneling and filled in holes.

Living Room

1. Installed Levelor blinds on windows.
2. Installed yellow moiree curtains (fabric from U.S.)
3. Repaired fireplace door and screen.
4. Removed plastic front gate door openers.
5. Removed excess electrical outlets.
6. Reupholstered four armchairs and one settee with blue silk damask (fabric from U.S.)
7. Repaired and cleaned antique rug.
8. Restored antique Secretary.
9. Professionally polished all antique furniture.
10. Acquired new lamp shades.

Study

1. Installed Levelor blinds.
2. Installed yellow moiree curtains (fabric from U.S.).
3. Reupholstered one gold velvet sofa (fabric from U.S.).
4. Reupholstered one yellow patterned sofa (fabric from U.S.).
5. Made large round ottoman, covered with gold velvet.
6. Made green silk draped skirt for round table.
7. New lamp shades (from New York).
8. Installed dimmer for chandelier.

Dining Room

1. Installed air conditioning.
2. Designed and installed wood covered valance.
3. Installed yellow moiree curtains (fabric from New York).
4. Ten new lampshades for sconces (from New York).
5. Repaired broken sconces.
6. Repaired and cleaned antique rug.
7. Repaired antique furniture: dining room table; 18 chairs; 3 sideboards and 1 cabinet.
8. New placemats and napkins, table organizer.

Bathrooms

1. Changed flourescent tubes to incandescent light.
2. Installed mirror on back of door.
3. Changed brown plastic fixtures to chrome.
4. Bought accessories: glasses, waste baskets, kleenex boxes, soap dishes, shower curtains.
5. Installed towel racks and hooks.

Upstairs Guest Room

1. Installed air conditioning.
2. Installed Levelor blinds.
3. Installed printed flower pattern curtains (from New York).
4. New bed covers and skirt in same pattern as above (from New York).
5. Recovered chair pads (fabric from U.S.).
6. Installed swing-arm reading lamps.
7. Lined drawers with flowered lining paper.
8. Installed new blue wall-to-wall carpet.
9. New wood hangers for closets:

Downstairs Guest Suite

1. Installed air conditioning.
2. Designed and built wall-to-wall floor-to-ceiling closets.
3. Installed T.V. and cable.
4. Installed window screens.
5. Installed Levelor blinds.
6. Installed printed flower pattern curtains (fabric from U.S.)
7. New bed covers and skirt in same pattern as above.
8. Recovered sofa and two armchairs with rose velvet with same pillows (fabric from U.S.).
9. Recovered three side chairs with blue cotton fabric (fabric from the U.S.).
10. Installed swing arm reading lamps.
11. Installed new blue wall-to-wall carpet.
12. New lampshades (from U.S.).
13. New wood hangers for closets.
14. Installed new wall-to-wall carpet in hallway leading to guest suite and acquired plastic runners.
15. Miscellaneous decorative accessories; vases, notepads, kleenex boxes, flower pots, etc.

Kitchen

1. Installed air conditioners.
2. Installed new refrigerator.
3. Installed new stove.
4. Installed new ice maker.
5. Moved light fixtures up to ceiling.
6. Repaired broken steps to china cabinet.
7. Relined shelves of china cabinet (brown to blue & white).
8. Installed new carpet in china cabinet (brown to blue).
9. Installed new walk-in refrigerator in basement.

Laundry Room

1. Installed additional washing machine.
2. Installed additional dryer.
3. Tiled walls with white ceramic tiles.
4. Designed and built storage closet for linens.

Garden and Exterior

1. Designed and built carport at front entrance (to replace plastic awning).
2. Removed Soviet-style black metal, roof high awnings from two terraces.
3. Removed Soviet-style light fixtures from two terraces.
4. Planted bushes, flowers, trees, ground cover.
5. Cleaned stonework.
6. Added and repaired stonework as necessary and added gravel to walkways.
7. New garden furniture.
8. New umbrellas.
9. Added flower pots and flowers.
10. Added lamp posts on driveway.

Miscellaneous

1. Produced booklet on history of Residence.
2. Installed weather-stripping on all windows.
3. Installed dimmers for all chandeliers and sconces.
4. Changed cord on all shutters.
5. Changed light bulbs to incandescent (from tubes).
6. Removed excess electrical outlets.
7. Installed push button telephone system.
8. Upgraded telephone system from one outside line to three.
9. Installed mobile phone.
10. Installed non-slip rubber on back stairs.
11. Acquired new bed linens, blankets, pillows, quilts, mattress covers, towels, bath robes, shower curtains, hooks.
12. Brought new uniforms for maids from U.S.
13. Installed new beige carpet in bedroom and study.
14. Acquired luggage racks for guest rooms.
15. Wrote: welcome instruction letter, telephone residence intercom instruction sheet.

Received from Washington

1. New matching table settings for 30 persons.
2. Pasta dishes.
3. Chafing dishes.
4. Ice buckets and tongs.
5. 5 dozen gold framed folding chairs.
6. 6 48" round folding tables.
7. Metal wastebaskets and umbrella stand.



12-8-97

National Office

THE PRESIDENT HAS SEEN

930 East 50th Street • Chicago, Illinois 60615 • Phone: 773-373-3366 • Fax: 773-373-3571

Washington, DC Bureau

1002 Wisconsin Avenue, NW • Washington, DC 20007 • Phone: 202-333-5270 • Fax: 202-728-1192

Wall Street Bureau

40 Wall Street, Suite 429 • New York, New York 10005 • Phone: 212-425-7874 • Fax: 212-968-1412

PO0287A

December 3, 1997

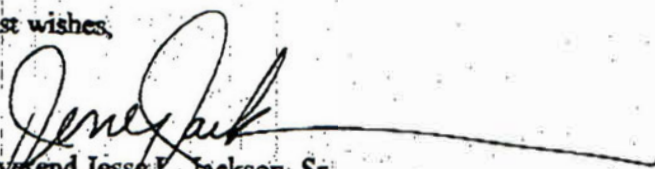
The President
The White House
Washington, D.C. 20050

Dear President Clinton:

I strongly encourage you to make a recess appointment of Bill Lann Lee to the post of Assistant Attorney General for Civil Rights, and/or to resubmit his name for confirmation in January.

This is the right fight, and he deserves the chance to serve. The Rainbow/PUSH Coalition and I look forward to working alongside you in this effort.

Best wishes,


Reverend Jesse L. Jackson, Sr.
Founder & President

jj/sbc

Executive Committee

Rev. Willie T. Barrow, Co-Chair of Board of Trustees • Angela Jordan Davis, Co-Chair of Board of Trustees
Rev. Jesse L. Jackson, Sr., Founder & President • Nancy M. Ware, Executive Director

THE PRESIDENT'S OFFICE
12-8-97

Copied
Moore
Reines
CDS

DC Issues

1. SBA contracting w/ DC Principals
2. BC visit in DC
3. Teacher Training
- ✓ 4. Tech. Tg. course
5. Meet w/ local education stat.
6. Any quick management improvement
7. SE "Global City" Project
8. Work in schools, police
9. Ec. Dev. Strategy
10. Test system.
11. New summer job for 800 to 2000
12. Put on elected official on
Finance Authority

Region Nine

Then on the issues raised
in meeting w/ DC folks - we
should check on follow up -
esp. on quick response to shortage
of trained technical workers in area,
possibility of work courses for unemployed
DC residents.



John P. Overbay
12/05/97 04:53:52 PM

*do a
letter*

'97 DEC 8 AM 11:43

Record Type: Record

To: Craig T. Smith/WHO/EOP, Simeona F. Pasquil/WHO/EOP
cc: Christopher J. Lavery/WHO/EOP
Subject: From Brian Barreto - Kathy Vick's Information

This is actually from Brian Barreto.

Craig I left a message with Chris regarding Kathy Vick, DNC Secretary.
Her husband, Kendall Vick, passed away last night. I thought that you might want to share this
with POTUS. Here is what I have so far:

Monday - December 8

Memorial Service - 10:00am - 12:00pm (tentative time)
location: Kathy Vick's Residence

Funeral Service - time TBD (looks like it will be in the late afternoon)

Please send all correspondence to:

Kathleen M. Vick
1235 Washington Avenue
New Orleans, LA 70130

504-899-3565 (h)
504-895-8006 (h)

I will keep you up to date on things. If you would like more information I am at ext. 65807.

12-8-97
*Send to Burkhard for letter
ASAP?*

Yes ☒ *No* ☐

C.

THE WHITE HOUSE
WASHINGTON

Cos
Berger
NSCWW Desk

DATE: 12-8-97

NOTE FOR: The Honorable Strobe Talbott

The President has reviewed the attached, and it is forwarded to you
for your:

Information ☐

Action ☒

Thank you.

Staff Secretary
(x6-2702)

cc: Sandy Berger

THE WHITE HOUSE
WASHINGTON

THE PRESIDENT
12-8-97

December 1, 1997

INFORMATION

MEMORANDUM FOR THE PRESIDENT

FROM:

SAMUEL BERGER *AB*

SUBJECT:

Yavlinski Comments on Russia

*Study
what's your
comment on
this - [initials]*

197 DEC 1 - 97

Attached is a memorandum on a Harvard symposium attended by Russian political activist Yavlinski. Yavlinski, head of the reform-oriented Yabloko, is controversial and opinionated, but his views are thought-provoking and should not be dismissed. In essence, he believes that:

- The central question is whether Russia will develop into an open democracy or remain a corporatist, criminalist oligarchy.
- Russia's economy remains highly vulnerable, plagued by over-centralization, continued dominance by Soviet-style monopolies, excessive regulations, organized crime and stringent taxes.
- Successful reform will require a clean separation of the political and business centers of power.
- Russia faces three critical threats: loss of control of WMDs; instability in the Caucasus; and unstable regional neighbors.
- To Russian eyes, NATO enlargement symbolizes our lack of confidence in Russia's future; it is likely to stir feelings of humiliation among the general population.
- The U.S. needs to treat Russia as a mature adult and cease to rely on personalities whose time has past (i.e., Yeltsin).
- Russia presents you with an historic opportunity. You should seize it by speaking openly and offer significant assistance.

Attachment

Tab A Memorandum on Yavlinsky's Points

cc: Vice President
Chief of Staff

8115

HARVARD UNIVERSITY
JOHN F. KENNEDY SCHOOL OF GOVERNMENT
Strengthening Democratic Institutions Project



79 JOHN F. KENNEDY STREET
CAMBRIDGE, MASSACHUSETTS 02138

MEMORANDUM

To: Sandy Berger
From: Graham Allison
Date: October 29, 1997
Subject: Yavlinsky's Major Points

From September 21 - September 27, Harvard's Strengthening Democratic Institutions Project hosted Yabloko leader Grigory Yavlinsky's visit to the United States. The purpose of this memo is to note some of the most important themes, propositions, and one-liners stated by Yavlinsky during his visit. As one of the most astute observers of the Russian scene as well as an active politician, Yavlinsky has a provocative perspective on most issues. Our Project has prepared this summary for our own record. We share it with you on a private basis.

What follows are simple, succinct summaries on the Russian economy, threats to Russia, NATO enlargement, U.S.-Russian relations, the Russian government, and Russian democratization compiled from a number of Yavlinsky's presentations and conversations over the week.

1. Big themes:

- If one were describing the state of Russian political and economic developments in one word, that word is "good." If one is allowed two words, the answer is: "not good."
- Russia now stands at a crossroads in which the central question is: What kind of Russia will emerge? Will it be a Latin American-type corporatist, criminalist oligarchy (as it is now tending toward)? Or will it be a normal, open democracy? Note: Interestingly, just two days after Yavlinsky's public speech at Harvard this year (September 22), both Yeltsin and Nemtsov used almost identical words in posing "the question" about Russia. On September 24, in a speech before parliament, Yeltsin said, "The question is...what type of state and what type of society will the free economy promote?" On September 26, the *Financial Times* quoted a Nemtsov interview in which he said, "Russia now has to choose one of two ways – bandit capitalism or democratic, peoples' capitalism."

- Democratization, and democracy itself, are essentially a process, not an end-state. A democracy that fails to address the question of the values and views of its citizens will be incomplete, and will risk its citizens electing the likes of a Salazar or a Hitler. In 1996, Russia demonstrated a limited democracy. The opportunity to run for office and the opportunity to vote were largely unconstrained, but access to television and political financing was greatly skewed. Additionally, the vote count shifted several percent of the vote total in favor of Yeltsin.

2 The Russian economy:

- Inflation has been stemmed, but this does not signify real success in macro-economic reform. In late 1995, the Russian government simply stopped paying salaries to people. A simple formula emerged: no money = no inflation. As a result of this policy, the Communists and nationalists gained a 70% majority in the Duma. An economic stabilization that kills inflation by not paying the guardians of nuclear weapons risks catastrophe.
- Deng Xiaoping advocated one country, two systems for China. Russia has heeded his advice in the contrast between Moscow and the rest of the country. Eighty percent of financial resources of the country are in Moscow; the city attracts 75% of foreign investment. It is time for the rest of the country to join in the boom by decentralizing power.

The current Soviet-style monopolies must be destroyed. The 100 biggest companies produce 50% of GDP and employ only 3% of the labor. Today's Russian monopolies divide and re-divide existing property without investing additional capital to promote development. Medium and small enterprises have failed to emerge. The task for Russia's economy is to create the appropriate market structures from below and to encourage personal initiative, small enterprises, and entrepreneurship. Currently, this development is prevented by stringent taxes, excessive regulations, and organized crime.

- To break the monopolies, political power must be separated from business power. Russia needs to develop open procedures, international accounting standards, public information with a free press, and public control of the government. The Russian courts and legal system must be strengthened in order to fight corruption.
- For reforms to work, the Russian tax code must be changed. Today, the total tax rate is 85-90% with inefficient enforcement measures. As a result, only 50% of the requisite taxes have been collected to date in 1997. A new tax code with three or four taxes which are extremely low – no more than 15% – plus one or two local taxes should be adopted. The majority of the government's budget revenue should come from sources other than taxes – by using Russia's natural resource base of oil, gas, diamonds, and gold. However, there must be public control of these resources, so that the revenues are responsibly spent. Currently, only 10,000 people in Russia (.007% of the population) are using, and becoming wealthy from, the state's natural resources.

3. Threats to Russia:

- The first and largest threat is the loss of control of nuclear, biological, and chemical weapons. The indicators of the increasing risk of a massive loss of control are evident in the troubles of the Mir space station, the suicide of Vladimir Neachi, Director of the Chelyabinsk-70 nuclear complex, and the recurring examples of nuclear theft. But the big risk here is of a discontinuous and dramatic loss of dozens—even hundreds—of such weapons. Recall the donkey that continued working for a week with no food—and on the 8th day died. This is a threat to Russia, to America, and to the world.
- The second threat to Russia is instability in the Russian Caucasus. Chechnya has won only tacit independence, and progress toward resolving the issues behind the war has not come easily. Although immediate resumption of the war is unlikely, kidnappings, terrorism, ethnic conflict, and oil pipelines guarantee that the area will remain volatile for the foreseeable future.
- Third, Russia has the longest border with the most unstable regions in the world. For centuries it has been the wall between those instabilities and Europe. If that wall has holes in it, the results will be catastrophic for Russia and Europe.

4. NATO enlargement:

- NATO enlargement is not about real threats to the states who are joining, to Europe, or to Russia. The real reason behind NATO expansion is that NATO is a huge bureaucracy, and when bureaucracies do not know what to do, they expand.
- The subliminal lesson to Russians (which Yavlinsky personally believes as well) is that NATO enlargement communicates the fact that the Clinton Administration does not really believe that Russia can become a nominal democratic country within the next decade or two. The combination of Chechnya (an arbitrary war in which Russia killed 100,000 people unnecessarily), failed economic reforms, a criminal government, and Yeltsin's unpredictability, has led the American government to conclude that Russia is not a dependable partner, and that NATO therefore needs to expand. If the U.S. explained its proposition in those terms, Yavlinsky and perhaps even Russians would accept it and find it plausible. What seems hypocritical and mistaken to Yavlinsky is the proposition that Russia is fine, reform is fine, the relationship is fine, and NATO is expanding to Russia's border. The logic does not work. For elaboration of this point, see Yavlinsky's press conference on October 6 (attached).
- Russians have enough domestic problems. Therefore, the West should not be causing additional diversions or distractions. In the Duma, Yabloko had forged an alliance with the Communists and Nationalists to pass a production-sharing agreement. NATO enlargement has sharpened the differences between Yabloko and the others to such an extent that the bill's passage is unlikely.

- NATO enlargement can not only be distracting, but risks being destructive in terms of Russian politics. If NATO now moves to the Baltics, this will stir feelings of humiliation in the Russian population, and will thus lead to a significant decline in the possibilities for Yavlinsky-like democrats playing a larger role in Russian politics.

5. U.S.-Russian relations:

- The vital interests are the same. The first and major vital interest for both is to control nuclear, biological, and chemical weapons. A second common vital interest is the threat posed by terrorism. A third interest both countries share is a desire to avoid ecological disasters – more Chernobyls and equivalents. Yavlinsky emphasizes both the local and global character of these threats.
- What Russia needs from America is clear, tough, understandable relations. “Treat us like mature adults, not second rate, stupid children. Talk directly to the people as you did in the Brezhnev times”. During the Soviet era, the Russian people respected the United States because it spoke the truth to them. Although it dealt with the Soviet government, the U.S. government also maintained direct links with the people through its radio broadcasts. In the current situation, where Americans embrace Yeltsin and say, “He is our man and reforms are working,” the Russian population knows better and no longer believes in America. America must stop relying on personalities, and begin relying on institutions.
- Russia today presents a historic opportunity for a U.S. President worried about his historical image. Like Harry Truman in 1947, Clinton has a unique opportunity to go down in history as a truly great American president by helping a struggling nation get on its feet. “When I travel in Europe, even the grandchildren of the war generation are grateful to America for its assistance after the war. This is what makes America a great country.” For Clinton to go down in history, he must speak the truth about Russia and offer significant assistance. Will he rise to this challenge?

6. The Russian Government and policy:

- The Russian government is a corporatist, criminalist oligarchy that has the major economic interests both inside it and around it. Today’s government has no strategy, no policy, no plan. The first ten reasons for the government’s actions in every case can be reduced to one word: greed. So, for example, in answer to a question about Russia’s sale of \$1 billion in arms to Armenia and the subsequent tightening of the Russian-Armenian bilateral relationship, Yavlinsky discounted strategy, geopolitics, an interest in military bases, or an objective to squeeze Azerbaijan. In his view, the first ten reasons have to do with money and greed. Only then do the other calculations become relevant. This is his proposition about almost all Russian initiatives at home and abroad.
- In the shift from Communism to the current government, Russia has shifted from a closed criminal system to an open criminal system.

 Nemtsov's and the new government's fate are intertwined. Nemtsov's fate in the government symbolizes Russia's fate. Will he be dragged down by the corrupt system, or will the system be elevated to his level? Nemtsov is only powerful because he has the ear of the President. Unfortunately, one day Nemtsov will call Yeltsin, and Yeltsin will not answer. As for the new government, it is indeed saying the correct things, but there is a difference between saying and doing.

7. Threats to continuing democratization and the emergence of political parties:

- The problem with Yeltsin's reelection in 1996 is not that Russia elected a sick President (physically he is fine), but that it elected a person whose time has already past. Yeltsin played a very important role in history: he destroyed the Communist system. But now Russia faces a different task – building a civil society and destroying the present oligarchic system. Yeltsin does not possess the vision or leadership for this crusade.

 The current government's primary problem is that it does not have the confidence of the people. The people of Russia, correctly, consider the government corrupt. In order to be effective, it needs to regain the people's trust. However, the government refuses to listen to feedback from the people. As in 1917 and 1991, the people feel alienated from the decision makers and their actions. This can lead to dangerous situations.

- Parties have not developed in Russia to reflect the will of the people because Yeltsin and the leading oligarchs do not want them. In fact, they are actively campaigning against the development of political parties. The Yeltsin government will most likely seek to change the rules of the electoral game to eliminate the 50% of seats in the Duma chosen from party lists. By making all parliamentary elections local affairs, they hope to splinter the parties, assemble a Duma consisting of a disorganized mob, and thus further weaken the legislature vis-a-vis the President.
- Yavlinsky has declared his intention to run for president in 2000. He is actively promoting the development of Yabloko in the regions to assist his campaign. His stated goal is to double the size of the Yabloko Duma delegation to 100 in 1999, and then to use that as a spring board for the presidency. But Yavlinsky is realistic about his presidential chances. As for the other contenders:

Yeltsin:	it is conceivable that he will seek an unconstitutional third term
Nemtsov:	popular, but no organization, will he be tainted by current government work?
Luzhkov:	respected for his accomplishments, but will face serious challenges in increasing his popularity outside of Moscow
Lebed:	no organization, being marginalized by party of power, but strong image
Zyuganov:	has organization, but his time is past
Chernomyrdin:	quietly waiting, but is not the guaranteed heir

- The present Constitution is made for one man – Boris Yeltsin. Russian must now stabilize its political system; this system cannot rely solely on one person. Presently, no checks and balances exist within Russia, while many freedoms and rights are being eroded. A system where the President can essentially rule by decree when he wishes, where the court system is weak, where the press is controlled by the oligarchs, and where religious toleration is a matter of political convenience, is not a healthy democratic system.

**Excerpt from Press Conference in Moscow with Grigory Yavlinsky
Head of the Yabloko faction in the Duma.**

Argumenty I Fakty News Agency
October 6, 1997

Q: Could you comment on your position on NATO enlargement?

Yavlinsky: First, we support the treaty signed by Yeltsin in Paris. We believe that the right step. Incidentally, we support Yeltsin's foreign policy on a number of counts. We support the treaty with NATO, the treaty with Ukraine, we believe those to be right. Second, we do not think that NATO poses a military threat to Russia. Third, we believe that NATO enlargement is very bad for Russia because it means the ultimate collapse of the overall foreign policy of Russia over the past five years. For any country of the world, if a military alliance moves closer to its borders without incorporating that country, this means that the foreign policy of that country has dismally failed.

Finally, the most important thing is that NATO enlargement means that the countries of Western Europe and the United States do not believe that in the near future Russia is going to become a democratic country with civil control over the military. This means that in spite of all their assurances and their applause over our reform, they think that the war in Chechnya, the collapse of the armed forces, setbacks in economic reform, semi-criminal government and the unpredictability of the President himself are enough justification for them to continue to expand their military alliance. In this sense this is a tremendous signal to Russia as regards the real state of affairs in Russia. And this gives much food for thought to us as to what we are doing here and how we should behave.

There is a different set of problems as regards whether NATO enlargement is good or bad and whether it is necessary -- but that set of problems is addressed not by Russia but by NATO itself. From my point of view, the main reason behind NATO enlargement is that NATO is a huge bureaucracy, and like any bureaucracy which does not know what to do, it expands, as a rule. And that is why NATO is expanding. There are many generals, and many wages to be paid. Something needs to be done, so, they are expanding.

As for all that talk that it is a different NATO and that it is no longer a military alliance, this is all very funny. It is like saying that the thing advancing towards your garden is not a tank, or rather, it is a tank, but it is painted pink, and it carries flowers, and girls, and there is music, and it smells very well. People say: "But it is a tank." Well, it is a tank, but it will be more like a tractor. It is safe, it is very good, etc.

These arguments are not serious, but to us the problem is very serious, although not in the sense that it is a threat to us.

Q: One more question: do you yourself believe in a democratic future for Russia? After listening to you today, I have grave doubts.

Yavlinsky: I have absolutely no doubts that a free, democratic and dignified country can be built in Russia. It will not be the greatest or strongest power in the world, but it will be far better than it was or is today. This can be achieved, I have absolutely no doubts about that. And I am working for that.

THE WHITE HOUSE
WASHINGTON

Date 12/8

To: Dan Tanno, Laci Brainard

From: The Staff Secretary

Do we have to respond
quickly to this?

Phil Caplan

12-8-97

Send to Burkhardt?

Yes ☒

No ☐



INTERNATIONAL INSURANCE COUNCIL



GORDON J. CLONEY
PRESIDENT
INTERNATIONAL INSURANCE COUNCIL

900 19TH STREET, N.W./SUITE 250 WASHINGTON, D.C. 20006
TELEPHONE: (202) 682-2345 FAX: (202) 218-7730

December 5, 1997

The President
The White House

Dear Mr. President:

On December 12, the Financial Service negotiations under the World Trade Organization will conclude. I write in my capacity as a member of this Administration's Industry Sector Advisory Committee for Services and as one of the Administration's two most senior insurance industry trade advisors, urging your personal commitment to a successful outcome in the Financial Services negotiations generally and the Insurance negotiations in particular.

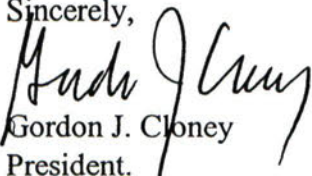
The Administration is extremely close to a historic trade policy success for the country and the world. An Agreement in this vital sector of world trade would be a keystone in the Administration's growing success in fostering productive U.S. trade in the global market place. Plainly put, this Agreement offers critical support to our American financial service exporters as well as a doorway for them to the global economy of the future.

As you are no doubt aware, the deadline for these talks has been extended three times in the past, due to inadequate -- but improving -- market access offers by the signatory countries. Fortunately, it looks now as if only five or six insurance issues of consequence remain, leaving a manageable amount of work to be finished.

The International Insurance Council supported you without reservation on NAFTA, the Uruguay Round and fast track. We will support your action in this instance just as strongly. And, of course, we will continue to back your efforts to establish market-based democracies around the world.

Go for it Mr. President! You and your Trade Representative, Charlene Barshefsky, deserve the applause that a successful Financial Services Agreement will produce.

Sincerely,


Gordon J. Cloney
President.

THE WHITE HOUSE
WASHINGTON

Date 12/8

To: Alan Sullivan

From: The Staff Secretary

This came in from American
Articles to the President's office

I think it something best
handled by the Mil office.

Call if you have questions

Phil Cople

copy sent
to Alan
Sullivan
(Miloff)

Chrom

12/04/97 THU 16:01 FAX 703 419 7905 AA SPCL SVC DCA

001

GroupWise Print for Dale Morris on 12/04/97 at 15:45:23

American Express Sheet1

From: Gerald McGaughey
To: US4C3.MIA4C33.Ric Arner, US4C3.MIA4C34.Kenneth Pya...
Date: 11/25/97 11:05am
Subject: Passenger Goddard -Reply

Lisa, I personally searched our baggage service area to be sure the bag was not here.....I also researched and discovered the skycap who handled Ms. Goddard was Bill Goldwait.....he vaguely recalled checking in a passenger who mentioned she had been to the white house...but he did not recall any specifics....the skycap did not check the bags...Ms. Goddard was assisted to ticket agent Carolyn Bankhead. I spoke with Ms. Bankhead and she could not recall anything specific about this customer.

I contacted Ms. Goddard today to get more information and also to find out more about the medal in question. She stated she was in Washington that week for the memorial for "Women In Service"...Ms Goddard was a staff sergeant in the Marines from 1943-45. On October 18, she attended the official memorial ceremony honoring all the women who had served in the armed services. She stated they had officers at the ceremony who randomly selected people to be given a special memorial medal. She was chosen. I have asked Dale Morris to contact his sources to see if we can get a replacement medal. While discussing this with Ms. Goddard, she indicated she really did not want a replacement but did want the original medal. She said it would not be the same. She did admit if the original medal is not located, a replacement might due. I assured her we would continue to search for her missing bag and medal. Lisa, realistically, I doubt if we find the bag now a month later. I suggest if we are able to get a replacement letter that we fly Ms. Goddard back to Washington to have someone officially give her another medal...that way it will not seem so unofficial.....so I will keep you in the loop of our efforts to get the medal

Staff
Sec gca

(202) 395-4198
97 DEC 5 PM 3:32

Post-It® Fax Note		7671	Date	12/4	# of pages	4
To	CAROLYN Huber	From	Dale Morris			
Co./Dept.	WHITE HOUSE	Co.	AA			
Phone #		Phone #				
Fax #		Fax #				

replaced....

>>> Lisa Callahan 11/24/97 02:35pm >>>

Please take a few moments to review BMAS record QKTDLT and re-research with all personnel involved. This passenger is an 85 year old woman who recently was in Washington and received a medal from President Clinton. She was returning from DCA, traveling in a WCHR, and apparently the skycap convinced her to check the small carry-on bag that, you guessed it, contained the medal she received from the President. The bag has not yet materialized.

You may already be aware of the file, but we have searched through our internal tracing processes at CBS and with OAs, but remain unsuccessful. Prior to paying this claim via normal procedures, I believe it is necessary to have both DCA and MIA investigate/search again. This is a PR nightmare in the making and therefore, we would appreciate it if search effort could be intensified at your stations and potentially conduct a discussion with the skycap in DCA who is mentioned in BMAS record.

If nothing else, perhaps Special Services in DCA can begin work with White House to have this medal replaced.

Thank for your personal attention to this matter.
Please let me know if you come up with anything.

Lisa

CC: US45.HDQ453.Vicki Moore, US45.HDQ456.Bob Ciminelli

GroupWise Print for Dale Morris on 12/04/97 at 15:45:08

From: Lisa Callahan
To: US700.DCA7001(Gerald McGaughey)
Date: 12/1/97 3:47pm
Subject: Passenger Goddard -Reply -Reply

We are at the point where we would normally pay the claim, (approximately \$1100.00)but we will hold off until the end of this week in the event you and Dale are able to secure any information about a replacement medal, so our response could be written accordingly.

THX

>>> Gerald McGaughey 11/25/97 10:05am >>>

Lisa, I personally searched our baggage service area to be sure the bag was not here.....I also researched and discovered the skycap who handled Ms. Goddard was Bill Goldwait....he vaguely recalled checking in a passenger who mentioned she had been to the white house...but he did not recall any specifics....the skycap did not check the bags...Ms. Goddard was assisted to ticket agent Carolyn Bankhead. I spoke with Ms. Bankhead and she could not recall anything specific about this customer.

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Thank for your personal attention to this matter. Please let me know if you come up with anything.

Lisa

CC: vicki moore

THE WHITE HOUSE

WASHINGTON

THE PRESIDENT HAS SEEN

12-8-97

December 6, 1997

MR. PRESIDENT:

Ersine wanted you to see this.

Phil Caplan

Copied
Bowles
Reed
Sperting
Curre
Hennrich
Engskov

EB (B) Reed (C)
This is great - we need
a firm agenda - and an
affirmative agenda that
concerns the future -
What would it
be?
Be

THE PRESIDENT
12-8-97U. S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C. 20410-0001

1870505-105

THE SECRETARY

December 4, 1997

~~Personal and Confidential~~

MEMORANDUM

TO: Erskine Bowles

CC: Gene Sperling
Bruce Reed
Sidney Blumenthal
Paul Begala
Rahm Emanuel
Sylvia Mathews
Ron Klain
Ann Lewis
John PodestaFR: Andrew Cuomo *AC*

RE: State of the Union

Please allow me to argue a simple point: there must be an "urban agenda" piece – as a policy cornerstone of the One America Initiative – in the State of the Union. Here are the seven urgent reasons supporting this point:

- 1) Media elites and opinion makers live in cities, own businesses in cities and associate with the more traditional democratic issues. I have traveled the country and spoken extensively with editorial boards and they are clearly waiting to see if there will be an urban agenda as part of the second term. As you know, the editors and publishers of the Nation's leading newspapers – and the top people at the networks – are often deeply involved in the civic life of their cities. Absent an urban agenda in this State of the Union, I am concerned that they will criticize the Administration on this point; if there is one, I believe that they will readily view it as a critical part of the President's legacy.
- 2) From the longer view as well, the extent of the agenda for cities and poor communities will weigh in the President's long-term legacy.

DETERMINED TO BE AN ADMINISTRATIVE
MARKING Per E.O. 13526Sec. 3.2(C) Initials: *DB* Date: *7/31/19*

2019-0774-5

2

- 3) Embarking on an expanded effort in this challenging arena would be important evidence of new energy for the second term.
- 4) It pre-empt's Democrats in Congress on a progressive agenda.
- 5) The absence of an urban program in the State of the Union – given the challenges posed by the passage of welfare reform and the steady and highly visible discussion in past months on the Race Initiative – will be glaring.
- 6) As the President noted in releasing the June, 1997 State of the Cities Report, the numbers are powerful. The economy is strong, but only 13 percent of new jobs are in cities. As the President has argued, the new economy will not work unless every American is brought along and given the tools to succeed – the opportunity for work and decent housing. Yet, the growth of assisted housing has stopped. Because of Congressional resistance, this is the first time in history that we are not building housing. Without expanded action, every other President, Democrat and Republican, in boom or bust economies, since the creation of HUD, would have built more housing than this Administration.
- 7) You cannot credibly address racial issues without an urban strategy. An expanded empowerment agenda can be a lesson learned from the *One America* dialogue and can be the action item to complement and strengthen the dialogue. If the One America Initiative is principally dialogue with a few scattered programs not directly and explicitly linked to an urban agenda, few will believe that there is a solid policy foundation underlying the Initiative.

I would urge three big new ideas as the centerpiece of such an "urban agenda" (those words are important) focusing on the empowerment theme. If the word "urban" is objectionable, I would suggest the *One America Opportunity Agenda* as a fall back. These ideas are ones that could have the most immediate impact – and ones for which the President would get significant credit, especially among the elite audience discussed above.

These three ideas (as well as the smaller, secondary items that follow) achieve the traditional progressive goals we all support – opportunity for all, community, and fairness – through new means – leveraging private sector investment, offering bottom-up, community-driven solutions rather than Washington mandates, and building on mainstream values of family, hard work and self-reliance. Together, these policy options offer a multi-issue approach to lifting the underclass into productive work and ensuring the vitality of America's communities. In short, this is not "your father's" urban agenda.

The *One America Opportunity Agenda* has three elements: jobs, housing and justice.

(1) JOBS

Welfare reform represents a new challenge in creating jobs and linking welfare recipients to work. The highest concentration of welfare recipients are found in inner-city areas where job growth lags. This proposal would help fill the "jobs gap" in America's cities by fostering greater private sector economic development by highly leveraging public funds.

*Can
help
city
economy
by
leveraging
public
funds*

Community Empowerment Fund. This public/private fund will invest in inner-city businesses and create a secondary market for economic development loans. A secondary market for economic development is exactly what the industry wants (a Fannie Mae for economic development loans) and needs. The new fund ("Eddie Mac") will "invest" in America but will not be a handout. It is not business as usual because Eddie Mac will be a separate entity with standardized underwriting and state of the art processing of private loans leveraged by public funds. The fund would be directed by a bipartisan board of business and community leaders, i.e., Jack Kemp, Colin Powell, etc. Experience with HUD's existing Economic Development Loan Program suggests that it is an effective method for providing jobs for welfare recipients. The Community Empowerment Fund would help grow the "new economy" in areas currently under served by the market by expanding and standardizing economic development lending. A one billion dollar funding level would have a significant impact, although it could work with less.

X

(2) HOUSING AND HOMEOWNERSHIP

Our proposed housing/homeownership initiative has two components:

✓

(a) Welfare to Work Vouchers and Homeownership Vouchers. The 50,000 new portable "welfare to work" housing vouchers will allow welfare recipients to move closer to job opportunities (see separate background if needed). The public housing homeownership vouchers would provide – for the first time in the history of public housing – qualified graduates of public and assisted housing (e.g. working families who have proven themselves to be good neighbors with a three year record of on time rent paying) the opportunity to buy a home using a Section 8 voucher and a \$5,000 down payment subsidy. This effort could help some 25,000 public housing residents become homeowners over a two year period helping them off assistance.

(b) Raise FHA Loan Limits to Make FHA Work for Middle-Class America. Historically, FHA was vital to middle-class America. As recently as 1970, FHA mortgage insurance accounted for more than a sixth of the dollar volume of all mortgage origination's. Today, FHA accounts for little more than one-twelfth of the volume and less than a third of FHA borrowers have incomes above the area median. Raising the FHA loan limits will restore the parity FHA once held with Fanny Am and Freddie Mac, while generating revenues needed to support other

components of the homeownership agenda. In addition, revamping FHA's home improvement loan products will expand FHA's presence in this growing market segment and increase the role of FHA in revitalizing the aging housing stock of older, inner-city and suburban neighborhoods.

(3) JUSTICE

1998 marks the 30th anniversary of the 1968 Fair Housing Act. As we can celebrate the progress made in the fair housing arena – and in civil rights – we must also finish the job. Fair Housing actions have emerged as a centerpiece of the President's One America Initiative.

A fair housing initiative for the 21st century could include: a new system of **Metropolitan Area Testing** to root out the remaining vestiges of housing discrimination; **greater funding** to meet the President's pledge to double **Fair Housing Enforcement actions**; and announcement of the **One America Broker** program, where HUD has partnered with the National Association of Realtors to develop a training and certification of real estate agents and brokers committed to serving the rapidly growing minority and immigrant home buyer markets – allowing Realtors, for the first time ever, to be officially certified as "One America Brokers"; and **Enhancing Mobility in the Section 8 housing program**, to make it easier for recipients to move to neighborhoods with more job opportunities, better schools and less crime.

Other urban agenda ideas include:

✓ **Round II Empowerment Zones.** While the President mentioned this in the last State of the Union, the Administration did not receive the funding needed to make this a reality and should press again on this issue. The early results from the first round of EZs are impressive. EZs have leveraged billions of dollars in private investments and created thousands of jobs in some of the nation's most distressed inner city neighborhoods. Without expanded spending, the Round II Zones will have a hard time matching the success of Round I Zones.

✓ **Education Opportunity Centers.** HUD's pilot Neighborhood Network program currently places computer learning centers in privately-owned assisted housing developments. An expanded program would open computer learning centers in public housing developments to support youth education and job training programs to help lift people off welfare. These learning sites – a technology oasis in the desert of public housing – would be a cheap investment to ensure that the next generation is self-sufficient and not stuck in the dead end of public housing.

✓ **Homeownership Opportunity Fund.** For a relatively small amount of money (\$11 million in credit subsidy) HUD could develop a loan guarantee program, modeled on the successful CDBG/Section 108 guarantee, to allow local and state governments to leverage current HOME funds with private moneys to fund large scale, affordable homeownership developments in distressed communities.

12-04/31 10-10 HUD OFFICE OF SECRETARY 7-34561301 10-000 000

5

✓ **One Strike and You're Out.** The efforts of the millions of law-abiding residents of public and assisted housing to rid their developments of crime and violence merit our support. Additional funding is needed to expand and strengthen One Strike.

✓ **The Officer Next Door.** Building on the current HUD program, we propose to double the number of police officers participating in this highly successful initiative. To do this, HUD will partner with private sector mortgage bankers and lenders to obtain preferential mortgage loan rates for participating officers. To ensure that the program promotes the revitalization of distressed communities, HUD could also offer – in an expansion of the program – deeply discounted home improvement loans to encourage acquisition and rehab of older homes.

Now Is The Time for an Urban Opportunity Agenda

The housing and community development successes of the first four years are a solid foundation for an expanded urban agenda. But expand the urban agenda we must. The effort to address divisive racial issues demands a renewed emphasis on expanding opportunities for all. Similarly, an urban opportunity agenda is an essential ingredient in any effort to make welfare reform work. The time is right for the President to launch a comprehensive second term urban agenda.

And HUD stands poised to implement this agenda. At the President's direction, over the past year HUD has moved aggressively to reform itself and crack down on waste, fraud and abuse. We have laid the groundwork for the President to argue that the Nation now has a credible vehicle to deliver an urban opportunity agenda.

The case: the American people are prepared to provide equal opportunity (not equal outcomes) to those less fortunate. However, before proposing any new solutions, they expect government to make existing programs work first.

For the Clinton Administration, that meant cleaning up the one agency specifically tasked with carrying out an urban opportunity agenda – and proving to the American taxpayer that their money can be well spent. The Administration has done that: HUD has seen a 500 percent increase in actions against bad landlords resulting in millions of dollars of penalties; a 25 percent reduction in staff; a sharp rise in enforcement efforts taken to stem housing discrimination; and a crackdown on frauds designed to rip-off homeowners and senior citizens. HUD, once the poster child of bloated bureaucracy, has become the poster child for reinvention.

Now – with a cleaned up and reinvigorated urban opportunity agency – we can say we've heard the American people, we have put our own house in order and are ready to offer new solutions and greater opportunity for the oftentimes forgotten people and cities of America.

I year marriage was in serious trouble.

"We were really having a difficult time in our relationship and growing further and further apart," says Mrs. Kellen. "We couldn't talk to each other. Rather than have a conversation, we had verbal attacks or silence."

On the advice of a marriage counselor, the Kellens, who live in Leicester, N.C., took a bold step. They enrolled in a four-month marriage education course designed to help participants improve communication and problem-solving skills. In the process, they joined growing ranks of couples around the country who are seeking to strengthen marriages rather than give up on them.

"The divorce revolution is over," says William Doherty, director of the marriage and family therapy program at

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At the same time, marriage-education programs are increasing. Several dozen established programs now

See **MARRIAGE** Page 14



Celestial Walk in the Park

Columbia astronauts Winston Scott (left) and Takao Doi test a crane in the space shuttle's payload bay this week. Their mission is to test tools to be used in building the international space station.

THE PRESIDENT HAS SEEN

12-8-97

To Sandy / WSC

Israel Grows Beyond Its Socialist Roots

But yesterday's strike shows not all want free market

By Ilene R. Prusher

Special to The Christian Science Monitor

TEL AVIV

ISRAEL'S government- and state-run businesses - which account for nearly half of the country's output - ground to a halt yesterday as a powerful federation of labor unions called a general strike to protest Prime Minister Benjamin Netanyahu's economic policies.

His vision of turning Israel's semi-socialist economy into a capitalist, high-tech tiger is one of Mr. Netanyahu's favorite topics of conversation - and a welcome diversion from wide criticism of his handling of the peace process.

But liberalizing markets and trimming government spending are proving as tough as the road to Arab-Israeli reconciliation.

Among the utilities that shut down yesterday was the public bus system, a critical service in a country with no mass rail or subway systems and many one-car and no-car families.

But even the way Israelis get to work is changing as the nation races to join the global marketplace, along with other countries that used to have planned economies and belong to the fading "second world."

A case in point is this city's old central bus station. Here, fresh fruit piles up amid

See **ECONOMY** Page 8

■ \$55 billion IMF deal, signed yesterday, forces Koreans to accept foreigners in economy.

By Michael Baker

Special to The Christian Science Monitor

SEOUL, SOUTH KOREA

EVERYBODY does their little part. If you've got a dollar, a mark, or a yen, you can drop it in a collection bucket around Seoul, and contribute to the nation's dwindled foreign reserves.

But saying it's a drop in the bucket is an understatement.

A \$55 billion rescue loan - the biggest ever - was given to Korea Inc. by the International Monetary Fund (IMF) Wednesday, in an attempt to reverse a nose-diving economy and stop Asia's financial rot from spreading to the rest of the world.

The crisis has achieved what US trade negotiators never could: swinging open the reluctant door of the Hermit Kingdom to foreigners. "Outside-country people" will now be able to own half of a Korean company, for instance.

Korea's antiforeign feelings go back centuries, when farmers grew accustomed to competing in a zero-sum game with farmers in the next valley or kingdoms across the sea. Many Koreans find it incomprehensible that their economy now needs to go through the "bone-aching pain" that President Kim Young Sam recently called for.

See **KOREA** Page 6



DOLLAR SAVED: A boy holding a US dollar waits with his father to deposit it at a Seoul bank.

REFORMS IN THE JEWISH STATE

Israel's Other Battle: Shedding Socialism's Yoke

ECONOMY from Page 1

the din of vendors who bleat out their daily price specials.

Scrappy wooden booths offer a wide selection of fake leather bags, cheap rayon shirts, and bootleg tapes that are the stuff of flea markets everywhere.

All that's missing are the buses. Most have been moved to the new central station nearby. There, a six-story shopping mall-cum-transportation hub lets travelers pick up CD-ROMs, muffins, and cafe lattes - even a pair of Levis - while they wait.

Teenagers drawn to the fashionable clothing boutiques and pop music stores - as well as the McDonalds, Burger King, and Sbarro chains - hang around as though they have come here more for the scene than to catch a bus.

The difference goes beyond money and modernity. This juxtaposition of the old and new is like a flashing neon testament to how drastically Israel has been changing since the beginning of the decade.

But such rapid change brings its own growing pains. Yesterday there were no buses to be taken at either station as the country's services were shut down by the general strike called by Israel's labor unions, which oppose Netanyahu's economic policy.

The Israeli leader has made some headway in his first 18 months in office. Foreign-exchange controls have been eased, as have restrictions on companies raising capital abroad. He and his new finance minister managed to pass some unpopular belt-tightening, but the planned \$650 million cut for 1998 is hotly opposed by the unions. It would reduce government expenditures as a percentage of gross domestic product (GDP) from 47.3 percent to 46.8 percent next year.

But that still leaves state spending at a much higher proportion of economic output than in most Western countries, with which Israeli exporters are trying to compete.

No peace, no progress

Further frustrating Netanyahu's plans, a plunge in expectations for Middle East peace since his election has slowed the robust growth Israel experienced during the height of historic Arab-Israeli reconciliation.

GDP jumped 6.5 percent in 1994 and 7.1 percent in 1995, the two years following the signing of the Oslo peace accords. The rate of increase in GDP for 1997, originally forecast at 4 percent, will be 2.5 percent instead.

Analysts note that there are many structural problems with

the Israeli capital markets, which are devoid of long-term institutional investors like pension funds and life-insurance companies that are the staples of stable markets elsewhere in the world.

Such problems hindering growth, in turn, could be helped by privatization.

The wish list for eventual sale includes parts or all of the Bezek telephone company, El Al Air-

the dream of socialism in Israel," he says. "The Labor Party doesn't oppose it. It's a less idealistic country today, and most people are looking only to profit."

It's not as though Israel ever made social equality a top priority, he explains. The first prime minister, David Ben-Gurion, removed that issue from his agenda in favor of priority No. 1: ensuring the fledgling Jewish state's

"The gap between the top 10 percent and the bottom 10 percent is now one of the widest in the world. The real backlash," he predicts, "will be to this move to fast privatization."

Some say, however, that the pace of privatization has been like watching grass grow.

"According to Netanyahu's agenda, he intends to sell off 12 or 13 out of about 100 state-

ing to resolve its differences with the Palestinians.

"If we had peace, and the peace process was completed, maybe he could just concentrate on this," says David Lev-Hari, an expert on international economics at Hebrew University.

Professor Lev-Hari says that the most important thing for driving the economy - privatizing the state-run banking industry - has not been touched.

"They haven't done anything about the competitiveness of the banking system," he says. "That means there are not many foreign banks in Israel."

As a result, Israeli banks charge fees unheard of elsewhere in the world and have many conflicts of interest, such as giving loans to and owning shares in the same businesses.

The communications sector is the only one - no other sectors have made the changes in competitiveness that Netanyahu is talking about. They admire Thatcher, but they're not Thatcher yet," says Lev-Hari, comparing Netanyahu's economic circle to that of former British Prime Minister Margaret Thatcher.

The area where Israel is continuing to experience a boom is its high-tech sector, which has fast gained a reputation as the Silicon Valley of the Middle East. Giants like Intel are setting up shop here, attracted by a labor force swimming with highly educated programmers that include Russian-immigrant scientists.

Smaller, indigenous companies producing software and Internet-related products are now finding the business environment more conducive to start-ups.

Jacob Perry, president of Cellcom - Israel's fastest growing cellular phone provider - after two years in business - says critics have been too quick to write off Netanyahu's efforts.

"Israelis don't have enough patience. The rate of privatization in Israel is not bad at all," says Perry, interviewed at his headquarters in a sparkling new office park outside Tel Aviv.

"It's not so easy to privatize a dynamic market in such a little country with so many contradictory forces. In this political environment, privatization is not such a simple task."

The wheels of change, he says, are not going to be held up forever by tacks thrown in the road by the labor unions. "It's a menace because they can paralyze the country.... But that's not the most important point. It's that people are getting used to the idea of a free market."

■ First of two parts on Israel's historic shift to market economy.



HUB OF COMMERCE: An Israeli soldier stands watch at the central bus station in Jerusalem in August. The ultramodern facility, which also houses a shopping mall, illustrates the rush toward modernity that Israel has seen in this decade. The station was quieted yesterday by a general strike that shut state businesses.

lines, Israel Oil Refineries Industries, Israel Military Industries, and Israel Chemicals.

But, for example, Israel is only putting small amounts of El Al on sale each year while the government reviews whether it should retain a controlling interest in case another crisis like the 1991 Gulf War arises.

Then, all international airlines stopped flying here and only Israel's airline continued operating.

Moreover, each move to shrink government has been met with fierce labor opposition and strikes. And throughout this give and take, some Israelis yearn for old ideals - essentially those of Israel's socialist founders - while others say Netanyahu is dragging his feet in bringing US-style economic liberalism to Israel. (Related story, Page 9.)

Hebrew University's Moshe Lissak, one of Israel's premier sociologists, says the changes underfoot are a watershed.

"The Likud plan is to sell 90 percent of government-owned industries. That will be the end-of

survival.

Matters of national security have continued to push social issues onto the back burner for almost half a century.

Nonetheless, Israel does offer such benefits as health insurance and free education - including college tuition - for all its citizens.

'In this political environment, privatization is not such a simple task.'

- Israeli businessman

Tax rates are high, but problems like homelessness are nearly nonexistent.

"Sweden was our model and we never achieved it, but I still think we achieved a lot," says Mr. Lissak. Still, he says the gap between rich and poor, one measure of a income distribution, is broad for a so-called socialist country.

owned companies," says Zeev Golan of Jerusalem's Institute for Advanced Strategic and Political Studies, an economic think tank. "That's not exactly massive privatization. Even if they succeed in privatizing everything, sometimes they'll sell only a portion of a company, so ... it's not really going to reduce the size of government."

End America's \$3 billion?

Mr. Golan suggests that Netanyahu can help liberalize the economy and strengthen its private sector by following up on the offer he made to the US Congress shortly after his election last year: to start weaning Israel off its yearly \$3 billion in aid.

"We get this huge amount of aid and loan guarantees, so the government has money to grow with and distribute at the expense of the private sector," Golan says.

Other critics complain that even of the privatizing Netanyahu has promised, too little has been accomplished while the government remains wrapped up in try-

97 DEC 5 AM 7:58

Ms. Betty Currie
Personal Secretary to the President of the United States
The White House
Washington, DC 20500

Daniel E. Ford
3441 H March Cr.
Bolling Air Force Base,
SW Washington, DC 20336
(202) 561-6174 or e-mail SilvrEagle@aol.com

Dear Ms. Currie, September 30, 1997

I am writing to ask a personal favor. I wish to see a picture of President and Mrs. Clinton or a letter that my wife did for the Clinton family.

My wife Marie custom framed some pictures in the summer of 1991 when they had a room redecorated in the White House Mansion. The interior decorator consulted by President and Mrs. Clinton in turn contracted Marie to mat and frame the selected artwork. Marie was given artistic license to color-coordinate the mats and wood frames to accentuate the art with the wallpaper and paint that were to be used in the room. We heard that the work was received with wonderful exclamations by the President and Mrs. Clinton.

Marie is on a
prestigious list of
Shalikashvili, S
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If there is
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Have you seen
this? This was faxed to
me today because he
had not heard from us!
B

Dan Ford

12-8-97

Don -
Can you have photo
"best wishes" to
AP'd Marie Ford
and then mailed to Daniel
Post. Thanks
Phil

12-4-97

Second copy
Carol -

'97 DEC 5 AM7:58

Ms. Betty Currie
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My wife Marie custom framed some pictures for the Clintons in the summer of 1991 when they had a room redecorated in the Governor's Mansion. The interior decorator consulted by President and Mrs. Clinton in turn contracted Marie to mat and frame the selected artwork. Marie was given artistic license to color-coordinate the mats and wood frames to accentuate the art with the wallpaper and paint that were to be used in the room. We heard that the work was received with wonderful exclamations by the President and Mrs. Clinton.

Marie is preparing to open a new business. She has developed a very prestigious list of clientele, including GEN Colin Powell, GEN John Shalikashvili, Senator James David Cane, and the president of The Country's Best Yogurt (TCBY). My hope is to receive a personalized letter or picture from all of those people. My wife has followed me in my military career and done outstanding custom frame jobs for many people. I would like to obtain the item(s) before her birthday, the 30th of December.

If there is any way you could assist me in my quest I would be very appreciative. Please contact me if there is any question or further assistance that is required.

Sincerely,

Dan Ford

The President and Mrs. Clinton
President and First Lady of the United States
The White House
Washington, DC 20500

Daniel E. Ford, Sergeant First Class, US Army
3441 H March Cr.
Bolling Air Force Base,
SW Washington, DC, 20336
(202) 561-6174 or e-mail SilvrEagle@aol.com

September 30, 1997

Dear Mr. President and Mrs. Clinton,

I am writing to ask a personal favor. I would like a personalized letter of appreciation or a personalized photograph of your family for my wife. She did some custom framing for a room you had redecorated in the summer of 1991. My wife Marie was contracted at the time by your interior decorator. Marie was given artistic license to color-coordinate the mats and wood frames to accentuate the art, wallpaper, and paint you selected. The decorator reported that you liked the work very much.

Marie is preparing to open her new business. She has already developed a prestigious list of clientele, including GEN Colin Powell, GEN John Shalikashvili, Senator James David Cane, and the president of The Country's Best Yogurt (TCBY). My hope is to receive a personalized letter or picture from all of the people named here. My wife has followed me in my military career and done outstanding custom frame jobs for many people. I would like to obtain the letters or photographs for her "Recognition-Wall." The goal is to have them for her birthday, the 30th of December.

My deepest thanks for your consideration of this request.

Sincerely,

Daniel Ford

12-8-97

THE WHITE HOUSE

WASHINGTON

'97 DEC 1 AM 9:56

November 24, 1997

MEMORANDUM TO THE PRESIDENT
FROM RAHM EMANUEL
SUBJECT STEPHEN COHEN MEMO

Attached is a memo from Stephen Cohen on the Iraq situation that I think you will find interesting.

Copied

Bergen

COS

EMANUEL

*Source
This is interesting
What do you think
Cohen's October
10*

M E M O R A N D U M

To: Rahm Emmanuel
From: Steve Cohen
Subject: Iraq vs. Saddam
Date: November 24, 1997

Five elements of the Saddam/Iraq situation must be teased apart to maintain pressure on Saddam and to restore a modicum of agreement between the US and the Kuwait coalition.

A) Weapons inspection must be complete and thorough. It must seamlessly segue into weapons monitoring once UNSCOM has met all goals about inspection and destruction.

B) Economic sanctions must be maintained until UNSCOM has fully satisfied its inspection and destruction goals and until monitoring is agreed and in place. The sanctions must segue into controlled economic activity in which the regime's preferred channels are supplemented if not supplanted by civilian merchants who predate the regime.

C) The oil-for-food arrangement should be expanded subject to a UN agreement that there will be no political contact with the regime other than to assure compliance with the remaining United Nations resolutions (such as return of Kuwait detainees). The agreement should include that there will be no high level contact (beyond the level of Foreign Minister) by any nation with Saddam at all. It is especially important to get Arab leaders to agree that any change on sanctions be accompanied by a tightening of a political quarantine on Saddam Hussein.

D) The no-fly zone for military aircraft should be over all Iraq and the civilian aircraft must be monitored for no transport of any military or dual use equipment or technology. In addition, the Security Council must insist on preventing any conventional military build-up of Iraq.

E) The key principle is to decouple the issue of sanctions from the notion of "getting to live with Saddam". There should be no getting to live with Saddam. On the other hand there should be a focus on getting the Iraqi people alive. This should focus on heightening interaction with the elements of Iraqi society in Baghdad and the rest of Sunni Iraq through economic channels. The emphasis should not be on exiles.

The Russians and French should be permitted to benefit from the economic relations with non-governmental merchant elements insofar as France/Russia and others tighten the political quarantine on the regime itself. This should be the quid pro quo with American allies/competitors. Let them play their economic game but as much as possible through old commercial channels not through the regime. Let the political/military lead stay American and become only more American, through the United Nations and through bilateral American actions and channels.

Rahm Emmanuel
Page 2
November 24, 1997

The alternative to dual containment:

IRAQ:

Finally, there may come a time when covert political discussions with Iraq will become the more pragmatic path for American interests. That will be the case when the United States is ready to make a major push for a comprehensive peace that encompasses more than an Israeli-Palestinian agreement. It is not there now. The stalling of the peace process should be the time to ratchet up pressure on Saddam, not lower it. This requires coordination with key Arab allies.

This coordination requires convincing ourselves and the Arabs to move to a more overt shunning of Saddam and a more open acceptance of the Iraqi people.

IRAN:

What is necessary now is a beginning of reassessment of dialogue with *Iran*. Here too the key is not to let the economic tail wag the political dog. It may not be possible to stop others from playing with Iran economically. If so rather than fighting a lost battle, it would be better to insist that the cost for France/Germany/Russia doing business with Iran is to stay clear of the political/military process by:

- ✓ (A) by shutting the door-- and the window --- on dual use technology;
- ✓ (B) by implementing some harsh penalty system for free lance technology bootleggers and advisors;
- ✓ (C) by letting the US take the lead on the military/political process.

The United States should step up the United States involvement and assert control of the terms of acceptance of Iran in international discourse. This should mean an American monopoly political/military with Iran.

THE PRESIDENT HAS BEEN

12-8-97

THE WHITE HOUSE

WASHINGTON

December 1, 1997

MEMORANDUM TO

THE PRESIDENT

FROM

RAHM EMANUEL

SUBJECT

CRIME SPEECH

① Memo on
Crime Speech
② Rahm
I like it esp memo #1
#2 is needed in it clearly
Police memo is clearly
but just punishment -
[IS]

Attached are two memos that Mark Kleiman prepared on crime and drugs. As I mentioned in my weekly report last week, I believe that you should deliver a speech outlining our efforts on the issues of crime and drugs. The speech would not put forth specific initiatives or policies but mark your overall philosophy based on what we have learned fighting these issues over the past five years. I think that the speech should be intentionally controversial. It should attack both the left and the right and should be written to create a debate on the issues of crime and drugs.

If you agree I can begin to work on getting a date on the schedule for such a speech.

Copied
Emanuel
COS

2 COPIES TO POTUS

agreed

UNIVERSITY OF CALIFORNIA, LOS ANGELES

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



UCLA

SANTA BARBARA • SANTA CRUZ

MARK A. R. KLEIMAN
PROFESSOR OF POLICY STUDIES
SCHOOL OF PUBLIC POLICY AND SOCIAL RESEARCH
3250 PUBLIC POLICY BUILDING
LOS ANGELES, CALIFORNIA 90095-1656
(310) 206-3234 Voice
(310) 206-0337 Fax
kleiman@ucla.edu

To: Rahm Emmanuel
From : Mark Kleiman
Re: Targeted Zero Tolerance and Crime Control
Date: November 6, 1997

Central point:

Using only existing knowledge and resources, the country could have a much smaller crime problem three years from now than it has now.

The important new idea is "targeted zero tolerance," also known as "getting deterrence right." It can work at the neighborhood level, focused on the petty crimes that create the atmosphere for major crimes (e.g., some of Bill Bratton's initiatives in New York), or at the level of the individual offender or offender group (e.g., the Boston Youth Gun Project and coerced abstinence for drug-involved offenders).

Either way, the three keys are focus, communication, and follow-through.

Focus means picking specific behaviors for zero tolerance and, where possible, identifying the individuals or groups most likely to engage in them. Communication means telling those people precisely what won't be tolerated and precisely what will happen to them if the lines are crossed. Follow-through means delivering the promised sanction every time. This requires using the resources and powers of all the elements of the criminal-justice system: not just police, but probation, parole, prosecutors, courts, juvenile authorities as well; not just the locals or the feds, but everyone together.

Key organizing ideas:

Disorder makes neighborhoods vulnerable to serious crime. Controlling disorder prevents serious crime.

Most serious offenses are committed by a small number of people. Controlling their behavior is therefore essential. It is also feasible, precisely because they are so active and thus so vulnerable to enforcement focus. Multi-offending and

probation/parole status make high-rate serious offenders manageable, if the system works in a coordinated fashion to use those handles. That rarely happens now.

Deterrent threats need to be communicated to the people they are intended to deter, on an individual, "This Means You" basis where possible. The threat needs to be specific about what behavior will trigger a response and what the response will be. Arrests and sentences are very poor communications channels. Don't strike the rock, talk to the rock.

Most offenders are reckless and impulsive. Low-probability deferred threats of serious punishment sometime in the future bounce off them (otherwise they wouldn't be offenders). We need high-probability threats of immediate punishment; if we can deliver on those, behavior will change even if the punishments aren't severe.

The resources of the police and the rest of the criminal justice system can't deliver sanctions for every violation of every law by every person. But they can deliver effective zero tolerance for specified violations by specified people.

Controlling group offending (as represented by youth gangs) requires group-level accountability. Tell the whole group that if any member commits a specified act (such as shooting someone) the whole group will become a zero-tolerance target with respect to any offense, no matter how petty. Then let the groups control their own members.

A convincing threat can deter much more behavior than could actually be punished. How does the mythical Texas Ranger face down an angry mob when he has only one bullet left in his gun? By letting everyone know that the first one who steps forward will get shot. No one wants to go first.

Neighborhood version:

Crime is going down for many reasons: more cops on the street, more high-rate serious offenders in prison, good people in high-crime neighborhoods getting together to stop the carnage.

We're also getting smarter about controlling crime. Community-based, problem-oriented policing has penetrated more and more deeply into the daily life of police departments around the country, thanks in part to the community policing requirement attached to the COPS grants but in greater part to the growing understanding among police officers and the leadership of police departments that community policing is the best way to do the job of crime control.

One of the key ideas behind community policing is "fixing broken windows." By refusing to tolerate low-level acts of disorder (vandalism, graffiti, public drunkenness, retail drug dealing) and by cleaning up physical signs of decay, we can send a signal to all potential violators that this block, this corner, this neighborhood are not places where "anything goes." That turns out to have a powerful effect on serious crime.

But simply announcing a blanket zero-tolerance policy is an empty gesture, and all the offenders know it even if the pundits don't. There's no way any police department could make an arrest every time some local ordinance is violated, and if they tried the result would be to gridlock the courts. What Bill Bratton's troops did in New York was to focus on a few specific kinds of disorderly activity: some city-wide, like "squeegeeing," but most on a precinct-by-precinct basis. The choice of behaviors for local zero tolerance was made by precinct management, in consultation with neighborhood residents and business owners. In every case, the target behaviors were well-publicized in advance. The goal was not to maximize the number of arrests (that's the idea behind "sweeps") but to get the level of the targeted activity as close as possible to zero as quickly as possible, using the minimum number of arrests necessary.

This variety of targeted zero tolerance makes neighborhoods more crime-resistant. Learning how to make it happen is a central element of doing community policing well.

Offender/group version:

Most serious crime is done by a relatively small number of offenders. Most of them are active in a wide array of crimes, large and small, and many of them are on probation or parole when not in prison. Multi-offending and conditional release give the criminal justice system potential handles that can be used to suppress the serious stuff, but traditionally those handles haven't been used very well; the fact that the police think that a particular probationer is behind a string of robberies tends not to influence how his probation officer handles him. Just recently, practitioners have learned how to use them in a different version of targeted zero tolerance, and the results have been spectacular.

The Boston Youth Gun Project identified about 1300 juveniles and young adults in 60-70 gangs as being responsible for virtually all of the youth gun homicides in Boston. The gangs were called in, one-by one, as groups, for meetings involving the gang unit, the drug unit, the Department of Youth Services, probation, the District Attorney, the State Attorney General, the U.S. Attorney, and the DEA and BATF.

Each gang was given the following message:

1. We know who you are.
2. We know what you're doing, and most of it is illegal. You're playing hooky, you're violating your probation curfews, you're stealing, you're selling marijuana, you're drinking out of open containers, you're driving unregistered cars, whatever.
3. We can't stop all of you all the time.
4. We can stop any of you anytime we want. If all of us work together to enforce all of the laws and probation conditions you guys violate, you won't be able to function for a day. This doesn't mean we're going to violate your rights or harass you; it just means that every time one of you does something illegal he's going to pay for it. You won't have any fun or make any money.
5. Here are the rules: Nobody gets shot. Nobody gets stabbed.
6. If you violate the rules, we'll know. We know who is feuding with whom, and if someone from the Elm Street gang show up with a hole in him we'll know it was one of you Beech Street guys.
7. At that point, we're all over you like a cheap suit, and we won't let up until you say "uncle" and turn in all your guns.
8. There's no deal here: just a threat. As long as you keep doing illegal stuff, you're vulnerable to arrest or other sanctions, and we're not giving you a pass. But if you break the rules, we promise you'll pay for it.

After this series of meetings, there were two shootings (neither fatal). In each case the gang involved was identified and targeted. In each case, they eventually gave in and handed in their guns. The task force then went to all the adjacent gangs, explained that Gang X had broken the rules, been spanked, and had now knuckled under, and explained further that any act of aggression against Gang X would subject the gang responsible to the same treatment. ~~XX~~ This was perhaps the key move: making it safe to disarm.

One especially violent outfit that made it clear they didn't intend to comply was taken out by a DEA undercover operation that will have all its key players doing long federal sentences, except for the ones who wind up doing even longer state murder sentences based on one another's testimony.

There hasn't been a youth gun homicide; over that period, the expected number would have been more than thirty. Everyone is breathing easier; not only juveniles, but adults, are less prone to carry guns now that the gangs are no longer shooting up the town.

A similar program in Minneapolis, started this summer, has had similar results. At the individual-offender level, Lowell, Mass., targeted the sixty people most active in committing aggravated assaults, and the rate of that crime fell by two-thirds. An earlier, less formal project brought homicides in

the Chicago's Cabrini-Green housing project down from more than 100 per year to fewer than five. This isn't just a cute idea anymore; it works, and we know how to do it.

This approach is not an alternative to community policing. It assumes that the police have detailed knowledge of who is doing what to whom, a focus on problem-solving rather than arrest-maximizing, and a broad definition of their mission and their potential allies. All of these are characteristic of community-policing departments.

Coerced Abstinence for Drug-Involved Offenders

Reducing drug use and crime by drug-involved offenders on probation and parole by requiring abstinence from illicit drug use, frequent drug tests, and immediate sanctions for violations relies on the same logic as other targeted deterrence programs: specifying behavior to suppress, singling out a group to be forced to comply, and using certainty and swiftness rather than severity to control their behavior.

Administration role:

These programs don't usually need much outside money or manpower; the idea is to focus the resources already present. They do need, or at least benefit from, cooperation by the U.S. Attorneys and federal enforcement agencies, but that has been forthcoming. (Boston started out as a Treasury Enforcement initiative.) DC would be a good testbed, but not until it has a functioning police department.

It would be useful to have some funding for conferences, training, and, most of all, technical assistance. Small dollars, big impact.

But the real opportunity is to put the concept in the public eye, with everybody leading the cheers: the President, the AG, the VP, Louis Frech (maybe), Ray Kelly. "Getting deterrence right" puts some meat on the bones of being smart rather than just tough. Or rather, it shows how to be tough intelligently and compassionately, and elides the distinction between "enforcement" and "crime prevention" by using enforcement to prevent crime.

Lots of outside people would happily sing in the choir: Bratton himself, who would love some opportunities to get back into the national media, Paul Evans, the Boston Police Commissioner, other police chiefs and prosecutors, mayors like Rendell in Philadelphia and Goldsmith in Indianapolis, academics such as Blumstein, Wilson, and DiIulio. This stuff, especially the Boston story, makes great press and could generate lots of columns, talk shows, etc., if the Administration helps give it a high profile. Jeremy Travis at NIJ would gladly help on the research.

and research-promotion end. (I've got a panel on the topic at the American Society for Criminology meetings in San Diego two weeks from now, and can help lay the groundwork.)

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nu* [A very ambitious version of this could involve a White House Conference on Crime Control where the new gospel would be preached. The point would be to say that crime control is no longer something that would be nice if we could get it; it's now available if we just do what we know how to do. One result would be to leave the pure lock-'em-up types on the Hill looking shrill and irrelevant.

Given that crime control is possible, it gets to be the centerpiece of any serious assault on urban poverty. Of all public services, protection from serious crime is the most unequally distributed by race and class, and the level of crime risk in urban poverty areas is one major reason why jobs there have been disappearing for a generation. As long as there wasn't anything sensible to do about it, there was no point explaining how nice crime control would be if we knew how to do it. But now we know.

Declining crime numbers make a good context for this, but we shouldn't bank too heavily on them. What goes down may come back up, and the demographics over the next decade are strongly against us. The best use of the good news is to make some political space for really intelligent crime control policy.

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A THIRD WAY IN DRUG ABUSE CONTROL

Mark A.R. Kleiman

Much of the damage now done by drug abuse, drug dealing, and drug control efforts in the United States is avoidable. Using only existing knowledge and resources, the nation could have a much smaller drug problem five years from now than it now has. That conviction stands behind a new effort mounted by the Federation of American Scientists and endorsed by some forty experts in drug research, drug policy analysis, and law enforcement. Its first effort was the publication of a set of fourteen "Principles for Practical Control Policies." [See box for excerpts and a list of signers.]

Along with Robert MacCoun of the Graduate School of Public Policy at Berkley and Charles R. Schuster of the Wayne State University Medical School, I helped organize the group and draft its first statement. We plan to organize a number of working groups to prepare detailed policy statements on a number of specific topics, including sentencing, retail law enforcement, treatment, and alcohol regulation.

This essay reflects some of the thinking behind that project. However, while the Principles statement was so thoroughly collaborative an effort that it is no longer possible to assign individual authorship to its sections (the penultimate draft bore the heading "Draft S" and a date almost nine months later than the date of "Draft A"), what follows is very much an individual statement and is the responsibility of its author alone.

"Hawks," "Doves," and the Struggle over Drug Policy

The major barrier to more effective drug control policies is that effectiveness - measured in terms of damage control - is not at the center of policy-making in this arena. Discussion has instead been dominated by a strongly ideological polarization about how to deal with the subset of abusable, addictive, and/or intoxicating substances that also are illegal (or restricted to medical uses alone). At one pole are the advocates of stricter controls, increased enforcement, harsher punishment, and school-based and mass-media efforts to "denormalize" non-medical consumption of those substances: advocates, in the unavoidable jargon phrase, of a "war on drugs." At the other pole are those who are more afraid of anti-drug efforts than of drugs, who therefore favor relaxed controls. In the logical extreme, this tendency

points toward repeal of the controlled substances laws themselves, that is, "legalization."

The stylized combat between "warriors" and "legalizers" is convenient, both for journalists and office-seekers and for the partisans at the two polar extremes. For journalists, it provides an easy set of categories and a source of battling quotations or dueling experts. For office-seekers, it sets up a no-lose situation. Since support for legalization, even of cannabis, remains safely below the 25% mark, if the only options are "drug war" or "legalization" the choice isn't a hard one. For the partisans, the actual horrors of the current situation serve as a firm rhetorical basis from which to attack the other side: as testimony to how much evil would be averted by repeal or, from the other viewpoint, as a both reminder that half-measures are inadequate (there is no substitute for victory) and a faint indication of the extent of the damage illicit drugs would inflict if made even more widely available by legalization.

Against these conveniences of the warrior/legalizer analysis of drug policy must be set some disadvantages. By focusing on the currently illicit substances, it removes from the debate over "drug policy" the question of what to do about alcohol, which entraps several times as many addicts and accounts for considerably more crime, disease, fetal damage, and death than all the illicit drugs combined, and about nicotine in cigarette form, which while not intoxicating is astonishingly addictive and roughly doubles the mortality rate of its addicted users at any given age. Excluding them from the debate makes it possible to be strongly against "drugs" without supporting higher taxes on beer or cigarettes. But thinking about drugs while excluding alcohol and nicotine is a little like thinking about oceans while ignoring the Atlantic and the Pacific. For each of these licit substances, control measures (not the same ones) well short of those now applied to the "controlled substances," and not requiring even a fraction as much enforcement effort, could prevent enormous suffering among users and non-users alike.

The warrior/legalizer polarization also conceals the reality that neither an unreflective tightening nor an unreflective loosening in current measures aimed at the illicit drugs is likely to improve matters. The shape of the function relating total social damage to the overall tightness of drug controls remains not merely an unexplored question but an unasked one. In particular, how it slopes near the current level is quite unknown. In the abstract, there is no reason to think either that doing more of the same will produce a radically better result or that, where a fairly heroic dose has failed to cure, a homeopathic dose will succeed. But there is every reason to think that a variety of changes, some in the direction of tightening and others in the direction of loosening, would markedly improve the overall situation.

The metaphor of "drug war" has, perhaps inevitably, generated "hawks" and "doves" as an alternative set of labels for the two poles. These labels have stuck in part because this version of the struggle over drug policy is conducted along substantially the cultural and ideological fault lines that characterized the anti-war movement. The pro-war/short-hair/jock world view and sensibility are as recognizable at meetings of drug-war "hawks" as the anti-war/long-hair/hippie world view and sensibility are at gatherings of those who call themselves "drug policy reformers." (Even back then, someone suggested that at least the on-campus aspect of the Vietnam issue had less to do with "hawks" and "doves" than with "jocks" and "freaks.")

In this instance, however, the hawks have had very much the better of the political confrontation. While discontent with the performance of the anti-drug effort is quite widespread, the legalization option has consistently failed to catch the public imagination other than as a bogey-man. Legalization advocates draw some comfort from the widespread support they enjoy among some elites, noticeably academic economists and law professors, and the unmeasured but substantial "underground" legalization constituency among judges, prosecutors, and police; they can also reflect that support for the Eighteenth Amendment remained strong until almost the end, and hope for a comparable turnaround as a result of a major scandal or the sudden accession of a few very prominent leaders to their cause. In the meantime, however, the public doesn't seem to be at all receptive. The political sociology and psychology of why this should be so is a fascinating question, but the situation stands, with no current hint of any substantial change.

Moreover, the drug-war doves have consistently failed to come up with any coherent description of post-prohibition control regimes or any plausible predictions of the extent of drug abuse and drug-related damage under alternative policy scenarios. They tend to assume new regimes with the magical property of exerting all the consumption-reducing powers of the drug war with none of its costs. Their speeches and publications tend to be long on horror stories about the present and future if prohibitions are maintained, but short on the details of the "taxes," "regulations," "educational campaigns," and programs to abolish poverty and racism that are to replace those prohibitions. To unsympathetic ears, they sound like nothing so much as Marxists asked what practical arrangements are to replace capitalism or libertarians asked how, precisely, the minimal state is to handle air pollution and the maintenance of city streets or keep the improvident and unfortunate from starving. In particular, the drug policy reformers, like their drug-warrior opponents, have been virtually silent about how to control the carnage and other suffering associated with the currently legal drugs.

Thomas Szasz continues to say what he has always said – that an unregulated market in psychoactive drugs would lead to a substantial increase in the number of people who severely damage themselves with such drugs, and that such an increase is a price worth paying for freedom – but he remains cheerfully marginal, with few drug-war doves capable of matching his clear-mindedness or willing to copy his apparent hard-heartedness.

Harm reduction as slogan and policy

With the legalization campaign largely bankrupt both politically and intellectually, the anti-prohibition forces have fallen back on a strategy of piecemeal attacks on current policies, under the general rubric of “harm reduction.” As a result, this innocent-sounding label has become highly ideologically charged.

To understand how it is that someone could be against “harm reduction” requires a little simple algebra.

Let us imagine that the total damage done by drugs and drug control efforts under a given set of policies and surrounding social conditions could be measured as a single quantity. Call that quantity D , for (total) “Damage”; it might be measured in lives, or dollars. Imagine also a single number measuring the extent of drug use; it might be the total number of dosage units consumed, or the total number of users, or some more complicated measure. Call that quantity U , for “Use.” Dividing D by U , we have the ratio of damage to use, which we can think of as a measure of the tendency of drugs, under those policies and social conditions, to create damage; call that H , for “Harmfulness.”

Concretely, imagine society X in which the use of alcohol is widespread, and society Y in which it is rare; if the total damage D associated with alcohol in the two societies were equal, we would say that alcohol is more harmful in Y than in X , because the ratio of aggregate damage to use is higher. Prohibition of alcohol, for example, would be expected to reduce use but increase the rate of harmfulness in a variety of ways, from creating illicit markets to weakening informal social controls of moderation in drinking. To a lesser extent, so would heavy taxation, which would shrink consumption by increasing price but at the same time make any given level of drinking that much more difficult economically for low-income heavy drinkers. Conversely, lower taxes, or the repeal of prohibitions, would be expected to increase use but reduce harmfulness. In each case, much would depend on the details of policy and of user behavior; more than abstract theorizing is required to determine whether a particular policy would push aggregate damage up or down.

To favor drug control policies that minimize total damage is merely to apply to the drug problem the general rule of policy analysis dictating that policies be judged by their (likely) results. Holding use constant, anything that reduces harmfulness ought to be welcome, since if U is fixed and H falls, $D = U \times H$ must fall in proportion.

But that is precisely the fly in the "harm reduction" ointment. There is no reason to think that drug use, however measured, is a fixed quantity in the face of policy changes. In general, if those who use drugs are at all rational, one would expect that any reduction in the harmfulness of drug-taking to them would lead, all else equal, to an increase in the level of use. So it will not in general be true that reducing harmfulness will reduce aggregate damage; that will be true only if a given reduction in H does not lead to a more-than-proportionate increase in U .

Of course, any given program to reduce harmfulness (what MacCoun has called "micro harm reduction") may in practice contribute to reducing aggregate damage ("macro harm reduction"), even if it were to increase use somewhat. I can think of several good candidates, including the familiar "designated driver" campaign (which aims to reduce not drinking, or drunkenness, but only the probability that a given drinking incident will lead to a car crash) or changes in law and police practice designed to reduce the extent of needle-sharing among injection drug users. Many "doves" believe, sincerely and not unreasonably, that current policies tend to over-emphasize reductions in drug use at the expense of opportunities to reduce harmfulness. But those who interpret "harm reduction" in terms of micro harm reduction alone reject out of hand any policy that would reduce aggregate harm by reducing use, and it is hard to believe that no such opportunities exist. This has fueled suspicion among drug war "hawks" that the "doves" are merely trying to seize a fine-sounding slogan, especially in light of the indiscreet statement by the head of a prominent "drug reform" group that "Harm reduction is what we're calling legalization now." Those who favor macro harm reduction - minimization of aggregate damage - are left with an unpleasant choice between abandoning a useful term to the harmfulness-minimizing extremists or using it and risking being confused with them.

But the fury with which the drug warriors have attacked "harm reduction" as an idea is not entirely attributable to this suspicion, or to the perhaps justified concern that measures intended to reduce harm without increasing use will go awry. Just as many of the micro-oriented "harm reduction" advocates oppose attempts to reduce aggregate damage by reducing use, many "use reduction" advocates oppose attempts to reduce aggregate damage by reducing harmfulness. Psychologically, there is no great distance between thinking that drug use is a dangerous practice and ought to be discouraged in order to avert harm and feeling

that drug use is an evil practice whose practitioners deserve all the harm that can be made to come to them. The generational and cultural baggage which the drug issue carries merely adds to the tendency for disapproval of drug use to shade over into hatred of drug users and dealers.

The political controversy over needle exchange programs illustrates this phenomenon. Several careful studies have found that exchange programs not only reduce HIV transmission but increase the rate at which participants enter treatment, and there is no evidence whatever that needle exchange does anything to increase the rate of needle initiation or the consumption rate among those who do inject. Yet the Congressional ban on funding such programs remains, and the relevant officials remain unwilling to provide the certification of benignity that would clear the way for such funding.

It is possible to be unenthusiastic about publicly-supported needle exchange efforts on pragmatic grounds. There are several reasons to think that small-scale, voluntary efforts might outperform large-scale publicly funded ones. Other means of outreach to injection drug users might be equally effective in changing behavior while creating much smaller political problems. Changes in police practice independent of needle exchange - especially the cessation of arrests for possession of injection equipment - might have comparable potential for changing sharing behavior. Even the scientific evidence, while unanimous, is not quite conclusive.

But it is not on these grounds that the Helms Amendment rests. The Archangel Gabriel could appear on the Senate floor with a scroll written in letters of fire attesting to the fact that needle exchange reduces drug abuse as well as disease transmission without noticeably changing the politics of the situation. It is the sense that needle exchange represents a compromise with heroin addiction, rather than any actual undesirable side-effects it might have, that keeps it controversial. It would be unkind, but not unfair, to say that the continuing opposition to needle exchange programs expresses a preference that injection drug users who cannot or will not quit should die, as painfully as possible.

Only by liberating ourselves from the illusions of "harm reduction" in its harmfulness-fixated "micro" sense and "use reduction" as preached by those who still pretend to believe that America could become "drug free" can we develop practical policies to shrink the total damage drug abuse, drug dealing, and drug control measures do to individuals and institutions.

Prevalence Measurement as a Policy Trap

The dominance of the "use reduction" viewpoint is both illustrated and reinforced by the extent to which measures of prevalence, especially the prevalence of self-reported illicit drug use among adolescents, as measured by the annual Monitoring the Future surveys, dominate public discussions of the effectiveness of drug control policies. That dominance is unfortunate for at least three separate reasons, even putting aside concerns about the accuracy of self-reports not verified by any chemical test:

- Prevalence in the use of any drug is a poor proxy measure for aggregate damage.

Most users of most drugs (cigarettes and heroin are the prominent exceptions) are occasional users, suffering little damage, doing little damage to others, and contributing little - even in the aggregate - to the illicit markets. The highly skewed distribution of drug consumption means that a relatively small number of individuals on the right tail of the distribution account for most of the activity and most of the damage. If the shape of the distribution were fixed, reducing the total number of users would reduce the size of the right tail proportionately, but there is neither theory nor evidence to suggest such a fixed relationship. Thus, for example, the dramatic decrease in the prevalence of cocaine use since 1986 has not been accompanied by any detectable shrinkage in volume consumed or aggregate damage; rather, volume and damage continued to rise until about 1989, even as prevalence fell, and at best have fallen slightly since despite sharp continuing declines in prevalence.

- Illicit-drug prevalence numbers, especially among adolescents, are dominated by those who use marijuana only, and relatively modest amounts of that. While the damage associated with heavy, chronic marijuana use is far from negligible, aggregate marijuana-related damage represents a small proportion of the total illicit-drug problem. Again, if there were a fixed proportion between cannabis use and the use of more dangerous drugs, as postulated by the strong form of the "gateway hypothesis," or even if there were some weaker tendency for marijuana use to increase vulnerability to the use of harder drugs, shrinking the number of adolescent cannabis users would be a powerful way to reduce total drug-related damage; but again, there is no convincing theory nor evidence to suggest that the observed correlation between marijuana use and the use of other drugs has any causal significance.
- Like other fashions among adolescents, the use of various psychoactive substances varies wildly over time, for reasons very imperfectly understood and in patterns not easily manipulated. Even as apparently substantial an intervention as the decriminalization of marijuana by several states in the 1970s seems to have left very little measurable trace on rates of adolescent marijuana

use in those states. The relationships between current policies, especially at the national level, and prevalence rates are probably even weaker, and in any case entirely obscure. Thus using the Monitoring the Future numbers as scorecards for the performance of the current national Administration is utterly inappropriate.

The Means of Drug Abuse Control

Conceptually, the elements of explicit drug abuse control policies can be listed under five headings:

Legal restrictions on supply and consumption (regulation, taxation, prohibition);

Law enforcement to give effect to those restrictions;

School-based, community-based, and mass-media efforts to persuade potential drug users not to start (called, conventionally but not quite accurately, "prevention"); and

Efforts to persuade, help, and coerce current users to cut down or quit (conventionally but again inaccurately, "treatment").

To this catalogue must be added an often-omitted fifth category: policies not aimed directly at explicitly at drug abuse control, but whose operation serves to reduce drug-taking or its unwanted consequences. (One way to reduce drunk-driving fatalities is to build safer cars and highways; better job opportunities, or stronger conventional values - if we knew how to provide either one - might reduce drug dealing among poor adolescent males.)

Understanding the roles and limits of these elements in reducing drug damage is the meat of drug policy analysis as a practical enterprise. That understanding is made difficult by a combination of genuine complexity, ideological preoccupation, and organization and professional self-seeking.

While the oversimplified categories of "licit" and "illicit" break down under close examination - sufficiently high taxes or tight regulations are not practically distinguishable from prohibitions - laws restricting availability and increasing price are nonetheless of great importance. Relatively modest changes in price levels brought about by taxation have measurable impacts on consumption of alcohol and nicotine, and especially on initiation rates among the young. Prohibition, even in the absence of aggressive enforcement, tends to suppress consumption not merely

by increasing prices but by decreasing the ease of access, especially for new users. These effects – what Peter Reuter has called “the structural consequences of product illegality” – are illustrated both by American alcohol prohibition and by Dutch cannabis policy, where despite the *de facto* legalization of the retail trade the price of a gram of cannabis is not markedly lower than in the United States.

Once a drug is prohibited, and that prohibition is enforced sufficiently to prevent flagrant retail distribution, the potential contribution of additional enforcement to reducing its consumption may not be very large. That potential is greatest for drugs which have not yet achieved mass-market status and in “border” zones between areas where more or less open illicit distribution flourishes and areas where such distribution is absent. In general, however, the phenomenon of market replacement – new dealers entering the trade or current dealers expanding their business to fill the market niches left by dealers deterred by enforcement or incapacitated by imprisonment – puts strict limits on the value of enforcement as a means of drug abuse prevention.

Xp What well-designed and competently-executed enforcement can do, however, is greatly reduce the neighborhood impacts of illicit markets, by creating pressure on dealing organizations to deal discreetly and to avoid the employment of adolescents and the use of violence. Careful economic and operational analysis can identify specific tactics to put identified open markets out of business. Enforcement aimed at maximizing the number of arrests or the number of felony convictions, and sentences based largely on drug quantities and such irrelevancies as being within some given distance a school, sacrifice these opportunities. For example, there is a federal statute creating an enhanced sentence for a dealer who employs a minor, but the quantity-based mandatory sentences are so harsh that the enhancement is very rarely pursued, leaving dealers with no effective incentive to avoid minors as employees.

The anti-drug persuasion effort (usually referred to as “prevention,” as if the laws and their enforcement did not serve to prevent drug abuse) is virtually everyone’s conceptual favorite. The problem is learning how to do it, actually implementing programs that successfully replicate proven prototypes, and finding out whether the effort worked. The first two would be enormously difficult in any event, but that difficulty is multiplied by the enormous complexity of the last. Since severe substance abuse disorder (especially involving illicit drugs) is a rare outcome, and one that typically develops several years later than the ages at which school-based programs typically work, outcome evaluation represents a huge challenge.

The easily-measured outcomes, since they involve common and early occurrences, are the rates and ages of initiation for alcohol, nicotine, and marijuana,

but there is no strong reason to believe that all, or only, programs that succeed on these measures will succeed in reducing the incidence of serious drug problems. For example, the popular and widely-implemented DARE program, which brings police officers into fifth-grade classrooms for thirteen hours of instruction focused largely on the social skill of refusal, has consistently failed to show benefits in delaying the onset of drug use, but one recent study shows that DARE students are less likely than matched controls to take up the use of cocaine or inhalants several years later.

Even if more were known about how to deliver anti-drug messages in classrooms, actually getting it done with actual school personnel would represent an daunting challenge. (Recall that the "New Math," as delivered by highly skilled and highly motivated pilot-program staff, was a well-documented and successful program.) As to mass-media efforts, their proven efficacy in reinforcing anti-drug sentiments among adults who do not themselves use illicit drugs has not been matched by any demonstration that they influence the behavior of current or potential drug users.

Some anti-drug persuasion efforts almost certainly produce measurable benefits, and benefits well in excess of their costs. But the hope that any feasible persuasion effort can produce age cohorts with markedly less propensity to get into trouble with drugs than current cohorts seems unjustified. There may be a good case for aiming more effort at earlier ages and addressing the broader problem of impulse control and health-risk avoidance rather than drug abuse specifically.

The transition away from frequent, high dose use of psychoactive drugs is often a difficult one; that's what the term "addiction" means. External assistance, in the form of help, advice, exhortation, medication, and pressure, can increase both the number of attempts to quit and their success rate. For many of those who have had severe drug abuse problems, the recovery process will involve more than learning how not to abuse drugs; they also need to reintegrate themselves into the entire fabric of family, living space, neighborhood, and workplace relationships that they have been neglecting, and in some cases to catch up on pieces of education and maturation that were omitted in an alcoholic or otherwise drug-induced haze. It is conventional, but far too simple, to speak in terms of "drug treatment;" while it is true that formal treatment can help in the recovery process, it is also true that most people who have, for some substantial period, smoked cigarettes or used intoxicants on a more-than-daily basis, no longer do so, and that only a minority of those ex-abusers have had any formal drug treatment.

While long-term cessation is a highly desirable goal, and for most ex-drug abusers probably represents the only stable healthy state, imperfectly successful quit

attempts also have benefits, in the form of reduced drug consumption and drug-related harm during the attempt and for some time following it. The conventional evaluation of treatment efforts in terms of the percentage of their graduates who remain entirely abstinent a year later misses this important class of benefits. Worse, it gives program managers a strong incentive to seek out and serve low-cost, high-recovery-probability clients rather than concentrating on those whose problems are causing the most damage. Far better to evaluate programs in terms of their ability to reduce the absolute level of drug-related damage to those they treat and to surrounding individuals and institutions.

XX (Evaluated as a crime-control measure alone, providing drug treatment for criminally-active addicts is strikingly cost-effective. Yet publicly-funded drug treatment remains scarce, and is frequently of poor quality. The lack of effective political pressure to remedy the situation has many causes, including some internal to the treatment programs themselves and the public agencies which manage them, but reluctance to do anything for the hated class of drug abusers surely accounts for a substantial part of the problem. The focus on prevalence as the single measure of drug control success also plays a role; because they concentrate on the minority of problem users, treatment and related activities have little impact on the total number of drug users even when they dramatically reduce total damage.

XX (Expanding drug treatment and making sure that it is available to the right people is one way to shrink drug-related harm on the right tail of the distribution. Another is to use the coercive pressure of the criminal justice system to induce reductions in drug use and drug-related crime among probationers and parolees. With heavy users accounting for about 80% of cocaine and heroin volumes, and last year's arrestees including about 75% of heavy heroin and cocaine users, it seems probable that as much as 60% of the cocaine and heroin sold in this country goes to people who are nominally under criminal-justice supervision. Drug courts and drug-diversion programs are useful efforts in this direction, but limited in scope and scale. It is possible that making frequent drug testing - with immediate and predictable, even if mild, sanctions for each missed or "dirty" test - part of routine supervision for drug-involved probationers and parolees could make a major dent in the illicit markets and in drug-related crime. Here again, the problem is to take an attractive concept that seems to work well in pilot programs and operate it at a scale big enough to matter.

Current Drug Control Efforts

(Drug law enforcement, including prison cells to hold convicted drug offenders, accounts for something like three-quarters of the estimated \$35 billion in annual public-sector drug abuse control expenditures. At any given moment,

* approximately 400,000 Americans are behind bars for drug law violations, and in the poverty areas of many big cities noticeable fractions of all the young men are, or have recently been, so confined. If one could, by some heroic feat of measurement, weigh the total suffering caused by illicit drug abuse against the total suffering caused by incarceration for drug-law violations, it is not at all clear which side would be heavier. While most of those imprisoned for drug offenses also commit non-drug offenses, it appears that on average they do so at only about half the rate of those locked up for "predatory" crimes. Consequently, the expansion of drug-related imprisonment has probably had the tendency to increase crime by reducing the incapacitative effectiveness of the average prison cell.

There is a shocking lack of evidence that this very substantial expenditure of resources and infliction of pain is matched by any proportionate impact on drug abuse or drug-related harm. The price of cocaine is substantially lower now than it was fifteen years ago, even though the number of cocaine dealers imprisoned has increased by an order of magnitude over that period. Even more shocking is the lack of curiosity about the effectiveness of enforcement: it is as if the punitive process needed no external justification.

In a pale reflection of the hawk-and-dove battle over legalization, there is a long-standing quarrel over the appropriate shares of the drug abuse control budget. Here the "dovish" camp - by no means restricted to those who favor wholesale revision of the drug laws - favors expanding the share of treatment at the expense of enforcement. (Everybody talks about prevention, but nobody does much of anything about it in budgetary terms.)

There is a good case to be made for expanding drug treatment, and another good case to be made for shrinking (and, more importantly in my view, redirecting) drug law enforcement. But the conclusion often drawn - that drug law enforcement dollars ought to be redirected to treatment - does not follow from these premises and is probably incorrect.

The "drug budget" is an artifact of measurement. No one actually has a fund of \$35 billion to allocate to among drug law enforcement, drug prevention, and drug treatment. Rather, spending for drug abuse control comes out of appropriations to law enforcement agencies, schools, and a variety of health-care and social-service agencies, including the state departments of alcohol and drug dependency which in turn buy services from private, largely non-profit, treatment providers.

The total national health-care effort totals about \$1 trillion. Between public programs such as Medicare and Medicaid and the tax subsidy to employer-paid health insurance, about half of those dollars come from the public fisc. If drug

* treatment is under-funded, that is because it gets a tiny share of a colossal "health budget." By contrast, the national law enforcement and criminal justice effort totals about \$125 billion. If drug law enforcement is over-funded, that is because it gets a generous share of a much smaller "law enforcement budget." On this analysis, the case for moving money from drug enforcement to drug treatment seems quite weak. If more resources are needed for drug treatment - as I believe they are - why should they not come out of the health care sector? If resources can be saved by reducing drug law enforcement, why should they not be redirected to, say, reducing the proportion of homicides which go unsolved from the current 35% to the less than 10% which was the national average a generation ago?

* Thus cutting drug law enforcement is neither a necessary nor a sufficient condition for increasing drug treatment; even if one wanted to redirect drug law enforcement spending into drug treatment, the budgetary mechanisms are simply not there to make the transaction work. Getting health care providers and their financing mechanisms to pay appropriate attention to substance abuse - including the large proportion of substance abuse that occurs in relatively mild forms among those who are not socially disposed, and that can be substantially reduced if primary-care physicians are trained and induced to make appropriate early and brief interventions - will require a mammoth effort. That effort must embrace changes in medical education and certification, the management of health insurance programs and health maintenance organizations, policies of public providers of health services or health insurance, and the health-coverage purchasing behavior of employers and their labor unions. The sooner we stop playing budgetary games instead, the sooner we can get to work.

The Licit Drugs

The political transformation of the tobacco issue over the past generation, but more strikingly in the past five years, has created conditions under which it may be possible to make a serious run at reducing the level of tobacco-related disease. But how far we are from treating even the least popular of the licit addictive substances as if it were a "drug" is illustrated by the proviso in the proposed "global tobacco settlement" that conditions the FDA's authority to regulate nicotine content on a certification that any such regulation would not create any "substantial market in contraband."

* In any case, it seems likely that significantly higher cigarette prices are on their way, perhaps along with subsidies for smoking-cessation programs. (Amazingly, most health insurers will not pay for the nicotine patch; the turnover in their subscriber pools, and their reluctance to offer benefits that might attract smokers onto their rolls, makes it financially imprudent for them to do so, despite

evidence that the patch roughly doubles the success rate of unassisted efforts to quit smoking.) Whether anything else will be done for the large population of strongly addicted smokers, especially the elderly poor remains to be seen. Some sort of exemption from higher cigarette taxes for smokers over a certain age and under a certain income level would be easy to justify, but the most likely outcome, as reflected in the proposed settlement, is that they will be allowed to add impoverishment to the other harms they inflict on themselves by continuing to smoke. Even a licit-drug addict, it seems, gets little sympathy or help.

Part of the reason anti-smoking sentiment may be expressed in legislation is that most smokers are addicted and hate both the fact that they smoke and the companies that supply them. (In this, smokers resemble heroin addicts.) Efforts of the tobacco companies to create a "smokers' rights" movement have proven signally unsuccessful. By contrast, most people who drink alcohol (like most people who smoke cannabis) are controlled users and satisfied customers, much easier to mobilize against any increase in price or decrease in availability for their favorite mind-altering chemical. That makes the prospects for higher taxes on alcohol much dimmer. Bolder measures, such as public service advertisements directed against drunkenness (as opposed to drunken driving or underage drinking) or an effective ban on the sale of alcohol to those convicted of drunken driving or drunken assault seem even more remote. On the other hand, the widely violated ban on sales to, or use by, minors, and the definition of the age of majority for that purpose as 21, remain sacred cows.

Conclusion

Anyone who expresses real optimism about the prospects for significant drug policy improvements in the short run might reasonably be asked what he has been smoking (or drinking). The forces that support the current unsatisfactory set of policies and outcomes cannot be wished out of existence.

Yet the gap between actual performance and optimal performance - between what we now do and what we know how to do - is too wide to tolerate. Elite and mass dissatisfaction with the situation, albeit unfocused, may be too widespread to ignore. Many officials, given adequate cover against the dreaded charge of being "soft on drugs," might be willing to try something new. Under these conditions, pointing out a "third way" between the warriors and the legalizers seems worth a try. Even where optimism seems unjustified, hope remains a virtue.

THE PRESIDENT HAS SEEN

12-8-97

Private Program to Match Savings for Poor

Associated Press
Thursday, September 25, 1997; Page A26
The Washington Post

Some 2,000 poor people who manage to save money -- even if it's just \$10 or \$20 a month -- would have their contributions matched under a new private program aimed at giving needy Americans the same incentives to save as the middle class.

The \$12 million program, funded by a coalition of foundations, will allow 2,000 people in 12 cities to open individual development accounts. The money could be used only to buy a house, pay for education or start a business.

It is a twist on welfare policy, which traditionally has limited recipients' bank accounts on grounds that someone who has savings does not need welfare.

That policy has kept people poor rather than kept them off the rolls, said Robert Friedman, chairman of the Corporation for Enterprise Development, which is coordinating the project.

"We have spent on the poor, but we have not invested in them," he said yesterday. "We do not really offer paths out of poverty."

A bipartisan coalition in Congress is pushing a bill to spend \$100 million over four years to create 50,000 accounts. Backers included Sens. Dan Coats (R-Ind.) and Tom Harkin (D-Iowa) and Reps. John R. Kasich (R-Ohio) and Tony Hall (D-Ohio).

The four-year private program will begin next year with two sites in Chicago and one each in Fond du Lac, Wis.; Ithaca, N.Y.; San Francisco; Washington; Austin, Tex.; Barre, Vt.; Indianapolis; Kansas City, Kan.; Portland, Ore.; Berea, Ky.; and Tulsa, Okla.

Supporters noted that the government provides incentives for middle-class Americans to save. Tax deductions for

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mortgage payments, individual retirement accounts and other incentives cost \$200 billion a year, Friedman said.

In recent years, many states have loosened their welfare rules to allow more savings. And 24 states have opted for a provision in last year's welfare law allowing them to disregard money in these individual accounts when determining if a family qualifies for benefits.

Individual development accounts have been tried in a few cities, including Chicago and Indianapolis, but the initiative announced yesterday is the first well-funded, large-scale effort to encourage people who have little money in the first place to put some of it away.

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30 TIMES EACH DAY

30 TIMES EACH DAY

yyyyyyyyyyyyyyyyyyyyyya

I'm simply being pompous in thinking you need to waste your time reading this -- but it makes for good bathroom reading!!!!

I forgot to mention to you when I saw you that while the thing I love most about your administration is your focus on education, I never hear anything about teachers' salaries being an important factor. Too often wonderful teachers are forced into other careers or leave the US to teach in American schools abroad because their salaries are simply inadequate. Moreover, we cannot attract the kinds of people who would be outstanding teachers because their pay is so low.

I recall hearing in a seminar a few years ago that the Japanese pay their teachers 2% more than their engineers, and we know how engineers are revered in Japan. That sends a message about the importance of education to the Japanese. What kind of message do we send to Americans when teachers' salaries barely make it above the poverty line?

From the perspective of someone who has been in school recently, I have a large bone to pick with the whole concept of "tenure". After a teacher has taught at a school for, I believe, 7 years they receive tenure which is blanket job security. Too often I had teachers in school that were teaching from the same textbook and notes that they had when they first started teaching -- sometimes that was 20 years ago! I know your efforts now are concentrating on upgrading the standards by which curricula are developed so that they meet the national standards and can pass the tests, but some of the teachers are not capable of keeping up. This, of course, loops back to the idea that we need to be attracting the right kinds of teachers.

Would the private sector ever be able to provide any kind of financial support to teachers directly? Maybe through teacher scholarships which are earned on merit?

THE PROSECUTOR
12-8-97

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12-8-97

THE WHITE HOUSE

WASHINGTON

December 5, 1997

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MEMORANDUM FOR THE PRESIDENT

FROM: SAMUEL R. BERGER

SUBJECT: Your Question on Indictment of Saddam Hussein

In a notation to a recent Tom Friedman column on Iraq, you asked whether it would be possible to indict Saddam Hussein.

During the Bush Administration policymakers discouraged efforts to indict Saddam for war crimes, instead hoping that he would be ousted by other more acceptable senior Iraqis who might have nonetheless been involved in such crimes

We have taken a different approach and have supported bringing Saddam and his regime to justice. In 1994, we endorsed the establishment of a commission to investigate the international criminal conduct of Saddam, which -- at least in the case of Yugoslavia and Rwanda -- has preceded the UNSC establishment of an international criminal tribunal. We have also secured the escape from Northern Iraq of persons who witnessed Iraqi atrocities and might participate in future judicial proceedings.

Certainly Saddam has committed indictable offenses. The Iraqi government has committed many acts of genocide, crimes against humanity and war crimes during the past decade for which Saddam is responsible both due to personal involvement and by virtue of his command responsibility.

The harder question is what body would have jurisdiction to indict Saddam. Indictment in the United States is impossible. Although U.S. law has been amended recently to give U.S. courts jurisdiction to try persons for war crimes committed outside of the United States against a U.S. national, that law would not apply retroactively to crimes committed during the Gulf War. Other countries could theoretically proceed against him, either because their laws allow extraterritorial prosecution or -- as in the case of Kuwait and Iran -- because he committed crimes in

cc: Vice President
Chief of Staff

12-8-97

their territory, but we know of no state interested in indicting him.

The most obvious choice is a UN Security Council-created tribunal, or expansion of the jurisdiction of one of the existing tribunals. Neither the Rwanda nor the Yugoslavia Tribunal now has jurisdiction over crimes in Iraq or Kuwait. Nor would the proposed permanent International Criminal Court, as currently envisioned, because it would not have jurisdiction over acts committed prior to its creation.

There is, however, almost no support on the Council for such a tribunal for Iraq, due to well-known French and Russian desires to rehabilitate Iraq's international role and general Iraq fatigue among others.

One immediate and more realistic goal is to advocate a cooperative effort to collect and organize the body of evidence concerning Iraqi war crimes and crimes of genocide as a critical first step toward a future, internationally sanctioned, judicial procedure of some kind. We could promote a more active effort to establish an international commission under United Nations auspices to collect and analyze the available evidence. As mentioned, such commissions preceded creation of the Rwanda and Bosnia tribunals and are useful for assembling a public record.

With this in mind, we have supported efforts by non-governmental organizations, such as the International Campaign to Indict Iraqi War Criminals, called INDICT. INDICT has kicked off campaigns in the United Kingdom and the United States to build popular support for indicting Saddam Hussein and other Iraqi officials. Acting Secretary Talbott wrote the American leader of this effort last April to show our support. Earlier in the year, then Prime Minister Major and Labor leader Tony Blair both lent official support to this campaign.

There is also broad support in Congress for such a campaign; a House of Representatives resolution passed on November 13 urges you and the Secretary of State to endorse the formation of an international criminal tribunal to prosecute Saddam and other Iraqi officials. While getting a tribunal in the near term won't happen, our support for the commission sets down important groundwork and could bring greater international awareness of the Iraqi leadership's crimes.

Foreign Affairs

THOMAS L. FRIEDMAN

THE PRESIDENT HAS SEEN

11-20-97

Hard Problem

Why am I not comforted by this picture: Saddam Hussein is flat on his back from a war he started, and lost, seven years ago. Yet he has just managed to evict the U.N. weapons inspectors whose job it is to insure that he never again acquires weapons of mass destruction, and he is now deep in negotiations with the U.N. over what it will give him to let the inspectors back in. On top of it all, our lawyers in this negotiation — France and Russia — are his business partners.

Maybe there is a Clinton strategy unfolding here. Maybe the U.S. is just letting the Russians play out their diplomatic string one last time, so no one can say that Washington didn't give every opportunity for diplomacy, and then the U.S. will do whatever it takes to get Saddam to comply with the U.N. Maybe.

But the reason one has to worry is that this Administration has been drifting in the Middle East. The Clinton team's problem can be reduced to the following: Yitzhak Rabin died and Saddam Hussein didn't. U.S. policy was predicated on the opposite happening, and Washington has never adjusted to the fact that it hasn't.

For four years, U.S. Arab-Israeli policy was to follow behind the bulldozer of Mr. Rabin. He cleared the road, he took the political flak. We followed in his wake, helping at the margins. After Mr. Rabin was killed, though, the Clinton team was never ready to become the bulldozer itself. It was never ready to say to Palestinians, Arabs and Israelis that they had all deviated from the path that Mr. Rabin was plowing. Thus the U.S. is either going to press them back onto that road or simply walk away and let them nakedly face each other and their own publics without any peace process. So Rabinism collapsed, but Saddamism survived.

"Seven years ago Saddam had frightened the Arabs into accepting Pax Americana," says a Middle East expert, Stephen P. Cohen. "After all, the only political system left in the Arab world after Saddam blew up the whole neighborhood was the U.S. system."

where different Arabs can use his weight against each other and against Israel. And the more Rabinism is dead, the easier it is for the Arabs to justify moving from Pax Americana back to the old system."

And the more the sanctions go on without toppling Saddam, the more the Europeans and Arabs conclude that he is not going away and therefore they should be the first on their block to benefit from his survival.

Having reached this point, the U.S.

Dealing with Saddamism.

has only bad options. Virtually any diplomatic solution that involves Saddam restoring the U.N. inspection regime in return for an easing of sanctions will end up strengthening him as a symbol that the world, and particularly the Arabs, can't afford. And any military solution that targets either him personally, his military or his known weapons caches might not necessarily get at all his weapons and would require a lucky shot to get him. What to do?

If Saddam doesn't back down, and America's choice is between an imperfect military solution and an imperfect diplomatic one, using decisive force until Saddam is ready to unconditionally restore the U.N. inspectors would be more effective. Let's not exaggerate his toughness. When U.S. aircraft carriers started moving, he started blinking.

The only diplomatic solution that might have any credibility is one that returns the U.N. weapons inspectors to Iraq, increases humanitarian aid to the Iraqi people and is accompanied by an indictment of Saddam as an international war criminal who will henceforth be ostracized, including by France, Russia and the Arabs. That will at least draw a line between Saddam and the Iraqi people. That's

15 Dec 1997

system centered around the United States and its friends. Rabin made it easy for the Arabs to join that system by moving the process forward. Now, seven years later, the U.S. needs a new, integrated policy to keep Rabinism alive and Saddamism down. The longer Saddam is in power the more there is a temptation to bring him back into the Arab political fold,

not great, but it's about as good as you will get diplomatically.

This is a hard problem, and we armchair generals all have to acknowledge that. All one can ask is that, as America deals with it, it keep one strategic principle in mind: Any solution that does not revive Rabinism and curb Saddamism, both militarily and symbolically, will just pave the way for the next crisis. □

Is this possible?

The New York Times

THURSDAY, NOVEMBER 20, 1997

12-8-97

T. D. Tauler

THE FINANCE SUMMIT

Statement by

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C. Fred Bergsten*
Director, Institute for International Economics

APEC CEO SUMMIT

Vancouver

November 22, 1997

The Setting

This year's APEC summit takes place in the most tumultuous setting since the Leaders began meeting, down the road in Seattle, four years ago:

- the Asian financial crisis continues to threaten markets throughout the region and around the world;
- as a result, economic growth will be sharply curtailed in a number of countries and concerns are being raised about a global recession;
- consequent questions are thus being voiced about the future viability of the "Asian miracle" and even the underlying "Asian model" of development;
- questions are also being raised about the feasibility of future trade liberalization, most immediately the financial services talks that are aiming for completion in the WTO by December 12, in light of the currency crises and especially because of the failure of the US Congress to pass fast track trade authority; and
- because of the Congressional failure to pass both fast track and funding for the IMF's New Arrangements to Borrow (NAB), doubts are also being expressed about the continued active participation, let alone leadership, of the United States in international economic affairs including further progress toward achieving

* Dr. Bergsten was Assistant Secretary of the Treasury for International Affairs from 1977 to 1981, also functioned as Under Secretary for Monetary Affairs during 1980-81, and was Chairman of APEC's Eminent Persons Group throughout its existence from 1993 through 1995.

APEC's commitment to achieve "free and open trade and investment in the region by 2010/2020."

APEC Leaders thus face the most critical, and difficult, series of issues in the history of this young institution. Their ability to respond decisively and effectively will go far toward determining whether APEC will become a central player in resolving regional and global crises. A failure at Vancouver would confirm criticism that APEC is mainly a "talk shop" that need not be taken seriously as an action organization.

An Action Program

The APEC leaders can take decisive steps to deal with each of these problems. Fortunately, the yeoman work of their ministers and senior officials over the past year provides a strong foundation for the necessary actions. The following proposals were conveyed to Leaders last August by a panel of independent experts comprised of experienced observers of APEC from most of its member economies.

First, the Leaders should launch new regional arrangements to reinforce the efforts of the International Monetary Fund to help prevent and respond to future monetary crises in the region.

The primary goal would be prevention of future crises. The International Monetary Fund (IMF) did its job in foreseeing and warning of the impending problem. The systemic difficulty was that Thailand balked and no one pressed it to act. The IMF on its own demonstrably cannot get emerging economies to adjust preemptively. The best prospect is neighboring countries: because they are so likely to be hurt themselves by fallout from a crisis, their intervention is both legitimate and apt to be delivered forcefully. This is now particularly true in Asia in light of the contagion from Thailand that has engulfed the entire region and provided an objective lesson on the wider effects of a failure by one country to adjust responsibly.

APEC can provide the institutional locus for such efforts. It is already developing a process of "peer pressure" through which individual members encourage others to act responsibly, in the interests of the broader group as well as their own. APEC is using this approach to pursue free trade in the region by 2010. The most dramatic success came at last year's Subic summit when peer pressure persuaded a number of members to eliminate their tariffs on a wide range of high-tech products, enabling APEC to galvanize the Information Technology Agreement (ITA) on \$500 billion of global trade in the World Trade Organization a few weeks later.

The APEC Finance Ministers have been meeting regularly since the Seattle summit in 1993 instructed them to do so. Their deputies have convened even more often, and have just met in Manila on this very topic. They should now begin systematically assessing national economic outlooks and pressing members to adopt good advice, from

the IMF and elsewhere, that would head off future crises and thereby avoid new disruption in the region.

APEC should also create a standby funding arrangement to support future IMF programs in the region. The current cases are only the latest reminders that such crises inevitably occur from time to time and that Asia is not exempt from them. International rescue packages will be required in the future as in the past.

It is also clear that IMF lending by itself will never be adequate. The IMF has plenty of money. But IMF credits to any individual country are limited by that country's quota at the Fund; even the unprecedented multiples for Mexico (700 percent of quota) and Thailand (500 percent) produced only one-quarter to one-third of the amounts needed.

Widespread support has therefore developed for an "Asian monetary fund" to supplement the IMF. APEC is the logical institutional venue for such arrangements. It includes all the Asian countries that might need help. It includes all the potential creditors, including the United States and Canada as well as Japan, China, Hong Kong, Taiwan and Brunei. Its Latin American members would be helpful, Mexico with its crisis and dramatic recovery experience and Chile as a healthy role model. It could use the IMF's Tokyo office, as proposed by the IMF itself, to administer this phase of its activity.

The main criticism of this idea is that any standing fund would create "moral hazard," the risk that its very existence would assure future bailouts and thereby tempt countries to pursue profligate policies and private investors to continue pouring money into unsustainable situations. But there is a decisive answer to this concern (which, in any event, is often simply an excuse from those who wish to avoid putting up money): inextricable linkage of any new APEC arrangements to IMF programs. No country would put itself through the wringer of a monetary crisis and subject itself to the tender mercies of the IMF simply because rescue funds were available. Nor would private investors keep coming, with countless alternative opportunities around the world, if the Fund requires them to share the costs of adjustment programs as it must.

The alternative to standby arrangements is *ad hoc* bailouts as cobbled together by the United States for Mexico and Japan for Thailand. Their outcome is always highly uncertain, as when the Congress almost blocked the Mexican package. Their magnitude, sharing among donors and speed of delivery are purely fortuitous. Prepared standby funding is far preferable.

Second, the Leaders should reach agreement on liberalization of their financial services sectors. Every crisis in the region, ranging from Japan and Korea in northeast Asia to Thailand and Indonesia in southeast Asia, was caused primarily by the weaknesses of national banking and financial systems. Reform of those systems, phased in over appropriate periods of time and coupled with the installation of effective

supervisory mechanisms, is an essential element in the restoration of confidence in the currencies and economies of every one of these countries.

The current negotiations in the World Trade Organization provide a fortuitous opportunity for the region to move together to implement such reform. An APEC agreement at Vancouver would assure successful conclusion of the WTO effort by its target date of December 12. Such an agreement would enable APEC countries to take a decisive step toward resolving their current difficulties. Like APEC's leadership at Subic a year ago in bringing the ITA to successful conclusion in the WTO, agreement on financial services here at Vancouver would represent another major step by APEC both toward achieving its own Bogor targets and providing effective leadership of the global trading system. Fortunately, the United States has continuing negotiating authority for this sector so its failure to achieve fast track at this point will not impede the effort.

Third, the Leaders should agree to negotiate a series of new liberalization and facilitation agreements in a series of specific sectors over the next year. APEC's Trade Ministers and officials have made enormous progress over the past six months in identifying sectors where early liberalization can maintain the momentum toward achievement of the Bogor targets. The Leaders should specify a set of sectors that balance the interests of the member economies, from different parts of the region and at different levels of development, to follow up the success of the ITA in 1996 and hopefully the financial services agreement in 1997.

Such an initiative by the Leaders would demonstrate clearly to the world that APEC would not be deterred by the current financial crisis from pursuing its trade agenda. APEC would thus stand in sharp contrast to Mercosur, which has just raised its tariffs in an effort to stave off currency pressures, and others who are contemplating similarly retrogressive steps (that would inevitably fail in any event). It would also send a clear signal to the Congress of the United States that APEC was prepared to move ahead and that the Administration must therefore be provided with full authority to participate if the United States is not to be either left behind or forced to accept responsibility for the failure of the entire program.

Conclusion

Vancouver can be the most successful summit in the history of APEC if the Leaders adopt these three initiatives.

In 1993, the APEC summiteers decided to create "a community of Asia Pacific economies." The community now requires new mechanisms to avoid and handle future monetary crises as well as new initiatives to sustain the momentum toward achieving the trade targets of Bogor.

In 1994, the Leaders decided to achieve "free trade in the region." They now need comparably bold initiatives on the financial side as well as continuing efforts on trade.

In 1996, the Leaders effectively applied peer pressure to achieve the ITA. They now need to use similar techniques to head off monetary disruptions and to liberalize additional key sectors.

Vancouver can be the "finance summit" that will add to this chain of dramatic successes. If the Leaders take these steps, they will further stamp APEC as the most outstanding international institutional innovation of the post-Cold War era.

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THE WHITE HOUSE

WASHINGTON

November 26, 1997

INFORMATION

MEMORANDUM FOR THE PRESIDENT

FROM: JAMES STEINBERG *JS*

SUBJECT: European Commission Report on Encryption

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Steinberg
KWW Desk

You asked us to provide you with background on the New York Times article titled "Europeans Reject U.S. Plan on Electronic Cryptography," dated October 9, 1997 (attached at Tab A).

On October 8, 1997, the European Commission (EC) subcommittee on telecommunications published its report, "A European Framework for Digital Signatures and Encryption." While the report primarily focuses on exploring ways to ensure the authenticity of electronic transactions, it also includes EC concerns about the approach that the United States favors toward encryption and key recovery. It focuses on the following possible disadvantages to a key recovery policy:

- Key access schemes raise complex questions about costs to manufacturers and users that need to be considered by European policy makers when determining their individual national encryption policies.
- National requirements for key recovery, if too onerous or divergent, can hinder the secure and free flow of information, creating potential obstacles to EC trade.
- The European Union's Data Protection Directive may be violated if access to users' keys is not consistent with access conditions outlined in the Directive or pursuant to strict lawful authorities.

The New York Times article misrepresents and overstates the conclusions of the report by suggesting that it virtually dooms the U.S. efforts to establish a global key recovery system. Buried in the article, however, is the fact that the European Union is hardly unified behind the European Commission's views. Indeed, certain nations including the UK, Sweden, and France, are

cc: Vice President
Chief of Staff

actively working within the EC framework to ensure that their national efforts to arrive at balanced, public safety policies are not undermined by the EC's commercial focus. For example, France has adopted domestic restrictions that require that keys for communications in or through France be accessible by French authorities. The French defense authority noted that the report is just a first step in identifying issues for the European Union Council of Ministers, where national responsibilities for security and law enforcement will be taken into account.

The report also recognizes that nation states, not the European Commission, have the competency on law enforcement and national security and, hence, the final say on developing their encryption policies. Thus, national security and public safety dimensions will weigh heavily in any nation's decision on encryption policy. This fact was underlined at a recent meeting of senior officials from eight nations, hosted by the U.S. Special Envoy for Encryption, Ambassador David Aaron, and attended by the UK, Germany, France, Netherlands, Sweden, Canada, and Japan.

Contrary to the story that the New York Times article tells, the European nations are continuing to develop their national encryption policies, even considering key access schemes based on, or similar to, the key recovery scheme that we espouse. Ambassador Aaron is continuing a dialogue with these nations to encourage approaches compatible with U.S. policy. As a result, we are making significant progress on a common approach to export controls that balances public safety with commercial benefits.

Attachment

Tab A 10/9/97 New York Times Article

IE FROM BORDEN

Inc. said yesterday Cracker Jack snack unit of Borden Inc. er Jack, a candy-coat-rand best known for refers to the snack, million in sales last to-Lay. Analysts ex-livery trucks to make se 50 cents, to \$39.25. (Bloomberg News)

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RY AND GIFT STORES

day that it planned to gifts and home accesso-lling those items. The o call the stores the Gal-be 10,000 to 15,000 land. If the stores suc-onwide in an effort to retail market, its presi-of Neiman Marcus, a 32.75. (Bloomberg News)

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Europeans Reject U.S. Plan On Electronic Cryptography

Threats to Privacy and Commerce Are Cited

By EDMUND L. ANDREWS

FRANKFURT, Oct. 8 — The European Commission has rejected proposals by the United States aimed at insuring that police agencies can crack coded messages over telephone and computer networks.

In a lengthy report released today, the European Commission said the American approach could threaten privacy and stifle the growth of electronic commerce and that it might simply be ineffective.

The report appears to all but doom efforts by the Clinton Administration and the Federal Bureau of Investigation to establish a global system in which people who use cryptography would have to deposit a "key" for unlocking their codes with an independent outside organization. As envisioned, the police or intelligence agents would be able to use this key once they got court approval to carry out a wiretap. The plan has been vigorously opposed by the computer industry, which fears that it would jeopardize sales to foreign customers.

Because of the Internet's borderless nature, American officials have long acknowledged that their plan is workable only if most other countries adopt similar systems. If not, people could simply route their communications through countries with no restrictions.

The White House had already run into heavy opposition from civil rights groups, the computer industry and Congressional Republicans. And earlier this year, the United States failed to muster any support for its plan from the Organization for Economic Cooperation and Development, a consortium backed by more than 40 countries.

But the European Commission's blunt opposition, reported today in The Wall Street Journal, went considerably further, raising a slew of objections to "key recovery" and "key escrow" systems. Among them were these:

¶ Hackers could find new ways to

breach security. "Inevitably, any key access scheme introduces additional ways to break into a cryptographic system," the report said.

¶ The systems could weaken European data-privacy laws. "Any regulation hindering the use of encryption products," the report said, "hinders the secure and free flow of personal information."

¶ Even with a "key escrow" or "key recovery" system, criminals cannot be entirely prevented from using strong encryption.

More broadly, the European Commission said, any kind of key-based system could jeopardize the rise of electronic commerce. "If citizens and companies have to fear that their communication and transactions are monitored with the help of key access or similar schemes," the report said, "they may prefer remaining in the anonymous off-line world."

American officials did not disguise their disappointment, and challenged the Europeans to come up with better alternatives.

"I am a little surprised," said William Reinsch, Deputy Secretary of Commerce in charge of export administration. "My question to the European Commission is, where do they think the market is going? Our sense is that corporations engaged in electronic commerce want key recovery in some form, because they want to recover their own records and to monitor their own employees."

Beyond high-minded policy issues, European officials quietly acknowledge that they have political and economic concerns. For one thing, several countries do not like the idea of deferring to an American system that might allow American companies to dominate the next generation of security products.

The German Government, meanwhile, is worried that American authorities might have improper access to data on German users — possibly violating Germany's tough new laws on data protection.

But the European Union is far from united. Britain has generally

Dana to Build Plant in China

By Bloomberg News

The Dana Corporation, a maker of auto parts, said yesterday that it would build an axle factory in China's Fujian province, part of the company's efforts to offer customers in the Asia-Pacific region better support.

Dana, which is based in Toledo, Ohio, already operates three manufacturing plants in China and 13 in the Asia-Pacific region.

Dana's Fujian Spicer Drive-train Systems unit will build the 40,000-square-foot plant in Fuzhou. The plant, scheduled for completion next summer, will eventually employ about 150 workers. The company did not disclose the amount of its investment.

Initially, the plant is to make axle parts for full-size and small vans and sell them to a Fujian-based vehicle assembler. Later, it will make front and rear axles for light-duty vehicles.

sided with the United States in supporting an international system for regulating data encryption.

Indeed, the European Commission remained vague about what alternatives to the American system it might actually favor, nor does the report attempt to block member countries from setting up key-based systems if they want to.

American computer and software companies greeted the European policy declaration as a victory.

"Even the hard-line Governments, the U.S. and the United Kingdom, have said that any cryptography restrictions have to be internationally coordinated because otherwise you can just download material from another country," said Chris Kuner, a lawyer in Frankfurt who represents Netscape Communications and other networking companies in Europe.

"This shows that Europe does not agree with the idea of mandatory key recovery. This idea that that is the only possible regulatory framework for the world has been clearly rejected."

THE CHRISTIAN SCIENCE MONITOR

BOSTON - TUESDAY, DECEMBER 2, 1997

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BUILT FOR SPEED: The DEA calls Bob Perette's boat a "technological breakthrough."

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Americans by Thousands Talk Race

■ Clinton taps national grass-roots movement in town meeting in Ohio tomorrow.

By Ann Scott Tyson
Special to The Christian Science Monitor

SIGNALING an unprecedented, grass-roots push to bridge America's racial divide, hundreds of thousands of citizens in scores of towns nationwide are engaged in sustained, serious dialogues on race, experts say.

From small circles of a dozen people in rural Iowa churches to

gatherings of hundreds in inner-city Los Angeles, interracial dialogues have sprung up in more than 30 states in the past five years.

And as President Clinton seeks to inaugurate a national "initiative" on race, he is launching a meeting in Atlanta tomorrow, he is launching this quietly growing grass-roots movement.

• In Seattle, people have a racially mixed "dialogue" since September.

• In Los Angeles,

Israel's Big Peace Offer: Eye-Opener or Eyewash?

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See ISRAEL Page 8

J. Winston / ce Matthews
THE PRESIDENT HAS SEEN
12-8-97
we need to find a way to highlight their work - an they all on our web site? can we put out a booklet on letter to all delegations, Govs, Congresspeople on their
BZ

Grass-Roots Racial Dialogues Are Not

DIALOGUES from Page 1

study released last week entitled "Bridging the Racial Divide: A Report on Interracial Dialogue in America." "People are tired of sitting back in despair," says Mr. Hutson, who heads the Interracial Democracy Program at the Center for Living Democracy in Brattleboro, Vt.

Socially, the movement is breaking new ground by challenging a decades-old taboo in mainstream America on the public airing of candid, private opinions on race, say community leaders and national advocates.

Politically, it represents an important countercurrent to recent, racially polarizing debates over affirmative action, welfare, and other programs designed to aid minorities. In contrast, the grass-roots dialogues emphasize Americans' shared stake in racial and ethnic harmony and social equity, especially as the US minority population grows.

Moreover, the dialogues are not "just talk," but a starting point for community problem-solving, say experts and advocates. Across the country, the groups have spawned action on issues such as unfair housing practices, police-minority relations, racial tensions at high schools, and voter-registration drives. They have also intervened in crises caused by racially driven violence, for example by helping to rebuild black churches and counselling victims of the arsons.

As the movement grows, it will create a firmer foundation for national policy debates, experts predict. "It's tough to get to the level of good deliberation on policy ... when so many people have been taught not to talk about race," says Lori Villarosa of the Charles Stewart Mott Foundation in Flint, Mich.

In Rock Hill, S.C., a town of well-tended lawns and red-brick, one-story buildings, the sense of unease over racial issues mounted in the 1990s, as it did in many American communities, along with the Rodney King police beating, the O.J. Simpson trials, and the black church burnings in the South. But come January, signs on every road leading into the old mill town will bear a blunt, new slogan: "No Room for Racism."

The signs have little to do with overt racial hatred in the blue-collar community of 47,000, roughly a third of whom are black. Instead, the

idea grew out of local concern over the town's more subtle, private racial divides.

"We want people to realize that racism is in everybody's mind," says Manning Kimmel, the radio-station owner who proposed the signs. "You can't just point the finger. It's all of us, every cotton pickin' one."

It dawned upon Mr. Kimmel and others that Rock Hill "had as much racial division in the 1990s as it ever did in the 1960s. And why? Because nobody, including me, had done anything about it," reflects Kimmel.

The high school that Kimmel's two sons attended was integrated, but in the cafeteria blacks and whites sat apart. Workplaces were mixed, but "at 5 o'clock we all turned into pumpkins and went our separate ways," he says.

Getting things moving

Many American communities share Rock Hill's frustration over the stagnant state of race relations, as well as a disenchantment with national policy, experts say. But increasingly, like Rock Hill, they are coming together in interracial groups to air concerns and propose hands-on solutions.

"People are hungry for some

honest and open exchanges," says Wayne Winborne, director of program and policy research for the National Conference of Christians and Jews in New York.

The community groups enable residents to "dispel myths and break down stereotypes," says Molly Barrett, a project coordinator at the Study Circles Resource Center, which has helped establish more than 50 community-wide dialogues on race across the country in the past four years. "It's empowering," she says. "There is a feeling on the part of most people that it isn't the policymakers who are going to make the difference, it's the people at the grass roots."

Localities must take the lead in addressing race relations, agrees US Conference of Mayors head Paul Helmke, who adds that he is "upset" at the slow pace of Mr. Clinton's initiative. He has named the issue as one of three priorities for the mayor's organization, which has 500 members from cities with populations of more than 30,000.

"When we talk about racial issues in this country, the city level is really where it usually takes place," says Mr. Helmke, mayor of Fort Wayne, Ind. "Is housing steering going on? Are the police treating some people differently? When you get into the communities, people can spot unfairness when it happens, and that's what it's all about."

Most often, local efforts are led by churches and community groups, although schools, government organizations, businesses, and newspapers have also played a role. These bodies usually pro-

BOB LEVERONE/SPECIAL TO THE CHRISTIAN SCIENCE MONITOR



SIGN LANGUAGE: To help deal with the issue of racial division, Manning Kimmel, owner of a Rock Hill, S.C., radio station, pushed to put signs along local roadways declaring "No Room for Racism." He succeeded, and the signs will be posted in January.

vide trained "facilitators," who lead forums on ethnicity and race. Although the forums vary widely from town hall meetings to book clubs and dinner gatherings, people are always encouraged to express their emotions, air grievances, frankly debate problems, and discuss possible solutions.

Candid sessions

Participants from several different cities describe the sessions as painfully candid. In Seattle's "Dialogue Dinners," for example, organizer Judy Levy has been struck by the widespread hurt, confusion, and fear displayed. "One African-American woman was talking about feeling invisible and not feeling valued among white people. It was very painful and she was crying."

During one Los Angeles dialogue, a white man described himself as a very well-to-do Re-

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s Racial Dialogues Are Not 'Just Talk'

BOB LEVERONE/SPECIAL TO THE CHRISTIAN SCIENCE MONITOR

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During one Los Angeles dialogue, a white man described himself as a very well-to-do Re-

publican who had deliberately limited his family's contacts with blacks, and then cried. "After he composed himself, he said racism was terrible for our country but he didn't know whether we could do anything about it," says Avis Ridley-Thomas of the city attorney's office.

Yet while the discussions highlight differences, they also emphasize commonality. During a session of the Prince Georges County dialogue that focused on banks' discriminatory practices in lending to minorities, resident Imez Wood eased tensions with a healing thought.

"We all breathe the same air, drink the same water and bleed when the doctor pricks us with a needle," she said. "If we realize that, it becomes easier to change."

Some critics have questioned whether the interracial groups are "preaching to the choir" by attracting people who are already relatively tolerant and open-minded. "Even for folks in the choir, it's hard," responds Mr. Winborne of the National Conference. "You can take people who have been working on race relations for years, separate them into groups by race, and the conversations are different."

"We aren't going to convert the people who are out there doing hate crimes," acknowledges Ms. Villarosa. "But while this may not change folks who are really intolerant, at least it lets them know they don't have the implicit support of others."

In Rock Hill, some worry that the "No Room for Racism" signs might be vandalized. But if that happens, says city human relations commissioner Eliza Mills, "we'll have [new ones] up again the next day."

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Special to The Christian Science Monitor

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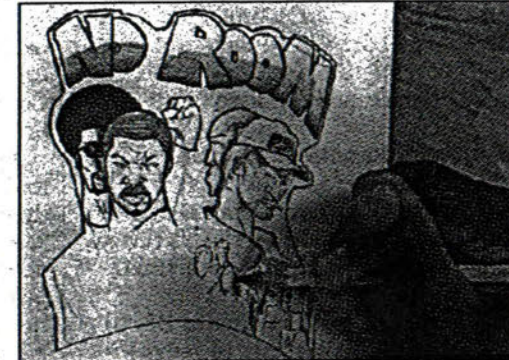
And as President Clinton seeks to invigorate his sluggish, six-month-old national "initiative" on race at a meeting in Akron, Ohio, tomorrow, he hopes to tap this quietly accelerating grass-roots movement.

• In Seattle, more than 450 people have attended intimate, racially mixed "Dialogue Dinners" since September.

• In Los Angeles, raw emotions

and tears have also erupted as thousands of people have joined regular discussion groups since the 1992 riots led the city to establish "Days of Dialogue."

MAKING A STATEMENT: A student at Rock Hill High School in South Carolina draws a proposal for an anti-racism poster.



• In Prince Georges County, Md., a unique community-wide dialogue is based on group study of Bebe Moore Campbell's novel "Brothers and Sisters," set in the aftermath of the 1992 Los Angeles riots.

"This is a new strategy that is working, and its replicating swiftly around the country," says Jonathan Hutson, co-author of a

See **DIALOGUES** Page 9

Israel's Big Peace Offer: Eye-Opener or Eyewash?

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See **ISRAEL** Page 8

On Cloning Humans, 'Never' Turns Swiftly Into 'Why Not'

A1

By GINA KOLATA

Just nine months have passed since an astonished world got its first glimpse of Dolly the lamb, the first animal cloned from a cell taken from an adult. It was a feat that science had declared impossible.

In the hubbub that ensued, scientist after scientist and ethicist after ethicist declared that Dolly should not conjure up fears of a Brave New World. There would be no interest in using the technology to clone people, they said.

They are already being proved wrong. There has been an enormous change in attitudes in just a few months; scientists have become sanguine about the notion of cloning and, in particular, cloning a human being.

Some infertility centers that said last spring they would never clone now say they are considering it. A handful of fertility centers are conducting experiments with human eggs that lay the groundwork for cloning. Moreover, the Federal Government is supporting new research on the cloning of monkeys, encouraging scientists to perfect techniques that could easily be transferred to humans. Ultimately, scientists expect cloning to be combined with genetic enhancement, adding genes to give desired traits, which was the fundamental reason cloning was studied in animal research.

Although a Presidential ethics commission has recommended a limited ban on cloning humans, only California has enacted a law making it illegal, and those who are intrigued by the idea argue that it is no worse, morally, than creating custom embryos from sperm and egg donors. After all, it is an American tradition to allow people the freedom to reproduce in any way they like.

"From my perspective, it's just a matter of time" before the first human is cloned, said Dr. Steen Willadsen, a cloning pioneer who developed the fundamental methods for cloning animals.

Dr. Willadsen, whose techniques were used in the cloning of Dolly, now works at an in vitro fertilization center at St. Barnabas Hospital in East Orange, N.J. He said he had no ethical problem with cloning humans. "It is not for me, as a person who invents techniques, to say how we should use them," Dr. Willadsen said.

Lori Andrews, a professor at Chicago-Kent College of Law and an expert on legal issues of reproduction, said she recently got a call from a British scientist who told her the same thing. Another doctor, Ms. Andrews added, told her that "if any of my relatives got cancer, I would clone them," and use the clone as a bone marrow donor to save the cancer patient's life.

"I absolutely think the tenor has changed," Ms. Andrews said. People

Continued on Page A24

Continued From Page A1

who said human cloning would never be done "are now saying, 'Well, the risks aren't that great,'" she said.

"I see a total shift in the burden of proof to saying that unless you can prove there is actually going to be harm, then we should allow it," she said.

Ms. Andrews likes to quote two fertility experts, Dr. Sophia J. Kleegman and Dr. Sherwin A. Kaufman, who wrote, three decades ago, that

new reproductive arrangements pass through several predictable stages, from "horrified negation" to "negation without horror" to "slow and gradual curiosity, study, evaluation, and finally a very slow but steady acceptance."

That happened, she said, with artificial insemination, with in vitro fertilization, with the freezing of human embryos and with surrogate mothers.

And it is happening with cloning, Ms. Andrews said. But what is so striking, she added, is that "the time frame from 'horrified negation' to 'let's do it' is so much shorter.

"This is very, very quick," she said.

Cloning would be fundamentally different from ordinary reproduction. It would involve taking a cell from a living person, slipping it into an egg cell whose genetic material has been removed and allowing the genetic material of the adult cell to direct the development of a new embryo, then fetus, then person who is the identical twin of the person who provided the initial cell. It would allow a living person to be reborn, in a sense, only at a later time.

Scientists and infertility specialists envision certain specialized circumstances in which it might be acceptable to clone humans. Grieving parents may want to reproduce a terminally ill child. Or a woman may want a child but be infertile. Is it worse somehow for her to clone herself than to obtain an embryo made-to-order with donated egg and sperm, the kind that many fertility clinics are already offering the infertile?

In fact, said Dr. Joseph Schulman, director of the Genetics and IVF Institute in Fairfax, Va., if a woman has no eggs and her husband makes no sperm, they might consider cloning both husband and wife.

"Then they could have one of each," Dr. Schulman said.

But what cloning really accomplishes, experts said, is to make it

DO NOT FORGET THE NEEDIEST!

The New York Times

TUESDAY, DECEMBER 2, 1997

1/2



Steve Kagan for The New York Times

"The time frame from 'horrificed negation' to 'let's do it' " has been short, Prof. Lori Andrews said.

possible, for the first time, to think seriously about genetically enhancing human beings. Scientists could grow a person's cells in sheets in the laboratory and sprinkle the cells with genes. Only a very few cells would take up the genes, and use them, but it is relatively easy for scientists to find those cells and pluck them out of the mix.

If they then used those cells to make clones, the clones would contain the added genes in every cell of their body. Already, two such experiments have been completed in animals, using cells from fetuses rather than cells from adults.

Last summer, Dr. Keith Campbell of PPL Therapeutics in Roslin, Scotland, and Dr. Ian Wilmut of the Roslin Institute in Edinburgh, the scientists who created Dolly, announced that they had made Polly, a cloned lamb whose every cell contained a human gene. Shortly afterward, ABS Global Inc., a company in De Forest, Wis., announced the birth of Gene, a calf that was cloned from genetically altered fetal cells.

With humans, predicted Dr. Lee Silver, a molecular biologist at Princeton University, the first genetic enhancements might be genes to protect against diseases, like an AIDS resistance gene or a gene to protect against Alzheimer's disease, both of which "have already been identified. In a sense, it would be no different morally from vaccinating a child for a disease, Dr. Silver said.

As more and more becomes known about genes, other enhancements become possible.

A shift in the ethical winds on human cloning.

"At present," Dr. Willadsen said, "there is a large effort involved in sorting out the human genome. I don't think they are doing that just to have some nice charts to put on the wall."

Research that lays the groundwork for cloning humans is proceeding rapidly. Dr. James Grifo, the director of the division of reproductive endocrinology at New York University Medical Center, is working on nuclear transfers, the crucial technique for cloning, but with another purpose in mind. His goal is to transfer the genetic material from immature eggs of older women into eggs of younger women. The egg could finish maturing with the machinery of the younger woman's egg, and that should result in less chromosomal damage, a problem in pregnancies of older women.

So far, Dr. Grifo has shown that he can move egg nuclei around, which is, in essence what is required for cloning.

Dr. Jacques Cohen and Dr. Willadsen, at St. Barnabas, also have moved nuclei between cells, but for a different reason. They are trying to help women whose eggs are easily fertilized but whose embryos tend to die, probably because there is a defect in the cytoplasm of their eggs.

"It's being used for a different

purpose than cloning, but the techniques are very much the same," Dr. Willadsen said.

At the same time, Dr. Donald Wolf, a senior scientist at the Oregon Primate Research Center and the director of Oregon's only in vitro fertilization center, at the University of Oregon, has two Federal grants to study cloning in rhesus monkeys. One will involve cloning from cells of an adult.

"We're pretty optimistic," Dr. Wolf said. "We have every reason to think it will work."

He explained that the National Institutes of Health, which gave him the grants, is interested in genetically identical monkeys for AIDS vaccine research and in clones of rhesus monkeys that, by chance, happened to develop a rare genetic disease, retinitis pigmentosa.

By cloning the animals, Dr. Wolf hopes to make enough of them for investigators to use them to study the disease and its treatments. But one consequence of the primate work, Dr. Wolf said, is that it will establish methods that could be applied for the cloning of humans.

"We are laying the groundwork," Dr. Wolf said.

Society should think about the possible results of all this work "sooner rather than later," Dr. Wolf said.

But some experts said the real question was not whether cloning is ethical but whether it is legal.

"The fact is that, in America, cloning may be bad but telling people how they should reproduce is worse," Dr. Willadsen said.

In the end, Dr. Willadsen said, "America is not ruled by ethics. It is ruled by law."

The New York Times

TUESDAY, DECEMBER 2, 1997

2/2

THE PRESIDENT HAS SEEN

12-8-97

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He is moving
away from our
position? Should we?
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Libya's Vast Desert Pipeline Could Be Conduit for Troops

A1

By RAYMOND BONNER

Continued From Page A1

LONDON — In the sandy expanse of Libya's desert, where temperatures climb above 100 degrees on a winter's day, an army of more than 12,000 foreign workers is toiling on one of the world's most audacious and mysterious public works projects.

Drilling rigs rise 60 feet in the air, their huge hammers and powerful drilling bits boring more than a quarter mile into the earth. Hundreds of trucks haul 75-ton sections of concrete pipe, 13 feet in diameter, which are lowered into place by giant cranes and buried under the sand.

Libya calls it the Great Man-Made River Project, and says the gargantuan lattice work of underground pipes, wells and pumping stations will someday make the desert bloom from Tripoli to Kufra.

But in separate interviews, three engineers working on the \$25 billion project said the official explanation was improbable or incomplete. They said they suspect that the system of underground pipes and reservoirs, which is being built largely with American equipment, has some clandestine military purpose.

"If Saddam Hussein said he was building a 4-meter pipe to 100 miles from Kuwait, 100 miles from Iran, 100 miles from Turkey, for the purpose of moving water, would you believe him?" asked a European engineer.

A tunnel of pipes 4 meters, or 13 feet, in diameter is large enough to accommodate military vehicles, even a rail line. When the project is completed, Libya will have more than 2,000 miles of tunnel stretching from Tunisia to Egypt. In the south it will reach almost to the Sudan and Chad, a country with which Libya has tense relations.

Every 50 to 60 miles along the pipeline, huge underground storage areas are being constructed, and the engineers said they are more elaborate than would be needed for holding water. These sites, made of reinforced concrete, would be suitable for bivouacking troops or storing military supplies, including poison gas, the engineers said.

While the system of pipelines does not by itself change the military balance in the region, it provides Col. Muammar el-Qaddafi, the Libyan leader, extensive opportunities to conceal his activities from the Amer-

ican spy satellites that pass overhead each day.

"This is the first real evidence of something which has been suspected for several years," Paul Beaver, a defense expert with Jane's Defense Weekly, said when told of the engineers' descriptions of the project. "Qaddafi seems to have taken a leaf out of Kim Il Sung's book and created a potential military arsenal underground," he added, referring to the late North Korean dictator.

North Korea has an elaborate underground military system with storage sites and tunnel routes for vehicles and troops. Mr. Beaver, a former British Army officer with intelligence expertise, said that the tunnel system would allow Colonel Qaddafi to conceal troop movements, gain an element of surprise over an enemy, and protect his own troops from preemptive strikes.

Other experts are alarmed because the pipeline runs through a mountain called Tarhuna. This is where Colonel Qaddafi is building a chemical and biological weapons plant, American and European intelligence officials have said.

The tunnel system would be an "extension of Tarhuna," said Robert Waller, an American expert on Libyan national security policy. It would provide Colonel Qaddafi with more places to store his chemical and biological weapons, protecting them from destruction or detection by overhead surveillance, said Mr. Waller, who worked at the National Security Council last summer.

The engineers who described the project were interviewed in different countries. They said they felt their jobs, and lives, would be at risk if they were identified. One of the men approached The New York Times after reading an article in the newspaper about industrial sales to Libya; he has also taken his concerns to American officials.

The other two men, residents of different countries, were located and interviewed separately; neither have spoken with American officials. All the men have had considerable experience on oil and water drilling projects around the world.

Despite Embargo, U.S. Goods Reach Libya

How so much American equipment has reached Libya for the project is unclear.

An embargo on trade with Libya has been in place since 1986 when President Ronald Reagan imposed it in response to evidence that Colonel Qaddafi was behind numerous terrorist attacks. Yet the desert is awash with American equipment.

"I see so many American products in Libya," said Alberto Bertoli, a senior manager with Il Nuovo Castoro, an Italian construction company that is a major subcontractor on the project. "I don't know how they got there."

The engineers, and Mr. Bertoli, said the project was relying on Cummins engines, Caterpillar earth-moving equipment, Baker Hughes drilling bits, Dowell Schlumberger cementing units and chemicals, as well as mining and drilling equipment from other American companies.

One of the engineers said he had seen more than 400 Caterpillars.

In a response to questions, the Peoria, Ill.-based company issued a statement saying that it went to "great lengths to comply with U.S. law," and that, "Specific shipments of Caterpillar products to customers in Libya have taken place with full approval of the U.S. Government. Caterpillar does not condone any transactions involving our equipment by third parties that do not comply with U.S. law."

"We won't be providing any additional information," the company said.

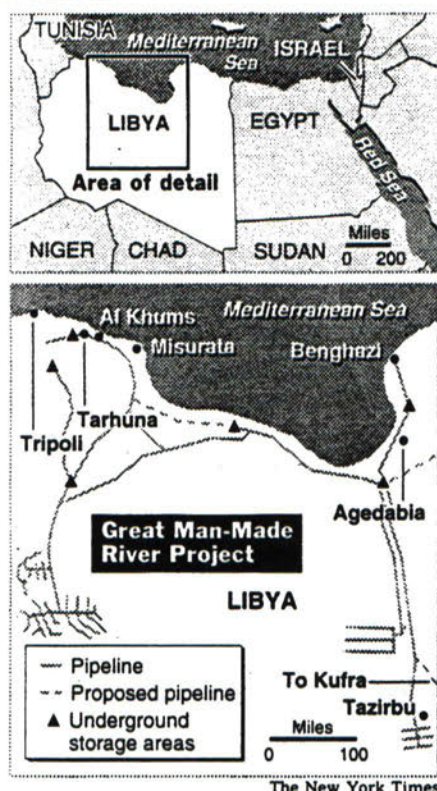
A senior official at the Treasury Department, which enforces the embargo on Libya, said the department had issued no licenses for export of

Continued on Page A14

The New York Times

TUESDAY, DECEMBER 2, 1997

1/2



Libya's pipeline project is considered too elaborate for irrigation.

any heavy equipment from the United States to Libya.

Cummins Engine, based in Indiana, said in a statement that it "is fully aware of the legal restrictions on dealing with Libya, and to our knowledge, there are no Cummins engines in Libya unlawfully."

Mr. Bertoli and the three engineers asserted that most of the dozen Soilmecc drilling rigs in Libya were outfitted with Cummins engines.

Soilmec, an Italian manufacturer, said that indeed it had bought engines from Cummins and that it had sold a dozen drilling rigs to Libya. It declined to say, however, if any had Cummins engines.

Libyan Oil and Gas Fuel European Nations

The European Union does not bar commercial trade with Libya, largely because many European countries rely on Libya for their oil and gas. It is revenue from this trade that finances the Great Man-Made River Project. And one way that Libya acquires American equipment is by routing it through Europe, with or without the American company's knowledge of the final destination.

American companies also get around the sanctions by having the work in Libya done by their foreign subsidiaries, Mr. Bertoli and the engineers said.

When the Great Man-Made River Project was begun in 1984, Brown & Root, the Houston construction company, prepared the feasibility studies and drafted the specifications. Price Brothers, a pipe-manufacturing company in Ohio, supplied the pipe-

making machinery.

Brown & Root, now owned by Halliburton, is still the project manager, and the huge pipes are manufactured at Brega, near Benghazi, under license from Price Brothers, a privately owned company.

But after the sanctions were imposed, Brown & Root transferred the work being done in Houston to its British office, said Ken Beedle, a spokesman for Brown & Root in Britain. He declined to say how much the contract was worth.

Price Brothers did not respond to requests for comment, made to its American and British offices. But in the past, news reports have said that it, too, transferred work to its British office after sanctions were imposed.

The primary contractor for the multi-billion dollar Great Man-Made River Project is Dong Ah, a South Korean construction conglomerate.

South Korean Company Is Main Contractor

Last year, the company and two employees, Je Han Lee and Glen Ainsworth, pleaded guilty before a federal court in Louisville, Ky., to charges of illegally exporting drilling equipment from the United States to Libya. The company paid a \$3 million fine while the employees received probation and fines of \$5,000 each.

Dong Ah is currently under investigation in Texas, on charges of having violated the embargo by buying anti-corrosive pipe chemicals for the Libyan project, and of money-laundering, American law enforcement officials said.

Companies that violate the embargo are subject to having their export licenses revoked by the Commerce Department. It is not clear why Dong Ah has not had sanctions imposed on it, and a Commerce Department spokesman said it would not comment on any investigations that "may or may not be under way."

Dong Ah did not respond to a fax with questions about the project, including how it was able to buy equipment from American companies.

One of the engineers said that Dong Ah was currently bringing to Libya a piece of equipment made by Dowell Schlumberger which is used to pour cement into holes and that Mr. Ainsworth had arranged it. The engineers said the unit, which may be reconditioned, came via Hamburg, Germany. Mr. Ainsworth was in Libya, and could not be reached.

A Schlumberger spokesman, who asked not to be identified, said that it was the company's "policy in all parts of the world to adhere to all U.S. laws as well as all other applicable laws regarding such situations." The company, which is registered in the Netherlands Antilles and has its headquarters in Paris and New York, declined to comment further.

A division of one of Schlumberger's competitors, Baker Hughes, has also been supplying the Great Man-Made River project, according to the engineers.

Hughes Christensen, a division of the Baker Hughes in Belfast, offered to sell Dong Ah 20 rock bits, at \$20,000 each, according to a fax provided to The New York Times. The offer was sent to Dong Ah's Je Han Lee, one of the men who pled guilty in the Kentucky case.

Little Sign of Irrigation Near Pipeline Project

Baker Hughes has its headquarters in Houston and a spokesman for the company, Arthur Downey, said its policy on trade with Libya was "stricter than U.S. law requires."

"It is well within the law for Hughes Christensen in the U.K. to have a transaction with Libya," Mr. Downey said, referring to Britain.

The project is intended primarily to supply water for irrigation, said Mr. Bertoli, the manager with Il Nuovo Castoro. After more than a decade of work, however, almost no irrigation work such as digging ditches or running pipes from the main line, has been done, according to the three engineers and a French consultant on the project. At the same time, about 70 percent of the pipe has been laid, and one third of the wells have been dug, the consultant said.

This reinforces the engineers' doubts that it is an irrigation project. Moreover, if it were, one of the engineers said, there would be no need to lay a 13-foot pipe from Tripoli and Benghazi. A pipe half that diameter would be adequate for hundreds of miles, because there would be less water to carry if water were being diverted along the way for irrigation.

In conventional military terms, the investment of \$25 billion in an underground tunnel system seems excessive, said Mr. Waller, the Libyan security expert, who is studying in the Department of War Studies at King's College, London.

But, Colonel Qaddafi does not always act rationally on military matters, said Mr. Waller. For example, the Libyan leader has spent billions of dollars fortifying his Mediterranean coastline, as if he were preparing for a repeat of the Normandy invasion, Mr. Waller said.

"It is in keeping with his siege mentality," he added.

Mr. Bertoli said it was "not logical" for Libya to spend \$25 billion in this way if its aims were military. But then, he said, it was not entirely rational for Libya, which has had economic difficulties, to spend so much to move water through the desert.

"It is not an economical project," he said.

THE PRESIDENT HAS SEEN
12-8-97

Sandy
What do we
know about this?
BC

captured
Bergen
COS

PHOTO COPIER • FAX • NAPALM • BIRTH-CONTROL PILL • CELL PHONE • ASSEMBLY LINE • WASHING MACHINE

NewsweekExtra

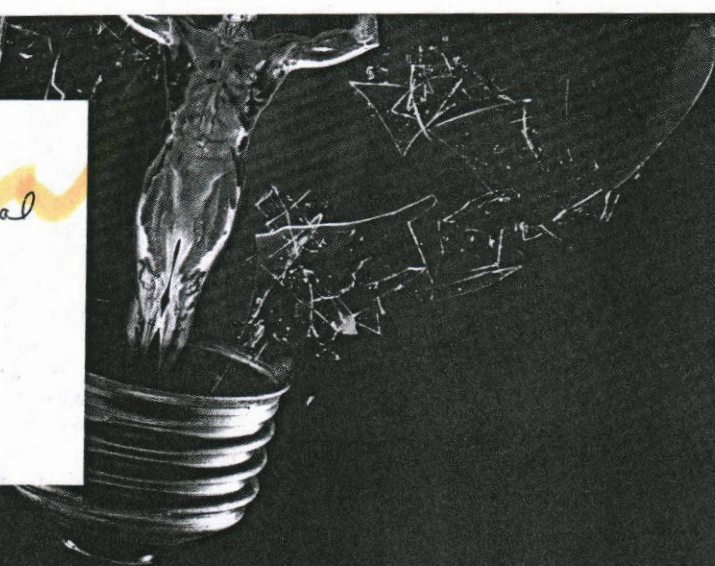
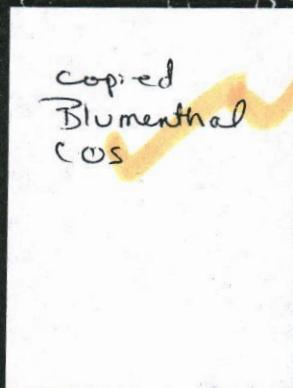
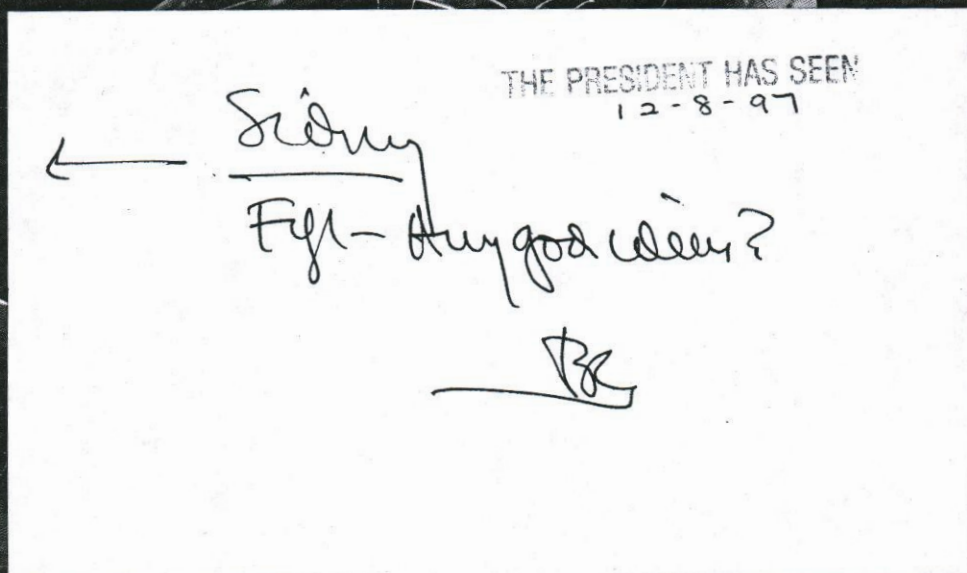
2000

A NEW MILLENNIUM

The Power of Invention

How an
Explosion of
Discoveries
Changed Our
Lives in the
20th Century

Plus: What
Awaits Us
in the 21st



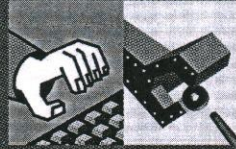
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H O W W



VIEW WORK



FOR THE WORK
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a century of rev

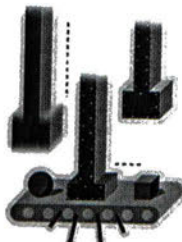
lutions on the job. Mass product
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of the consumer economy. This
was a mighty industrial engine
one that won world wars and th
peace that followed. By midcent
the American workplace was a
unprecedented marvel: jobs w
plentiful and benefits were rich
But another revolution was com
ing. The transistor and the fax
changed global communication
The photocopier changed the
office. The personal computer
changed everything. We still m
things, of course. But the futur
belongs to the knowledge work
Technology has given them the
tools to build a world in consta
transformation.

PHOTOGRAPH BY MICHAEL LLEWEL

NEWSWEEK SPECIAL ISSU

THE ASSEMBLY LINE

Let us now praise Henry Ford, who imagined the mass market and married it with the grit of the factory. BY ROBERT J. SAMUELSON



NO BUSINESS FIGURE casts as long a shadow over the 20th century as Henry Ford. Ford was the godfather of mass production, which, as the century unfolded, became the central organizing principle of America's industry and a defining characteristic of its popular culture.

His genius lay in fusing various strands of change—in auto design, in manufacturing methods, in merchandising—into a new concept. He imagined the mass market and married it with the grit of the factory in a way that affected how everyone else thought and acted.

The triumph of the Model T transformed the workplace, the landscape and popular psychology. Luxuries would become necessities: Ford wrote his own law of economic evolution. Until Ford, cars existed as technological toys enjoyed only by the rich. In 1906—almost three years before the Model T went into production—Woodrow Wilson, then president of Princeton University, warned that “nothing has spread socialist feeling in the country more than the automobile.” It symbolized, he said, the “arrogance of wealth.” These early cars were handmade, expensive and (because so many models existed) erratic. Ford's idea was to standardize design, streamline production, lower costs and make cars available to everyone. “I will build a car for the multitude,” he said. And he did.

Even now, the Model T's explosion is breathtaking. Between 1909—the first full year of assembly—and 1913, production went from 17,771 to 202,667; in 1924 (the peak year) it passed 1.8 million. Its price dropped from \$950 in 1909 to \$550 in 1913 to \$355 (with an automatic starter) in 1924. By force of example, the Model T inspired a revolution in business thinking. As new products emerged, they were to be churned out in vast quantities that made the typical American household an ever-expanding repository of consumer conveniences and gadgets. The process began in earnest in the 1920s, when vacuum cleaners, radios and refrigerators came into their own. In that decade, refrigerator production went from less than 5,000 to almost 1 million; radio production jumped from nothing to 5 million. The ramifications ultimately extended beyond the American living room or garage. The feats of U.S. industry in World War II stemmed in part from mass-production practices largely absent in Germany and Japan, notes British historian Richard Overy. “At one point in the war there were no fewer than 425 different aircraft models and variants in production,” he writes in his book, “How the Allies Won.” “By the middle of the war the German army was equipped with 151 different makes of lorry [trucks], and 150 different motor-cycles ... With such variety it was difficult to produce in mass.”

Growing up on a farm near Dearborn, Mich., Ford became a compulsive tinkerer at an early age, learning to fix watches and rejecting (to his

UPI—CORBIS-BETTMANN (LEFT)

father's horror) farm life. "He loathed plowing and planting, feeding and milking," wrote biographer Roger Burlingame. In 1879 the 16-year-old Ford found an apprenticeship at a shop in Detroit that made steam engines. By the early 1890s he had become the chief engineer of the Edison Illuminating Co., one of the nation's first electric utilities. But what absorbed his enthusiasm was his off-hours tinkering: in a woodshed behind his home, he was building a "horseless carriage." He finished in early 1896 and took his primitive car, mounted on bicycle wheels, for a spin around the block.

It would be more than a decade until the Model T, years that reflected the early auto industry's exuberant chaos. In 1900 the first National Automobile Show in New York City featured 40 car companies, and William McKinley became the first president to ride in a car. Ford was simply one ambitious player in a swarm of early automakers. Nor had the United States invented the car. That distinction belonged to Germany, where Nikolaus Otto built the first practical internal-combustion engine in 1876, and Karl Benz and Gottlieb Daimler built what are regarded as the first modern cars in the mid-1880s. But Americans pioneered in commercializing the car.

What ultimately separated Ford from his competitors was his concept and ob-

nacy: his decision to build only one model of car—a move opposed by some of his own managers and investors. Until the Model T, many car components were so inexact that they often had to be reworked individually on expensive machine tools (cutting or grinding machines) so that they would fit and function. Cars were assem-



Transforming the Landscape Henry Ford (left) and his son, Edsel, next to a Model T

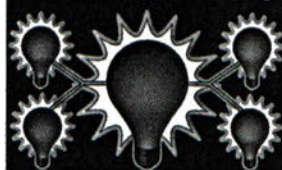
bled one by one, with workers fetching parts as needed. Car models changed frequently, so that long production runs for most parts were impossible. By avoiding constant design changes, Ford standardized parts and improved the use of machinery. Ford, his mechanics and engineers constantly improvised. One thing led to another. To ensure uniform parts, machine tools were rearranged: all the machines needed for a specific part were grouped together. Before, all the machine tools of one

type (say, cutting machines) were put together. Car assembly was broken down into many subassemblies (rear axles, engines, dashboards) and all parts for a subassembly were stored in bins around the workbenches. This freed workers from having to walk to get each new piece. After that came the assembly line in 1913.

This produced an upheaval of people as well as of machines. As production was simplified into more routine tasks (fastening a bolt, stamping a part, connecting two components), skill levels declined sharply. So did Ford's dependence on experienced craftsmen. By 1914 three quarters of the burgeoning work force were recent immigrants. The stress and monotony of Ford's jobs was disaffecting; in 1913, turnover was almost 400 percent. To minimize these problems, Ford decided in early 1914 to double the lowest wage, from \$2.34 to \$5 a day. The announcement was made with typical bombast: "The Ford Motor Company, the greatest and most successful in the world, will on January 12 inaugurate the greatest revolution in the matter of rewards for its workers ever known to the industrial world."

Higher wages worked wonders. By 1915 absenteeism had dropped roughly 85 percent. Ford restricted the \$5 wage to workers with at least six months on the

LANDMARKS

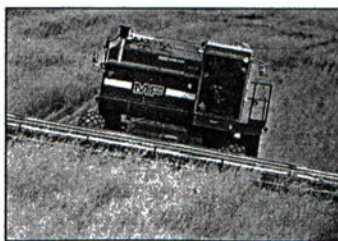


PLOWING AHEAD THE COMBINE

■ IF ONLY WE COULD CUT our wheat and thresh it at the same time. That was the imperative behind the development of the combine, which ranks as one of the most labor-saving inventions in agricultural history. The first successful combine, named after its combined functions of reaping and threshing, appeared in the 1830s, patented by a man named Hiram Moore. It was not till the

Separating wheat from chaff—without the fuss

20th century, though, that the machine became practical enough to warrant widespread use. Moore's combine and others like it could harvest 25 acres a day by the mid-19th century, but they required teams of 16 or more horses and multiple farmhands to run. When gasoline-powered tractors arrived after the turn of the century, things became much easier and smaller, nimbler combines began to proliferate. In the 1940s self-pro-



pelled combines enabled just one man to harvest an entire crop, and the modern age of agriculture had begun.

CHARGE IT! THE MALL

■ MERCHANTS HAVE clustered together ever since they started laying out arrowheads on animal skins, so defining what constitutes the first modern shopping center has been a matter of fierce debate. We'll define it as retailers gathering in a unified site operated as a single unit—with lots of free parking. And we'll go with J. C. Nichols, who in 1922 built the Spanish-style

Country Club Plaza in Kansas City, Mo. (still thriving). Shopping centers truly exploded in the 1950s and 1960s as downtown stores opened branches, then picked up and moved there altogether. The malling of America began in Edina, Minn., in 1956, and the nation's largest, the 4.2 million-square-foot Mall of America, is in nearby Bloomington. Now we have "festival marketplaces" like Faneuil Hall in Boston; "vertical malls" like Water Tower Place in Chicago; "power centers," anchored by a Home Depot or Toys "R" Us, and factory-outlet malls like Sawgrass Mills in Florida. All, of course, with lots of parking.

Greetings from



BUCKLE UP SEAT BELTS AND AIRBAGS

■ THE FIRST SEAT BELT were leather and used in horse-drawn carriages. Race cars got them in 1922, open-cockpit commercial aircraft in 1926. About 20 years later, Preston Tucker, the maverick carmaker, offered

job—a sensible limit, because he wanted to promote stability. And he conditioned the higher wage on good behavior, a more novel requirement. Through a Sociological Department of his company, Ford counseled workers to take baths, avoid excessive drinking, save to buy a house and keep a tidy home. A force of 150 inspectors visited homes to qualify workers for their payments. This earned Ford a reputation for being both paternalistic and authoritarian.

Ford's factory revolution triggered a broader economic and social upheaval. By the 1920s, the car belonged to the masses both in fact and in spirit. In 1910 there were only 458,000 cars registered in America. A decade later the total was 8 million, and by 1930 it had reached 23 million. Though many poor families still didn't own a car, this was almost one car per household. When sociologists Robert and Helen Lynd interviewed families in Muncie, Ind., in the 1920s for their famous study "Middletown," they found that the car had burrowed deeply into popular consciousness. One housewife pointed out that her family owned a car but not a bathtub. "Why, you can't go to town in a bathtub!" she said.

Improvements in cars and roads fed on

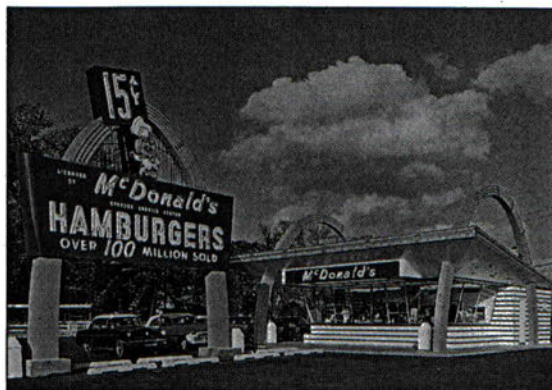
each other: the better cars got, the more Americans wanted better roads. And there was much to improve. Outside major cities, few roads were paved. The first national road survey, conducted by the Agriculture Department in 1904, classified 154,000 miles (7 percent) of the 2.15 million miles of rural roads as "surfaced," but the

ments. What worked, spread; what didn't, died. The first modern electric traffic light is usually attributed to Lester Wire, the head of the traffic detail of the Salt Lake City police. He installed it in 1912 to control the disarray on local streets. In 1920 Marquette County in Michigan pioneered the use of a white center line to keep cars

in their lanes. Two years later Wayne County (which includes Detroit) devised a truck-mounted striping machine. This improved efficiency dramatically: with the truck, two men could paint six or seven miles a day; by hand, four men painted only a mile a day. In 1940 the first two modern freeways opened: the Pennsylvania Turnpike in October and the Pasadena Freeway in December. By then the United States had 1.4 million miles of paved roads, 42 percent of the total.

The new car culture didn't create new values. It simply ex-

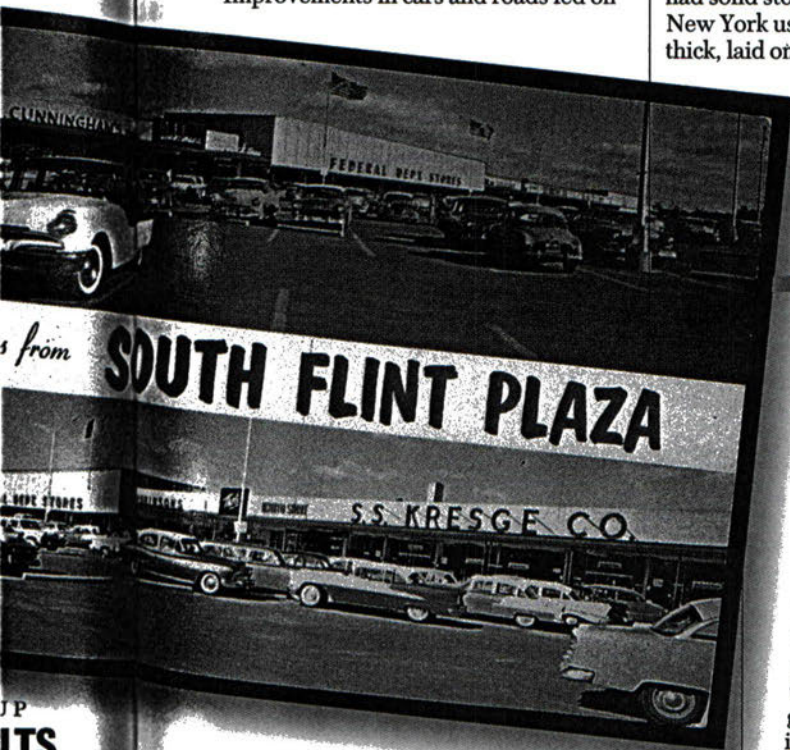
pressed old ones (freedom, equality, individualism) in new ways. If people traveled, they needed to eat, sleep and refuel. Farmers soon allowed motorists to pitch tents on bits of field. Then cabins sprouted. By the 1930s the country had an estimated 15,000 cabin camps, usually consisting of 10 to 15 sparse and inexpensive (say, \$2 a night for a couple) cabins. The young writer James Agee, reporting for *Fortune* in 1934, called these protomotels a "sound invention and a new way of life." Not



These Arches Were Paved With Gold A nation in perpetual motion stopped to fill up on fast food

surfaces consisted mainly of gravel or crushed stone. In cities, some major streets had solid stone pavements. Broadway in New York used granite blocks 10 inches thick, laid on a six-inch concrete base.

Everything about road-building and traffic control affirms the clichéd truth: necessity is the mother of invention. There were few breakthroughs and many small improve-



Pull in your car and pull out your wallet

seat belts as part of a safety package that included pop-out windshields. But the Tucker car was a commercial nonstarter. In 1949, the Nash Motor Co. included a front-seat lap belt, bolted to the frame, in its cars. By 1964, all

American cars had seat belts for the front passengers. In the mid-1980s, airbags moved to the fore, combining with automatic seat belts to form a successful passive-restraint system. That was vindication for Allen

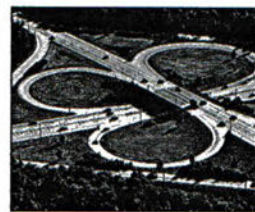
Breed, who for 20 years had been working on adapting sensors used in missiles and other armaments for airbag technology. His breakthrough version was a ball-in-tube device that could be made for as little as \$50. When a car decelerates to produce a pull four times that of gravity, a gold-plated metal ball in the sensor shoots forward, releasing a firing pin that in turn hits a percussion cap, triggering the inflator. The airbag explodes in a blink of an eye. Sensors are getting more electronic; future ones will use radar to anticipate a crash milliseconds before impact.

HIGHWAYS

THE CLOVERLEAF

■ NEXT TIME YOUR CAR IS caught in a messy cloverleaf interchange, blame Arthur Hill. This designer—about whom almost nothing is known—patented the idea in 1916. The first cloverleaf in the United States was constructed in 1928 in Woodbridge, N.J. A decade later the design had sprouted so widely that architecture critic Lewis Mumford sardonically nominated the concrete cloverleaf as the national flower. In fact it was a symbol of Americans' desire for unimpeded progress: it made possible an intersection without "conflict"—industry jargon for one car's needing to stop for another.

The trick was to lift one line of traffic over a second by means of a bridge and then connect the two with a gently curving ramp. By the late 1950s, the cloverleaf was falling out of favor. It took up too much land, slowed traffic and caused accidents. Today designs bearing names like the trumpet and the diamond are used to avoid "conflicts." And drivers still await the curse-free intersection.



They were gentle curves that flowed like rivers—except at rush hour

TOP TO BOTTOM: COURTESY MCDONALD'S GOLDEN ARCHIVES, CORBIS-BETTMANN

everyone agreed; some critics poked fun at the austere camps. "The point that the satirist misses when he lampoons American folkways is that most folkways make sense," Agee wrote. "The American people have created the cabin camp because the hotel failed them in their new objective—motion with the least possible interruption." The same verdict could be rendered of most of the roadside commerce that subsequently emerged.

Travel made Americans crave the familiar. They didn't want every roadside meal or overnight stay to be an adventure—and possibly a bad one. So arose the Holiday Inns and the Howard Johnsons: the motel and fast-food chains whose appeal lay in standardization. Similarly, cars promoted suburbanization, and suburbanization created a demand for nearby shopping from which came regional shopping centers (the first was Northgate, outside Seattle, in 1950) and covered, air-conditioned malls (the first was Southdale in suburban Minneapolis, in 1956). The chains and shopping malls represented innovation, too. New

needs spawned new forms of commerce and fierce competition. Everyone wanted the best locations and more of them. "This is rat eat rat, dog eat dog," Ray Kroc, McDonald's founder, once said of the fast-food industry. "I'm going to kill them before they kill me."

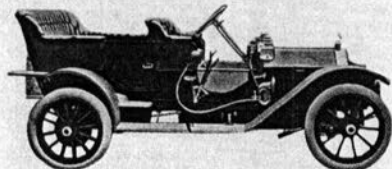
As a parable of technology's power, the car has few rivals. It contributed to the erosion of family, authority and community by making it easier for people to pick up and go wherever and whenever they wished. For the same reason, it broadened their horizons and homogenized America. Along with some other great technologies (the telephone, the plane, the television and air conditioning), it reduced the vast differences among regions that had existed before World War II. A more mobile society was a less parochial one. And, of course, it helped impoverish cities by draining away productive citizens and profitable enterprises. Even as it liberated, it also destroyed.

All this occurred without being planned or particularly predicted. Technology op-

erates by triggering thousands of small and large ripples—in other technologies, industries, lifestyles and popular attitudes. It is no stretch to say that Steve Jobs and Bill Gates are the heirs of Henry Ford. They, too, are peddling a new technology for the masses. Ironically, this relentless and often unforgiving process ultimately caught Henry Ford in its undertow. His triumph also became his undoing, because the world in the mid-1920s was no longer the world that had embraced the Model T. Better roads and better cars—enclosed and bigger—hurt the Model T. A used-car market had emerged; so had installment buying. Both changes made costlier cars more affordable. Ever stubborn, Ford tinkered with the Model T but clung to the basic design. When the end came, it arrived swiftly. In 1925 Ford's market share slipped below 50 percent. Sales continued sliding in 1926. By 1927 the Model T was finished. Though the company recovered, it never regained its dominance. The man and his car had become victims of their own success.

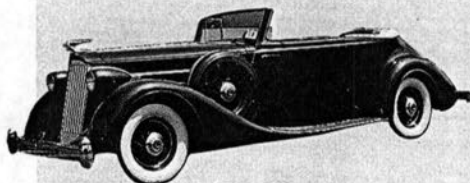
A Nation on Four Wheels

An American without a car is like a bird without wings, but cars are more than transportation. Over the years, their shiny paint jobs have reflected the national soul.



'09 Olds The earliest cars were toys for the rich—and irritants to everyone else

'26 Model T The mass-produced, mass-purchased Ford democratized driving



'39 Packard Even during the Great Depression, fat cats managed to ride in style



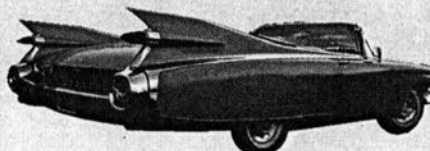
'48 Chevy Expansive and powerful—perfect wheels for the postwar boom



WWII Jeep Its rugged, can-do spirit sparked a love affair that endures today



'56 Thunderbird Power and panache—the stuff that men's dreams are made of



'59 Eldorado Finned, funky and futuristic, this ragtop Caddy was optimism incarnate



'63 Beetle Rebels of all ages dug the cheap Volkswagen



'69 Malibu Back then it was still smooth sailing for gas-guzzling 'land yachts'



'73 Toyota Homely, yes, but Japanese imports like this got beautiful mileage



'86 BMW The Yuppie chariot. Greenwich to Wall Street in half an hour

'91 Chrysler The minivan saved Detroit—and the suburban soccer mom



'95 Explorer Sport utility vehicles brave the suburban jungle

Creating the Future Bardeen (left), Shockley and Brattain's invention laid the foundation for the cyber-revolution

riddled with cul-de-sacs, he suggested, making it possible for electrons to enter but not to leave. The surface seemed to be positively charged on the outside, attracting electrons in, but negative on the inside, repelling them when they start to move. The electrons were stuck. As a result the flow of electrons—which is all a current is—could not increase. Applying an electric field did nothing.

For the next 20 months Bell's team turned to the most basic of research—the quantum properties of solids—as it sought ways to liberate the electrons in the semiconductor. "Without understanding solids from a quantum mechanical point of view," says William F. Brinkman, vice president of R&D at Bell Labs, "the transistor could not have been invented." On Nov. 17, 1947, Brattain launched the experiments that would bring success. He began with a splash—literally: he bathed silicon in various electrolytes (liquids that contain electric charges), such as acetone and distilled water. The electrolytes changed the electrical properties of silicon's surface. When Brattain shined a light on the treated silicon, a larger current flowed than from untreated silicon (silicon was known to produce a current in response to light; today that is the basis for solar cells). Apparently, the electrolytes set up an electric field that bulldozed the cul-de-sacs, allowing the electrons to escape.

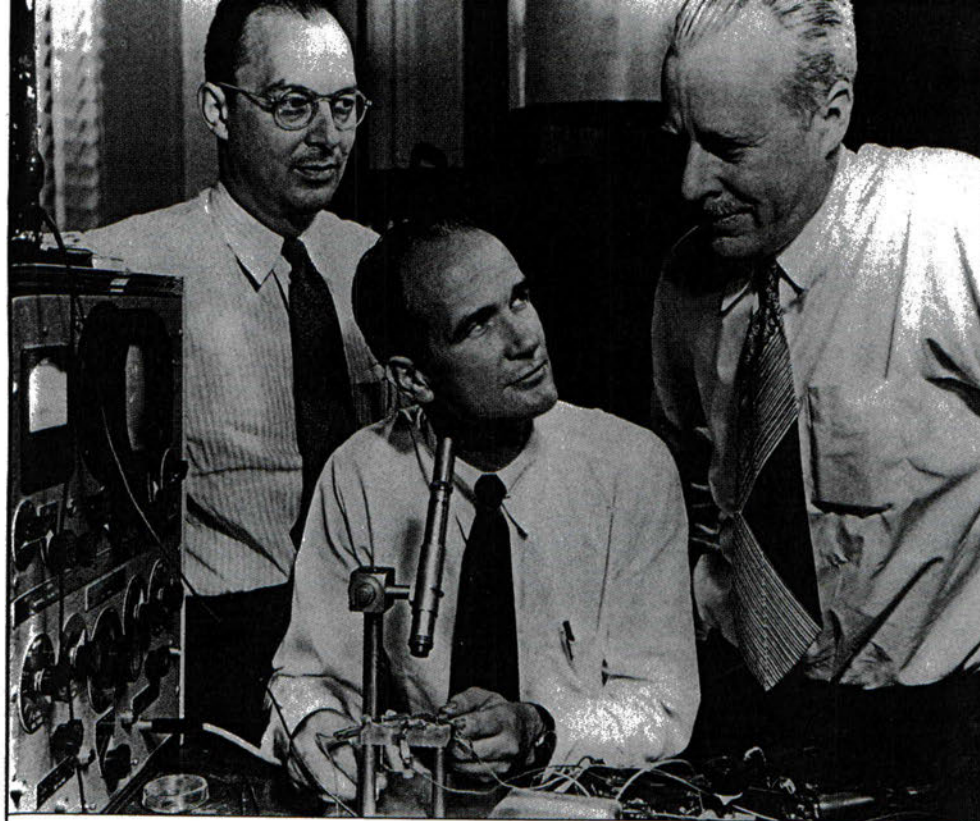
On Nov. 21 Brattain went to

Bardeen with a new

suggestion for making silicon amplify a signal. "Come on, John!" Brattain exclaimed. "Let's go out in the laboratory and make it!" They put a drop of distilled water on a slab of silicon. They pushed a tungsten wire through the drop and onto the silicon. They used a battery to apply one volt to the drop, hoping to stir up the positive and negative charges in the silicon just below the wire. Current through the contact

point increased 10 percent: positive charges in the distilled water pulled the silicon's electrons to the surface, making more electrons flow and thus amplifying the current. Carpooling home that evening, Brattain said he'd "taken part in the most important experiment that I'd ever do in my life," according to an AT&T oral history quoted in "Crystal Fire" (352 pages. W.W. Norton. \$27.50), a new book on the transistor by Michael Riordan and Lillian Hoddeson.

But hurdles remained. The silicon boosted current only



It changed the way we bank, drive, cook, communicate, listen to music and watch television. BY SHARON BEGLEY

THE TRANSISTOR

NATURE ABHORS A VACUUM tube," cracked Bell Labs physicist John Pierce. So did almost everyone else by the 1940s. Sure, vacuum tubes boosted the power of the phone network's electrical signals, which weaken as they travel. But vacuum tubes were too bulky, unreliable and inefficient to support what AT&T expected to be a boom in demand for telecommunications after the end of World War II. So as peace loomed, in the summer of 1945, Bell Labs established a group to forge the future out of semiconductors, materials whose properties lie midway between an electrical insulator's and a conductor's. In the fall of 1947, in a monthlong burst of inspiration, Bell scientists invented the device that came to embody, even create, the future. The tiny transistor changed the way we bank, drive, cook, communicate, listen to music, watch television and otherwise work, play and live.

The inventors were an unlikely trio. William Brattain was a farm boy and a born

tinkerer. William Shockley, hard-driving, ambitious and impatient, was named manager of semiconductor research in 1945. His ego would eventually fracture the team. "Whispering John" Bardeen, the low-key, famously self-effacing theorist, would become the only person ever to win two Nobels in physics.

In 1925 a British scientist had theorized that if an electric field enveloped a semiconductor, then the semiconductor would conduct electricity differently. In some cases, it would amplify incoming current. That appealed to the Bell scientists charged with finding replacements for vacuum tubes. But the phenomenon remained maddeningly theoretical; try as they might, no one could make semiconductors jack up a signal. Finally, in March 1946, Bardeen hit on the reason. Electrical fields were not having the desired effect on, say, a bar of silicon because the surface of the silicon is

Desk Set AT&T's 300 might have lasted forever but for the advent of push buttons and cordless portables



PHOTOS COURTESY AT&T ARCHIVES

10 percent, not enough to outdo vacuum tubes. Brattain and Bardeen tried every variation they could think of to better their results. Germanium instead of silicon. Gold foil instead of tungsten. A viscous liquid called glycol borate—"gu"—instead of distilled water. On Dec. 16 they jury-rigged their final contraption. "It was marvelous!" Brattain recalled: their transistor boosted power 450 percent. The key realization was that "holes"—weird quantum-mechanical entities that are the absence of electrons—carried current in silicon. When Bardeen returned home that evening, he mumbled to his wife, Jane, as she peeled carrots, "We discovered something important today."

But Shockley was far from elated at Bardeen and Brattain's success. He argued that work he had done in 1945 had sparked their invention, but AT&T's lawyers had filed a patent only on Brattain and Bardeen's device. Shockley worked obsessively on his own. On Jan. 23, 1948, he had his brainstorm: a sandwich. The bread would be semiconductor material with an excess of electrons; it was dubbed "n-type." The meat would be "p-type," with an excess of positively charged holes. When he attached wires and applied a voltage, holes streamed across the n-material into the p-area. His "junction transistor" amplified current just like Brattain and Bardeen's "point-contact" transistor. He tinkered with it in total secrecy. The rift in the team was now a canyon. Bardeen, fed up with Shockley, resigned in 1951.

In 1952 Bell Labs offered to license the point-contact transistor for \$25,000 against future royalties. They had few takers apart from a small Japanese start-up called Sony. Its first transistor radio sold, in 1954, for \$49.95 (more than \$300 in 1995 dollars). Bell Labs produced the point-contact transistor for 10 years. But by 1954 production of the junction transistor had overtaken it. In 1956 Brattain, Bardeen and Shockley shared the Nobel in physics.

As the price of a transistor plunged—from \$45 to \$2 in the 1950s to .00001 cent today—the applications mushroomed. In 1959 sales of solid-state transistors overtook sales of vacuum tubes, and there has been no going back. Before the transistor "the whole phone network was analog and the switches were electromechanical; the transistor changed that to digital transmissions and electronic switches," says Ian Ross, Bell Labs president from 1979 to 1991. Today transistors packed by the millions onto microprocessors run car engines, cell phones, missiles, satellites, gas pumps, ATM machines, microwave ovens, computers, CD players and every other modern electronic toy and tool. In 1997 more than half a billion transistors will be manufactured. Every second.

The Houses of Invention

IF THE GREAT INVENTIONS of the past were usually the work of an individual—a Gutenberg, an Edison, a Bell—then those of the 20th century are increasingly the brainchildren of entire labs. In an age marked by an explosion of knowledge, argues Warren Bennis of the University of Southern California, "one is too small a number to produce greatness." Some solitary inventors notwithstanding, America's

novation: Breakthrough Thinking at 3M, Du Pont, GE, Pfizer and Rubbermaid." At 3M, three cents of every dollar in sales (\$900 million recently) is plowed into R&D, supporting 6,500 researchers. At Pfizer, R&D swallows 14 percent of sales—\$1.7 billion in 1996.

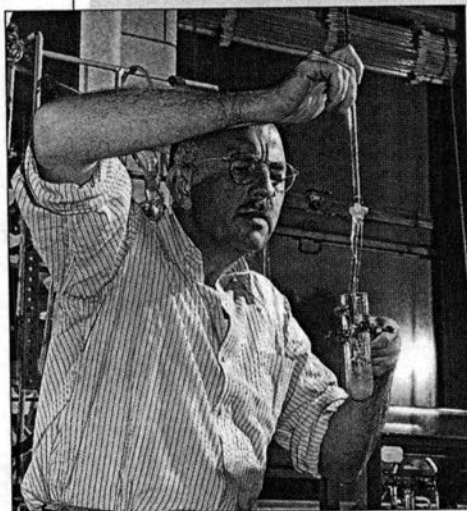
■ **Innovation:** At 3M, the rule is that 30 percent of sales must come from products less than four years old. And its scientists and engineers can spend up to 5 percent of company time on their own projects, without even telling managers what they're up to. 3M calls it bootlegging. Both policies send a clear signal that risk-taking is a core value. 3M's risk-taking spawned Thinsulate insulation, Scotchlite reflective sheeting for traffic signals and hundreds more inventions. Du Pont researchers may pursue their blue-sky ideas

an open culture," says Rosabeth Moss Kanter of Harvard Business School.

■ **Crossing disciplines:** In a corporate lab, the walls between chemists and physicists, metallurgists and mechanics are often lower than in academe. It was by throwing together physicists with metallurgists and chemists that Bell Labs wove together the diverse talents that invented the transistor. And unlike universities, the culture of a corporate lab encourages collaboration. Says William Brinkman, vice president for physical-sciences research at Bell Labs, "We call it 'spontaneous teaming'—you see an interesting problem that another group is working on and you want to be part of it." It works: Bell Labs also invented the laser, the UNIX operating system for computers, high-definition digital television, digital cellular phones, the international communications satellite, photovoltaic cells and information theory.

■ **Running interference:** A great corporate lab needs a leader who will keep the Suits (or "toner heads," as some Xerox PARC scientists called management) from stifling creativity. PARC's former chief did it so well that his techies invented the first user-friendly computer, the mouse, graphical interface, the laser printer and the local computer network. Unfortunately, Xerox is more famous for fumbling these inventions—Steve Jobs turned Xerox PARC's ideas into the Macintosh. Which just goes to show that having a bright idea is only the first step in inventing.

SHARON BEGLEY with
B. J. SIGESMUND



At Du Pont, researchers pulled man-made fibers out of their test tubes

engines of invention are corporate labs. What makes a great one?

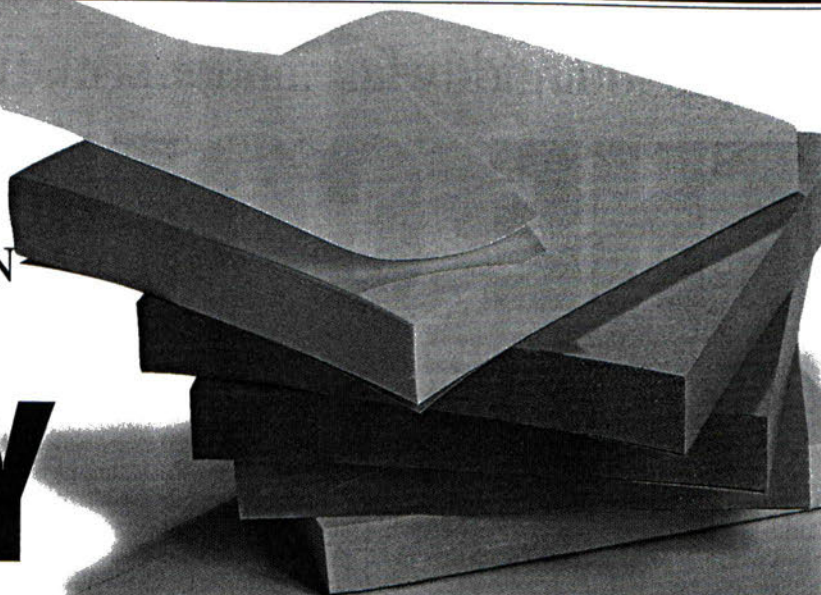
■ **A taste for gambling:** At Du Pont, it takes up to 250 ideas to generate one major, marketable new product. At Pfizer Inc., the yield is one new drug out of 100 possibilities. All of the ultimate losers suck up money before the winner pays off. Success therefore requires taking "monetary risks that would give most corporate finance officers a case of indigestion," says management guru Tom Peters in the new anthology "In-

one day a week. The idea is to be open to serendipity: every scientist makes mistakes, but only in a culture that encourages the exploration of the unknown do you get Teflon (when a Du Pont scientist working on Freon accidentally polymerized several gases into a white powder). Xerox's Palo Alto Research Center instituted mandatory weekly meetings. Everyone would grab a beanbag chair and take turns describing their ideas. "A universal characteristic of innovative companies is

A tribute to three products that hold our daily lives together.

BY KENDALL HAMILTON & TESSA NAMUTH

STICKY STUFF



Goodbye, Dog Ears Post—its are the ultimate page markers. Now they come in stick 'n' smell form—pizza, pickles and roses

NEVER BEFORE IN THE history of humankind has it been so easy to attach one thing to another. Big deal? Well, consider entropy. That's the scientific name for the tendency of things—atoms, molecules, paperwork, dirty socks—to become less orderly if left alone. Judging by your average desktop, plenty of people see nothing wrong with entropy. The trouble comes when you learn that scientists believe that as the universe becomes increasingly disordered, it runs down like an old battery. Not good. Fortunately, over the past century, inventive minds have brought us a bounty of products designed to keep our daily lives—and, who knows, maybe even the universe—together. The paper clip, for instance, is not only an ingenious amalgam of form and function, it's a powerful force for order. A few more of the finest:

Anybody who's ever struggled with a stuck zipper or stubborn button owes a debt of gratitude to Georges de Mestral, the Swiss engineer who gave us all an alternative. After a walk in the woods with his dog one day in 1948, de Mestral marveled at the ability of burrs to fasten themselves to his dog's coat and to his own wool clothing. De Mestral shoved a bit of burr under a microscope and saw that its barbed, hooklike seed

pods meshed beautifully with the looped fibers in his clothes. Realizing that his discovery could spawn a fastening system to compete with, if not replace, the zipper, he devised a way to reproduce the hooks and loops in woven nylon, and dubbed the result Velcro, from the French words *velours* and *crochet*. Today Velcro-brand hook-and-loop fasteners (which is how trademark attorneys insist we refer to the stuff) not only save the arthritic, fumbled-fingered or just plain lazy among us untold aggravation with our clothing, they secure gear—and astronauts—aboard the space shuttle, speed diaper changes and help turn the machine-gun turrets in the M-1A1 tank. Velcro U.S.A., Inc., engineers have even used the product to assemble an automobile. Try doing that with zippers.

Some theorize that the world is held together by Scotch tape. If that's not true, it could be: 3M, the company behind the

brand, makes enough tape each day to circle the earth almost three times. This was certainly not foreseen by a young 3M engineer named Richard Drew when he invented the tape in 1930. Drew, who'd come up with the first masking tape after overhearing a burst of frustrated invective in an auto-body painting shop, sought to create a product to seal the cellophane that food producers were starting to use to wrap everything

from bread to candy. Why not coat strips of cellophane itself with adhesive, Drew wondered, and Scotch tape was born. It was also soon rendered obsolete for its original purpose, as a process to heat-seal cellophane packaging debuted. Ironically, the Great Depression came to the rescue: consumers took to the tape as a dollar-stretcher, to keep worn items in service. Ever since, it's just kind of stuck.

The Post-it note not only keeps information right where we want it, it may also be the best thing ever to come out of a dull sermon. Art Fry, a chemical engineer for 3M who was active in his church choir, was suffering through just such a sermon one day back in 1974 when he got to thinking about a problem he'd been having with improvised bookmarks falling out of his hymnal. "I realized what I really needed was a bookmark that would attach and detach lightly, wouldn't fall off and wouldn't hurt the hymnal," recalls Fry, now 66 and retired from 3M. Fry called to mind a weak adhesive developed by his colleague, Spencer Silver. Fry slathered a little of the adhesive on the edge of a piece of paper, and *voila!* He wrote a report about his invention and forwarded it to his boss, also jotting a question on one of his new bookmarks and pressing it down in the middle of one page. His boss scribbled an answer on the note and sent it back to Fry, attached to some other paperwork. Later, over coffee, the two men realized Fry had invented a new communications tool. Today Post-its are ubiquitous—available in 18 colors, 27 sizes and 56 shapes. Some even contain fragrances that smell like pizza, pickles or chocolate. Soon, perhaps, we'll have our notes and eat them too.



Stuck on Himself David Letterman as Velcro Man on late-night TV

Despite our giddy fascination with this ubiquitous machine, w

THE COMPUTER

AS THE CENTURY COMES TO a close, the technology that obsesses us, captivates us, infuriates us and dominates us is the computer. But ultimately, this most amazing of inventions won't be seen as an artifact of the old millennium but the defining force of the one just dawning. Do you really think that we're already into the computer age? That's a gross underestimation of what the computer will eventually do to change our world, our lives and perhaps the nature of reality itself.

Underestimation, as it turns out, has been a constant in the brief but dazzling

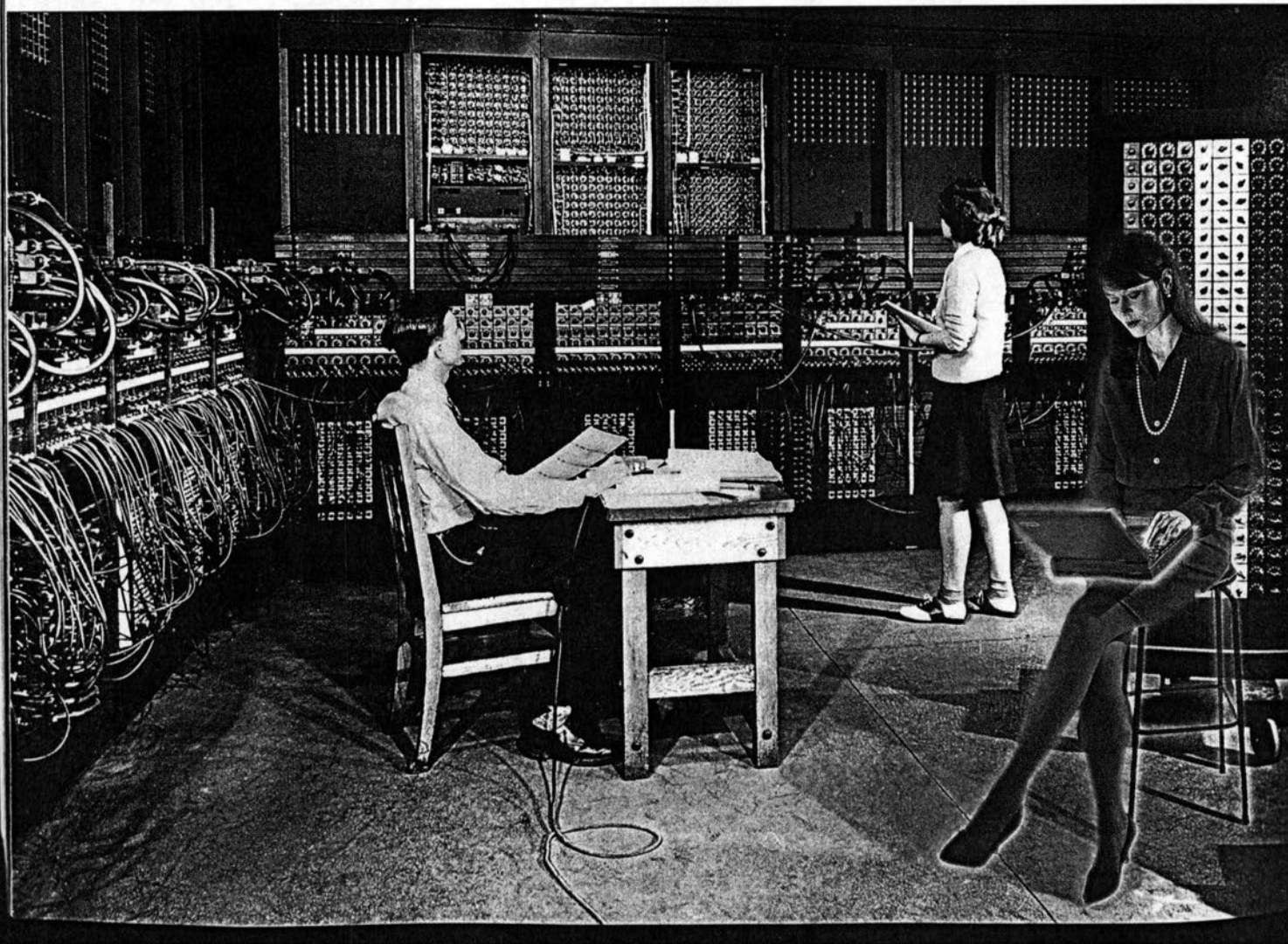
The Great Downsizing For power, today's laptop dwarfs the room-size ENIAC of 1946

history of this amazing machine. Surprisingly, the tale begins in the 19th century, when Charles Babbage, an English mathematician born in 1791, launched a lifelong quest to build information-processing machines—first a calculator called the Difference Engine and then a more elaborate programmable device dubbed the Analytical Engine. He lacked—among other things—electricity, transistors, keyboards and Bill Gates. Yet in the 1830s he came astonishingly close to producing something very much like the computers that would be celebrated decades after he died. Unfortunately, his skill at innovation was not matched by an ability to generate venture capital, and his plans were tossed into the unforgiving core dump of history.

The idea of a programmable machine that performed humanity's mental labors

reappeared in the 1930s. Specifically, the breakthrough came at the hands of another eccentric English mathematician, Alan Turing, who outlined how it was possible to build something that could perform virtually any mathematical task that one could describe. His proof involved an ingenious imaginary device that would be known as the Universal Turing Machine—essentially, a machine that could duplicate the work of any other machine. Even if the "machine" were a human calculator. Turing knew what the rest of us are still trying to wrap our minds around—such a contraption, a computer, can do *anything*. It's an invention that breeds invention itself.

But it took a war to bring about the physical devices that would be known as the first real computers. (A small but noisy



we still underestimate its ability to change our lives. BY STEVEN LEVY

controversy among computer historians involves whether a device constructed in 1939 by John Atanasoff and his student at Iowa State University, Clifford Berry, deserves the true mantle of First Electronic Computer.) In England Turing himself worked on machines that helped crack the secret codes used by the Germans. In Germany itself, a wizard named Konrad Zuse was working on that country's computing effort but never fully realized his ideas. And in America, a Hungarian genius named John von Neumann—perhaps the premier mathematician of this century—was pondering mechanical devices to help perform the calculations required for the Manhattan Project. A chance meeting at a train platform in 1944 led him to a team of scientists working at the University of Pennsylvania to create ENIAC (Electronic Numerical Integrator and Computer), which many people consider the true Adam of computers. Designed by J. Presper Eckert and John Mauchly to help crunch numbers for artillery-target estimates, this device used 18,000 vacuum tubes and cost \$400,000.

Von Neumann was fascinated, and he

worked with the ENIAC people to take computing to the next level: EDVAC, which was essentially a blueprint for the machines that followed: memory, stored programs and a central processor for number crunching. This scheme was sufficiently versatile to launch computers into the commercial realm. But even then, underestimation was as thick as in Babbage's day. Thomas Watson Sr., the head of the company that was perhaps most prescient of all in embracing the idea—IBM—thought it unimaginable that there would ever be a worldwide need for the machine. "I think there is a world market," said Watson, "for maybe five computers."

As we know, IBM sold a lot more than five computers. During the '50s and '60s big institutions and businesses used these expensive devices to perform complicated tasks, churning out responses to programs fed into the machine on manila cards. But while a quasi-priesthood of caretakers controlled access to the rooms that held these beasts, a small underground proto-hacker culture also emerged. These adventuresome supernerds used the computer to process words, to draw pictures

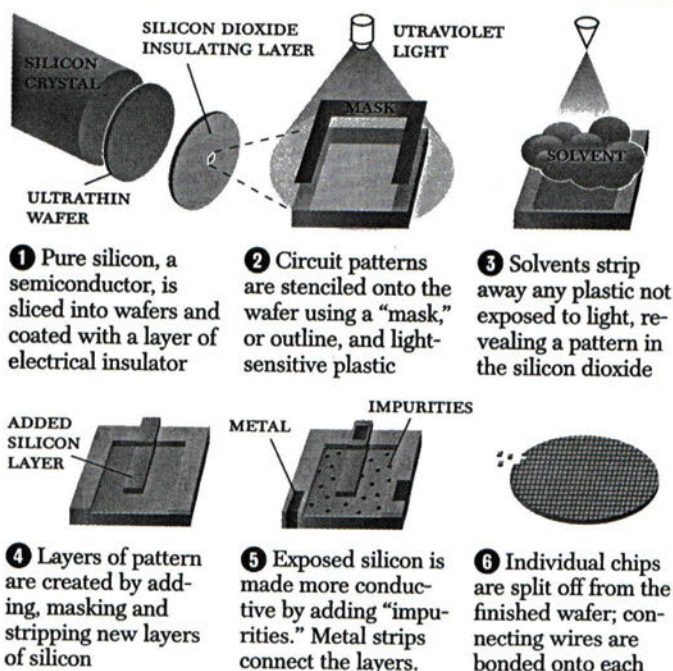
and even to play chess. (Naysayers predicted that a computer would never master this purely human intellectual pursuit. Garry Kasparov probably wishes they were right.)

What finally bound those two cultures together was the development of the personal computer. This was made possible by the invention of the microprocessor—a computer on a chip—by Intel Corp.'s Ted Hoff in 1971. Essentially, what once filled a room and cost as much as a mansion had been shrunk down to the size of a postage stamp and the cost of a dinner. By 1975, the PC was just waiting to be born, and the obstetrician was Ed Roberts, a Florida-born engineer who dreamed of a machine that would deliver to the ordinary man a machine that was the mental equivalent of what the pharaohs had in Egypt: thousands of workers to do one's bidding. His Altair microcomputer was announced in January of that year, and though it had limited practical value (the only way to put a program in was to painstakingly flick little switches), it caused a sensation among a small cult of tweak-heads and engineers.

Silicon Chip: Big Idea in a Small Package

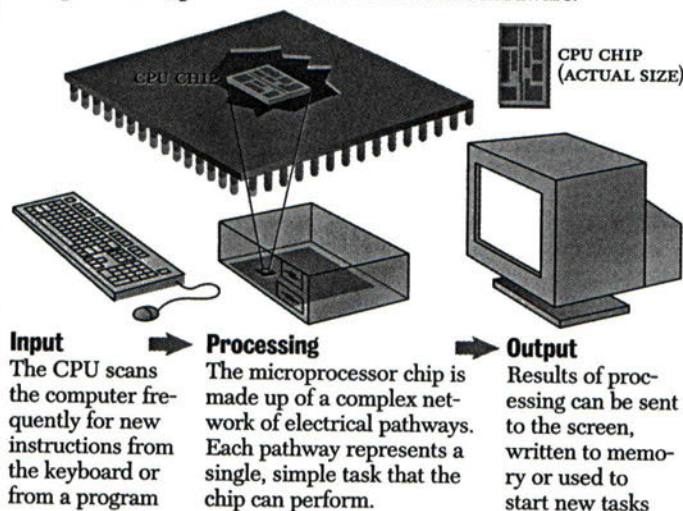
On the drawing board, it was called the monolithic integrated circuit: an entire miniaturized electrical circuit on a single, fingernail-size wafer of crystalline silicon (silicon, the second most abundant element, is found in many stones and sand). Jack Kilby and Robert Noyce, working concurrently, developed the microchip in 1958. It's been getting smaller, faster and more complex ever since.

How a chip is made



How it works in the computer

CPU chip A microprocessor, the computer's central processing unit, is the "thinking" part of the machine. It uses instructions from the system's memory and from external input (such as the keyboard) to manipulate data, perform calculations and drive hardware.



RESEARCH BY T. TRENT GEGAX AND THOMAS HAYDEN. ILLUSTRATION BY STANFORD KAY
SOURCES: INTEL CORP., CHARLES BABBAE INSTITUTE, MICHAEL HAYDEN



Working With a Net The age of the wired classroom has arrived

Like who? A Harvard student named Gates, for one, who instantly began writing Altair software. Another acolyte was Stephen Wozniak, who quickly designed his own machine, the Apple II.

Even then, people still kept underestimating. Consider what Ken Olsen, head of the then powerful Digital Equipment Corp., had to say when asked about the idea of the computer's becoming a common device: "There is no reason for any individual to have a computer in his home."

What proved him wrong was the

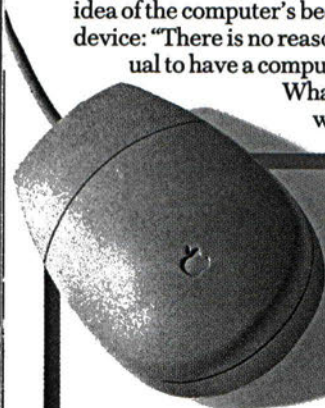
grass-roots development of software for these small devices: word processing, games and, perhaps the most crucial of all, a program called VisiCalc that not only automated the previously tedious task of calculating financial spreadsheets, but made modeling of business plans as easy as sneezing. Electronic spreadsheets were the tool that persuaded big business (which had previously turned its nose up at personal computers) to adopt the machines wholesale. And a new industry was suddenly thriving.

The next big step was the move to com-

puter communications in the '90s, when a program called Mosaic, written by students at the University of Illinois who later helped found the Netscape company, shot what was already an accelerating global Internet into serious overdrive. The prospect of millions of computers connected worldwide was suddenly a reality. People are still processing the effects of that explosion. And a lot of people, still in denial, are kidding themselves by thinking that the end of the Net transformations is anywhere in sight.

Where are the frontiers of computing? It's scary to contemplate, because the field is so young and the technology so flexible. But consider what some computer scientists are already working on. Nanocomputers—microscopic devices that may change the way we think of materials. Digital ink that will, in effect, transform paper into something as protean as computer screens. And "artificial life" software that works like biological organisms, so much so that it strives to be classified as itself alive.

Skeptics dismiss the feasibility of many of these ambitious projects. In other words, people still persist in underestimating the power of a machine whose limitations are seemingly unbounded. If history is our guide, even our imaginations cannot grasp what the computer will ultimately become. ■



DOUBLE CLICK THE MOUSE

■ HUMBLE IN SIZE (fits in your palm) and even humbler in name, the computer mouse is now taken for granted. Actually it's part and parcel of the elephant-size leap forward in computing that it accompanied: the graphical user interface, or GUI. In the mid-'60s, when GUI's godfather, Douglas Engelbart, began playing with what would become windows and menus, he realized that for people to comfortably access the stuff within a computer, they'd need a tool that let them intervene directly on

their screens, without necessarily using a keyboard. After experimenting with light pens and steering wheels, he decided on a pointing device as easy to use as an index finger. The first prototypes were wheeled blocks carved from wood. Later variations at Xerox's Palo Alto Research Center and at Apple streamlined and reshaped the device. Now only the tail-like wire is really mousey.

CHECKOUT BAR CODES

■ SUPERMARKET CLERKS use bar-code scanners to whisk your purchases from cart to bag in no time, but the technology behind them developed more slowly. In 1948, a grad student named Bernard Silver overheard a food-chain exec bemoan the lack of an automated-checkout system. Silver, with fellow student Nor-

man Woodland, developed and patented a system that used light to read a set of concentric circles. Crude and cumbersome, Woodland and Silver's concept waited for decades for the two innovations that would make it practical: computers and lasers. By the late '60s, they'd arrived. In 1973, IBM's Universal Product Code was adopted by the grocery industry. The following summer, a single pack of gum became the first item sold with a scanner. Store managers quickly discovered they could use the system not



You can't read this price tag—but a laser can

just to speed checkouts, but to control inventory and gauge customers' habits. Shopping has never been the same.

IN TOUCH THE CELLULAR PHONE

■ WITH ITS CATCHY NAME and clear convenience, the walkie-talkie was one of the hits of World War II. So after the war, companies moved to capitalize on the public interest in wireless phones. In 1946 AT&T set up the first commercial public radiotelephone service, in St. Louis. The system used a single transmitter and offered just six channels. It was a success, but was soon backlogged. And the system couldn't be expanded without clogging the radio frequencies. In 1947 AT&T hit upon the solution: instead of a single transmitter, you could



With one of these, you'll never have to walk alone

create a network of low-power transmitters, each placed in a region or "cell." As a phone user travels, calls could be handed off from cell to cell, allowing more people simultaneous access to the airways. In 1983, the first commercial cellular system clicked on with a call from Chicago to the grandson of Alexander Graham Bell in Germany. Experts predict some 500 million users by 2001.

Machines that make copies and send copies have become the modern office's favorite gadgets. BY T. TRENT GEGAX

FAXES & COPIERS

OF ALL THE electronic gadgetry in today's office, the PC is the most important

and widely used. No-brainer, right? Only if PC means "photocopier." The personal computer doesn't even rank second. That distinction belongs to the fax.

Now here's another surprise: after the telephone, the fax is the most important modern office innovation to be created in the 19th century. Alexander Bain, a hard-drinking Scot, patented the first fax process in 1843. As a schoolboy, Bain scored poorly and obsessed on clocks. After he moved to London, he developed the so-called master-slave mechanism, which, among other things, synchronized systems of school clocks. Bain's synchronization skills were indispensable for early fax technology. It required the transmitter of an image to send, via precisely timed telegraphy, successive lines of the image to a receiver, which were then reassembled at the exact same speed with the help of electromagnetic pendulums.

Nearly a century later, the idea for "electrophotography" came to Chester Carlson, a poor Caltech grad working in a New York City patent office. It was 1934, and Carlson found himself in constant need of duplicate copies of patent specifications. Loath to hand-copy everything, he set about saving himself time. Since he knew that large companies were already exploring photographic and

chemical copy processes, he turned his apartment into an electrostatics laboratory. It took Carlson four years to hit pay dirt. His first photocopied message: "10-22-38 ASTORIA." Carlson sold his idea to a New York firm that wanted an exotic name for its new process. A consultant, William Robert Jones, an Ohio State University classics professor, chose the Greek

word for "dry writing": xerography. A decade later, the company renamed itself Xerox. Its breakthrough 914, a 650-pound monster that cost \$29,500, debuted in 1960. By the 1970s Xerox had permeated corporate America.

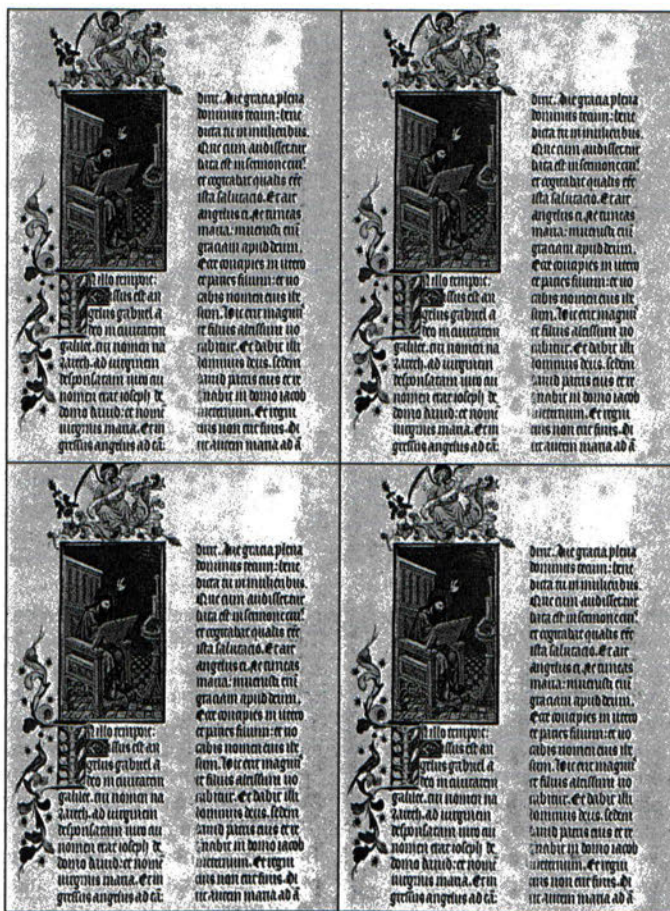
As the copier bloomed, the much older fax finally began taking root. The first commercial fax machine, then called long-distance xerography, went into service in 1964. The fax boom began in 1980, when the price dropped below \$2,000 and a digital standard made it possible to network all faxes worldwide. Between 1985 and 1990, fax ma-

chines proliferated—from 500,000 to 5 million. Federal Express tried to capitalize on the technology with ZAP Mail, a heavily promoted, high-speed fax service. It was a disaster, costing the company \$300 million, says Jonathan Cooper-smith, a tech history professor at Texas A&M. "But in the process," he says, "it popularized the fax machine."

Both pieces of equipment have played small roles in historical dramas. In 1962 the CIA used a Xerox repairman to mount an 8-mm movie camera inside the Xerox 914 at the Soviet Embassy in Washington, D.C. For its part, the fax has developed into a propaganda tool for democratic movements. During the 1989 Tiananmen Square demonstration, Chinese students in the United States faxed pro-democracy manifestoes to random Chinese fax numbers. Mikhail Gorbachev beat back a coup attempt in 1991 with the help of Russian citizens who faxed updates to the Voice of America that in turn were read back over the airwaves to millions of Russians.

Though they seem indispensable to modern life, the fax and photocopier may have begun their inevitable decline.

Some experts predict that e-mail and the Web will make the fax and photocopier redundant. But not for another two decades, predicts Columbia University's Michael van Biema. "We have this view of America being cutting edge," he says. "But an awfully large number of our documents still take four days to get from A to B by way of the U.S. mail."



The Monks Can Relax Copying this 15th-century illuminated Book of Hours is just a matter of pushing a button

Workers of the W

Good jobs will require more training than ever, and full-time positions will give way to freelance talent-for-hire

BY DANIEL MCGINN & JOAN RAYMOND

WHEN GEORGE YANO OPENED his garage in the Cleveland suburbs 47 years ago, the shelves were lined with Mitchell's manuals, the multivolume bible for mechanics. Back then, all Yano needed was the right book and a good ear to make any car run smoothly. Today the manuals

are gone, replaced by a Pentium-based computer and \$1,800 worth of CD-ROMs. The fix-it-by-sound method has disappeared, too; today's cars are controlled by noiseless computer chips. To keep up with the changes, Yano's son Andy, 43, spends two nights a week in continuing-education courses. It's a different world than when his father, now 74, looked under his first hood. "They used to call us grease monkeys," Andy says, pausing as he pulls a schematic drawing off the Internet as his father looks on. "If anybody told me I would have a computer in the garage, I would have told them they were crazy."

Workers of the world, get out your crystal balls. Just as the last decades have brought immense changes to the workplace—the influx of women, the advent of computers, the decline of organized labor, the rise of the service sector—the decades ahead will bring changes just as dramatic. Trying to make refined predictions of what work will look like decades from now is an exercise in folly, economists say, since the biggest changes will probably come from technological innovations we can only dream about. "To try to predict technology, you really go out on a limb," says David Bills, author of "The New Modern Times," a book on the past and future of work. But what lies ahead is not completely unpredictable. Demographers can tell us much about what the work force will look like 10 or 15 years out. Charting other changes is a matter of extrapolating from existing trends while hoping not to be embarrassed.

On the second floor of a Washington, D.C., office building, a group of 45 economists is hard at work on the government's sketch of tomorrow's workplace. Every other December, the Bureau of Labor Statistics publishes its employment projections. The paperback guide, a standard accessory in high-school guidance offices, predicts which occupations will grow and shrink over the next decade. The hot growth areas: health care and computer-related work. Things look less rosy for bookkeepers, typists, copy-machine operators—and anyone whose job can be vaporized by automation. Other changes are obvious. With longer life spans and the cash-strapped Social Security fund, working into old age will become more common. The workplace, like the country, will be home to many more immigrants. And if you work in a factory today, you—

or your children—are more likely to work in an office tomorrow.

That last change may be the most profound. In the future, says Robert Reich, the former Labor secretary who's arguably the nation's foremost contemplator of the future of work, we won't be able to classify workers under the blue-collar/white-collar division of yore. We also won't see so many Americans with only a high-school education earning comfortable middle-class wages. In Reich's view, the upper crust of today's white-collar workers will be classified as something that he calls "symbolic analysts." That rubric will include jobs—like lawyers, doctors, investment bankers and some teachers—that usually require graduate degrees. These will be well-paid positions involving "some of the most intensive knowledge work in the New Economy," he says. At the bottom of the ladder will be the so-called personal-service workers, the remaining low-skill, low-pay jobs that haven't moved overseas or been replaced by a computer. Think of the fast-food worker as the epitome of this job segment.

If the lives of the folks at the top and bottom of the ladder don't sound much different from what they lead today, that's because the greatest changes face workers in the middle, whom Reich calls, mercifully, "the new middle class." The rise of a middle class in America was largely a blue-collar phenomenon, and despite overseas competition, there are still millions of workers earning more than \$35,000 a year on an assembly line. Those jobs will dwindle in years to come. "Jobs bending metal or doing the machining in a factory will become fewer and fewer," Reich says. Tomorrow's middle class will be made up largely of "technicians," he says, whose jobs will usually require training on top of a high-school diploma. They will be the plumbers of the computer age. The technician class will include everyone from inventory managers to paralegals to high-tech auto mechanics like Andy Yano. "Almost all 'technician' jobs involve computers," Reich says. "You'll have to have more education than the old middle class."

Ed Lotterman, a regional economist at the Federal Reserve Bank in Minneapolis, already sees the changes. At local foundries, print shops and cabinetmaking plants, he sees many jobs that require more than the on-the-job training that sufficed in years past, but less than a college degree. Community colleges will train many of these workers, some of whom may receive proposed federal grants for two years of higher ed. And there may be a boom in privately run training schools.

Even the knowledge workers—those highly educated, high-earning professionals who should thrive in the new economy—face some big changes. In the wake of the early-1990s downsizing, it seemed as though nearly every laid-off executive had to call himself a consultant lest he admit to being permanently unemployed. But freelance talent-for-hire will become more the norm than the exception, experts say. A research project by the Human Resource Institute found that just 61 percent of the large companies it sur-

World, Get Online



veyed expected more than three quarters of its work force to consist of full-time, regular employees a decade from now, down from 84 percent today. While that may sound scary, Wharton professor Mike Useem says the midcareer executives he works with are already becoming comfortable with the notion of bouncing between employers and assignments rather than climbing the ladder at a single employer. Of course, they have no choice.

ACCORDING TO WATTS WACKER, A FUTURIST with SRI International, the talent-for-hire trend of the next century is a return to the guild system of the Middle Ages, in which tradesmen traveled from town to town practicing their craft for a variety of clients. Many knowledge workers will telecommute to their various offices.

Even without telecommuting, if you believe one school of thought, we won't be seeing our colleagues much in tomorrow's workplace. So say folks like Jeremy Rifkin, author of the best-seller "The End of Work," a discussion of how technology will take the place of many mass laborers. While it sounds like a chilling scenario with lots of painful unemployment, Rifkin argues

it will free us up for more cultural activities and nonprofit work. "There's no reason we shouldn't move to a 30-hour workweek now and a 25-hour workweek 10 years from now, with higher pay and benefits," Rifkin says. Economists scoff at that notion—if anything, they say, today's low unemployment rate and wage pressure show we face a shortage, not a surplus, of skilled labor. But Rifkin has sold more than 100,000 books and keeps a full speaking schedule, suggesting that there will always be ample work for futurologists.

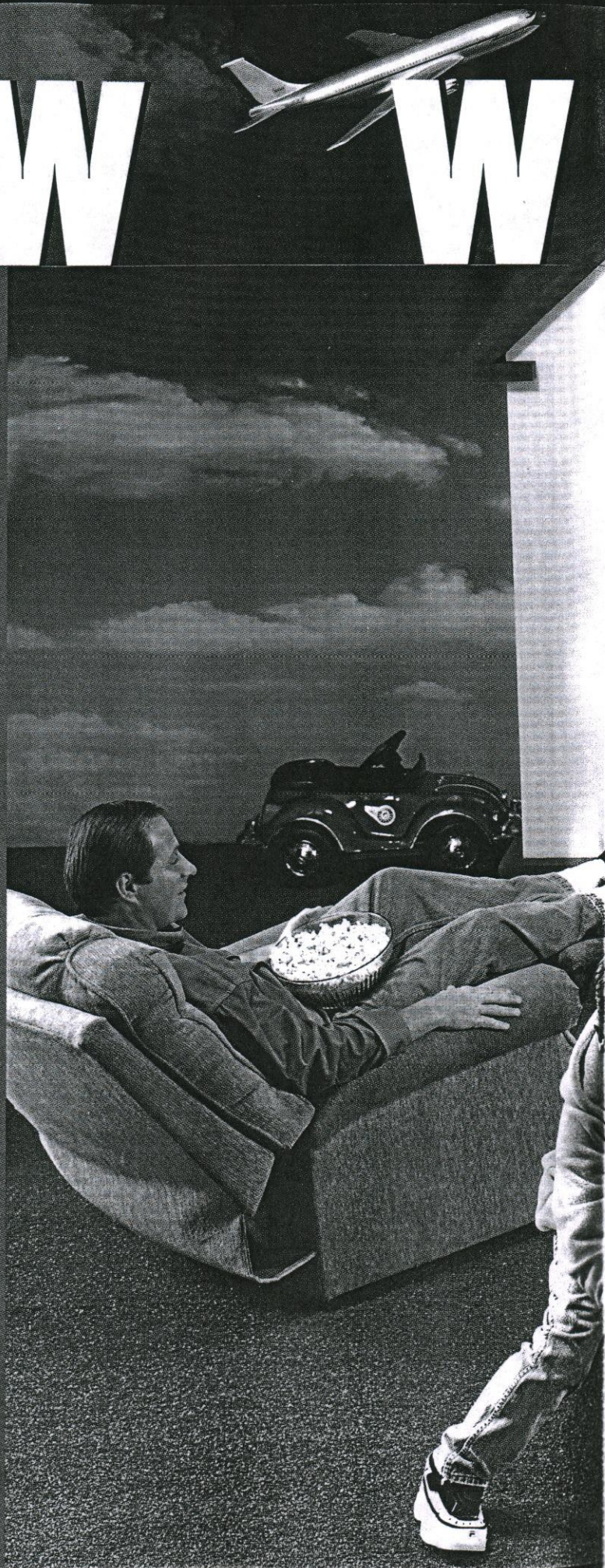
Not everything will change. Michael Tavoletti has learned that lesson well. It's no secret that farming has been a dying occupation for a century, but Tavoletti won't give up his 500 acres in central Ohio without a fight. Many of the rhythms of his job haven't changed in years: he still feeds his 100-plus head of cattle each morning and tends to fields of corn, hay and wheat each afternoon. But when it comes time to breed his cattle, Tavoletti now uses a computer to analyze what the potential of the offspring might be if he breeds, say, Cow 17 with Bull 8. Someday, he expects, the computers will help him optimize his planting, fertilizing and harvesting. "[I'm just] a guy who knows that technology is the key to keeping the farm in the family," he says. He's also a walking reminder that no matter what forecasters say, someone has to milk the cows. ■

H O W W



ON OUR LONG march toward domestic bliss, invention has made royalty of us all—and turned our homes into palaces. In this age of convenience, the humdrum tasks of ordinary life have become just a matter of pushing the right button. Turn on a machine and the wash is done, or the dinner is made, or the house is cooled, or the family is memorialized in a photo that, incidentally, can be preserved forever in a frame made of the wonderware known as plastic. No king who ever lived has had at the snap of his fingers the array of amusement we take for granted: music, movies and a mind-numbing choice of television channels, all at the other end of a remote control. Xanadu, we are here.

PHOTOGRAPH BY RAFAEL FUCHS
STYLING BY JAMES MASSENBERG



WE LIVE



Dishwashers, washing machines, vacuum cleaners and freezers have lightened the load on homemakers—but not always reduced their hours of toil. BY LAURA SHAPIRO

HOUSEHOLD APPLIANCES



DURING THE SPRING AND SUMMER OF 1913, AN editor at the Ladies' Home Journal compiled a list of the questions she had received from readers who needed help with their domestic problems. "Woman does all the work including laundry for a family of 10—is obliged to carry all the water that is used in the house," ran one notation. "Are there any efficiency methods that would help?"

Efficiency wasn't going to carry any buckets for this poor soul, but help was indeed on the way. First, of course, came electricity and running water, which reached most households within the first few decades of the century. With electric power came new machines that dramatically reduced the hard labor of housework. Pounding carpets, an arduous chore that involved carrying the carpets outdoors, hanging them up and battering them for dear life, disappeared with the vacuum cleaner. J. Murray Spangler, an Ohio department-store janitor, developed the first electrical suction-cleaning device for home use in 1907. He put together a machine housing an electric fan, a brush and a bag. The fan created a partial vacuum by pumping out air, the brush swept up the dirt, and dirt and air rushed into the bag. Spangler sold the patent to W. H. Hoover, and by 1926 more than half the households in Zanesville, Ohio, owned vacuum cleaners, according to a market-research study done at the time. It wasn't long before "the Hoover" became a household noun all over the industrial world.

But the job women dreaded most was doing the laundry. "From all available evidence—how-to manuals, budget studies of poor people's households, diaries—it appears that women jettisoned laundry, their most hated task, whenever they had any discretionary money at all," writes Susan Strasser in "Never Done: A History of American Housework." By hiring a woman to help, or sending out men's collars and cuffs to a commercial laundry, many women could lighten the burden a bit; but even with assistance, most housekeepers did little else on Monday but the wash. Sheer muscle power got most of the dirt out: each item had to be rubbed against a washboard in hot, soapy water. Next the housewife wrung out each item and boiled the clothes briefly on top of the stove. Then came another round of soaping, rinsing and wringing.

Some items had to be starched and wrung out yet again. Finally she hung everything outdoors and prayed for dry weather.

No wonder that even the rudimentary electric washing machines introduced around 1910 made such a hit. These contraptions were motor-powered washtubs that jiggled the clothes back and forth in soapy water. They eliminated hand-scrubbing, but the housewife still had to fill the washtub with water, empty it after use and feed each wet article through a wringer mounted on top of the tub. By the '20s the tub came equipped with an underwater agitator, a device of twisted metal that kept the water sloshing through the clothes, the better to force out the dirt. Fully automatic machines, which filled and emptied themselves, were developed in the '30s and became widely available after World War II. These machines needed no wringers on top because they were built with an inner, perforated drum for spin-drying—a process that uses centrifugal force to whirl the sopping clothes until they're semidry. Automatic dryers, also introduced after the war, completed the transformation of washday (although only Westinghouse thought to gladden the laundry room in 1952 with a machine that played "How Dry I Am" at the end of each cycle).

This brave new world of washing was made even easier with new cleaning agents. Since late in the 19th century, housewives had been accustomed to buying bars of laundry soap, made from fats and lye, and scraping them into flakes for washing clothes. (Rinso, the first granulated laundry soap, appeared in 1918.) When the fats needed for making soap ran short during World War I, the Germans developed a substitute: detergent. The active ingredient in detergent is the petrochemical alkyl benzene. Treated with caustic soda (found in lye) and sulfuric acid, alkyl benzene helps detergent penetrate soiled clothing more effectively than soap. One end of a detergent molecule has a slightly negative electrical charge, and is attracted to the slightly positive charge of water. The other end is repelled by water and instead latches onto grease and grime. As dirty laundry swirls in the washing machine, the agitation pulls the molecules, and the dirt, away from the clothing.

By the 1950s, domestic drudgery seemed on the brink of disap-

Washday Bliss For Doris Day in 'The Thrill of It All,' doing the laundry was no longer a grim chore but another reason to grin

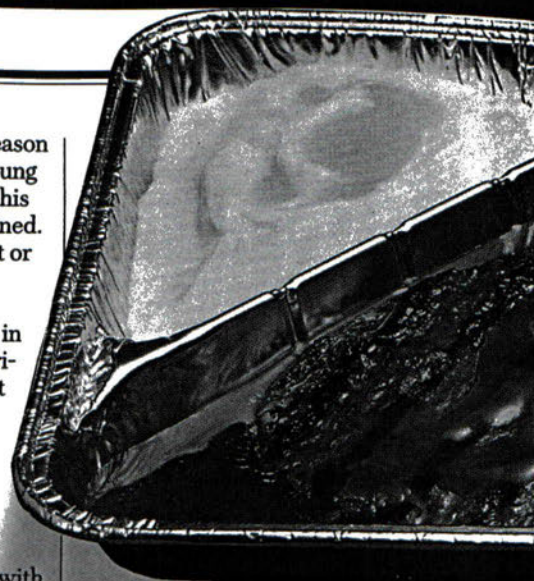
pearing altogether, at least according to the ads in women's magazines. "The Prestomatic Ironer! Relax while you iron!" "Now dry *electrically*—just by touching a dial!" "The new Ultramatic Caloric ... It's completely automatic! Lights automatically without matches. Cooks automatically while you're out. Makes coffee automatically while you sleep." Yet from the 1920s to the 1960s, the very period during which labor-saving appliances became standard household equipment, housework not only survived, it proliferated. According to research by sociologist Joann Vanek, full-time housewives in 1924 spent about 52 hours a week on household chores. In 1966, their counterparts spent 55 hours.

What happened? Credit an invention with a truly formidable impact on domestic life, a work in progress since the Industrial Revolution: the American Homemaker. Early in the 19th century, with every chicken she raised and every shirt she stitched, a housewife was intrinsic to the economy. But as production shifted to factories, the contribution of nonemployed women became more intangible. Picking up socks, driving kids to Brownie meetings—it all took time, but the results were transitory and the work certainly brought in no cash. In truth, middle-class women had a vital role in the factory-driven economy: they were supposed to be full-time consumers. Framing this responsibility in the noblest possible terms kept journalists and copywriters, at least, fully employed. As Vera Connolly, the editor of *Woman's Day*, cautioned her readers in 1938, just because

they had time on their hands was no reason to get a job. "It takes from a capable young husband the privilege of being head of his family and its sole support," she explained. "Then, too, there is no job so important or so joyous as homemaking!"

But keeping house, joyously or not, wasn't going to eat up 55 hours a week in the age of technology without some serious redefining of terms. One of the first to be transformed was "clean." The old sense of "no visible dirt" had already been revised upward with the discovery of germs, but even "hygienically clean" was becoming relatively easy to achieve with dishwashers and washing machines. Gradually, with the spread of automatic washers, a new standard emerged: clean clothing came to mean "has not touched human skin since most recent laundering." Under this definition it became reasonable to try on a blouse in the morning, grimace, and throw it into the laundry hamper. Vanek's data show that in 1928, before the invention of fully automatic washers, housewives spent about six hours a week doing laundry. In 1953, when ownership of the machines was common, the job took seven hours.

Another term that needed refurbishing was "cooking," in part to acknowledge the contribution made by convenience foods. Clarence Birdseye, a naturalist and fur trader traveling in Labrador in 1916, had been the first to understand how Inuit fish-freezing techniques could transform American dinner tables. The key was speed. When biological tissue freezes slowly,



Mealtime Magic Frozen dinners were an instant hit, divided like Gaul into three parts

large ice crystals form within and outside the cells. When the tissue thaws, the large crystals damage the cell walls (in plants) or membranes (in animals). The result is mushy-textured vegetables and tough meat. But the Inuits laid fresh-caught fish on the ice, where it froze quickly. The crystals were small, allowing cells to retain their integrity. Their fish had the texture and flavor of the fresh catch. Birdseye went home and established Birdseye Seafoods, later expanding his business to include meat, fruits and vegetables.

Convenience foods really did cut down on cooking time. A cake-mix cake hit the oven in two minutes flat; instant mashed potatoes lived up to their name (at least the

LANDMARKS



AT EASE LA-Z-BOY

■ IF EDWIN SHOEMAKER and Edward Knabusch had assembled their adjustable wooden deck chair just a little bit later in the year, the world may never have known the supine pleasures of the La-Z-Boy. As it happened, the two Eds, a farmer and a woodworker respectively, came up with their deck chair in the spring of 1928, which was still too cold for porch sitting in Monroe, Mich. A neighbor—or, by some accounts, a furniture buyer

from Toledo—suggested that the fledgling furniture designers take their chair indoors and upholster it.

That first chair begat a line of novelty furniture: the Gossiper, for instance, allowed busybodies to use the telephone in comfort and to store items in the chair's base. It was the Reclina-Rocker, however, that was to make La-Z-Boy synonymous with American domestic comfort. The chair, introduced in 1961, allowed lazy boys to rock in cushioned comfort and to crank a ratchet handle on the chair's flank to recline into a nearly horizontal position. It was an immediate

The Brownie made Grandpa say 'Cheese'

hit; in a decade sales went from \$1.1 million to \$52.7 million, leaving the two Eds very comfortable indeed.

CLICK THE BROWNIE

■ THIS WAS THE CENTURY the camera went democratic. In 1899 George Eastman, who, among

other things, invented the word Kodak, asked his industrial designer, Frank Brownell, to build a camera that was easier to operate and cheaper than any then available. The Kodak Brownie camera appeared on the market a year later. It was made of jute board and wood, with a two-element lens, cost about a dollar and used film that sold for 15 cents a roll. The Brownie was made to take pictures in average light, at an average focal distance, with a surprisingly quick shutter speed of 1/50th of a second. The camera's name derived from pixie characters created by Canadian illustrator Palmer Cox, and was chosen to em-

phasize its diminutive size (a child could hold it) and easy use (a child could operate it). The camera was an instant hit, selling 250,000 in its first year, and it stayed on the market for an amazing 80 years.

But the Brownie was designed for beginners. More advanced amateurs, not to mention the growing ranks of photo professionals, needed something small, precise, silent and capable of allowing small negatives to be enlarged into prints with little loss of sharpness. Oskar Barnack, an engineer of microscopes at the Leitz optical works in Wetzlar, Germany, had the idea in 1905 of converting a little machine that measured light exposures for movie film into a still camera. He





"instant" part). What's more, a growing segment of the nation's economy was devoted to manufacturing and selling convenience foods, while nobody had much of an economic stake in promoting homemade borscht. The challenge facing the food industry was to keep women excited about cooking—to make it "important" and "joyous"—just as technology was making it all but unnecessary. "Get dinner with the help of your refrigerator," suggested a 1953 story in the *Woman's Home Companion*. The refrigerator would "help" the housewife prepare in advance and store two separate meals, one for the adults and one for Junior. The grown-ups, for example, would have meat loaf and pie; Junior would have a hamburger and a cup of the pie filling. Miraculously, "cooking" had been made more time-consuming without in any way affecting the amount or quality of the food.

As convenience melted imperceptibly into inanity, the very concept of housework slipped free of its hard-labor connotations and drifted into the ethereal realm of "homemaking." In television commercials, homemakers were the women in dresses and high heels often pictured rhapsodizing over their new dryers. But for their real-life counterparts, homemaking had a couple of fatal flaws, primarily the tedium and the lack of tangible rewards. Hence it was vulnerable to just about any competition for the housewife's attention. In the early 1970s, a team of sociologists interviewed 309 women in Evanston, Ill., about their domestic responsibilities. The women put in a mean of 31.5 hours a week—the first reduction in housekeeping time since the dawn of labor-saving technology. Not that technology contributed much to the new efficiency. What made the revolution wasn't vacuum cleaners; it was work—paycheck-type work.

Paychecks had always been more effective than machinery in getting women out of the house. Vanek's research shows employed women tearing through their housework in about half the time reported by

at-home women. By the 1970s working women, once a minority, had become a critical mass: in the Evanston sample, 63 percent were employed full or part time. And the more time they spent at their jobs, the less household work got done—by the women or anyone else. The job itself shrank; whole chunks of it broke off from disuse. Today, women employed full time are experts at keeping chores to such a minimum—don't dust the piano until you actually sneeze while walking by—that it barely qualifies as housework, much less homemaking. Call it domestic life support.

But the American Homemaker is still with us. No, she doesn't spend the day beaming at her dishwasher anymore, or exclaiming over the brightness of her waxed floors. Instead you'll find her spray-painting the doorknobs for Thanksgiving or getting up at 5 a.m. to make 14 kinds of dim sum for brunch. Technology? She loves it; in fact, she's thinking of repairing that old sewing machine in the attic and making matador outfits for all the kids in the neighborhood. Sure, she has a paying job. But as her lifetime subscription to *Martha Stewart Living* often reminds her, "There is no job so important or so

joyous as homemaking!" As for the rest of us—the ones who would rather wear bath towels on the street than use a sewing machine again—what makes homemaking joyous today is that it *isn't* a job. At long last, it's a choice. ■



Cloth diapers were soft, reassuring and a smelly nuisance. The disposable diaper eased life for millions of parents.

made a prototype in 1913; the first Leica (a combination of "Leitz" and "camera") was introduced in 1925 at a Leipzig industrial fair. It quickly became the industry standard and the grandfather of today's 35mm cameras.

LITTLE HELPER DISPOSABLE DIAPERS

■ MARION DONOVAN was tired of dirty diapers and crying babies. Her two daughters were soaking through their leaky cloth diapers and wetting their beds, and the poor air circulation around the babies' skin caused irritating rashes. So in 1946, Donovan, a Connecticut housewife with a flair for invention, solved the problem. She devised

a cover made of nylon parachute material that could be slipped over a diaper, and designed it to hug the baby's legs and keep moisture in while allowing air to circulate. Plastic snaps replaced the pins that frequently pricked jiggly newborns. Thus was born the Boater, the world's first moistureproof diaper. Eventually, Donovan sold the diaper to stores, physicians and nurses at \$1.95 apiece, and newspapers around the country hailed her as a supermom.

Ten years later, in 1961, a chemical engineer for Procter & Gamble named Victor Mills took her invention one step

further. He helped create Pampers, the first successful disposable diaper.

OPEN SESAME THE POP-TOP

■ IT WAS 1959. AN ENGINEER from Dayton, Ohio, named Erald Cleon Frazee found himself on a family picnic without a can open-

er. Desperate for a beer, Frazee opened a can on his car bumper. Convinced there had to be a better way, he stayed up one night and devised the first easy-open can, using a ring that pulled off the entire top. Patented in 1963, it was the most important development in beverage containers since William

Painter invented the crown cork bottle cap in 1892. Later Frazee improved on his invention: the "pop-top can" in 1965 used a ring to pull a pre-punctured tab on the top of a can. In 1975 he patented today's commonly used "push in, fold-back" top, which eliminated the problem of millions of discarded tabs littering the landscape. Frazee sold exclusive rights to his inventions to the Aluminum Company of America (Alcoa) in Pittsburgh. In return, he received royalties for each of the 150 billion cans of beer, soda and juice guzzled every year in the United States. He died rich in 1989, secure in the gratitude of just about everyone except can-opener manufacturers.

Our clothes, our cars, our wrapping and our garbage are made of this material. How did we ever do without it? BY DEBRA ROSENBERG

PLASTICS

WHEN THE TITANIC plunged to the ocean floor in 1912, it became an underwater time capsule, a snapshot of life in the early 20th century. Salvagers who recovered the riches aboard the wreck 75 years later were struck by the absence of one material: plastic. That's impossible to imagine today. Since 1976 plastic has been the most widely used material in the United States. "In the five decades since World War II, plastic has crept unceasingly, and often invisibly, into our homes, cars, offices, even our bodies," writes Stephen Fenichell in his book *"Plastic: The Making of a Synthetic Century."*

The earliest plastics were invented with far more modest goals. Created from the plant-based material cellulose in the mid-1800s, they were used as replacements for ivory in billiard balls and dental plates. But the first completely synthetic substance didn't emerge until 1907, when chemist Leo Baekeland was cooking up chemicals in his Yonkers, N.Y., garage, hoping to develop a substitute for shellac. Demand for shellac—which comes from the shells of rare Asian beetles—had skyrocketed because it could serve as an insulator for the new electrical wires. Baekeland created a liquid resin that hardened into a transparent, amber solid that wouldn't burn, boil, melt or dissolve—even in acid. Dubbed Bakelite, the "Material of a Thousand Uses" was soon found in electrical insulation, but also in jewelry, ashtrays and—its greatest triumph—the classic black dial telephone.

Around the same time, Swiss chemist Jacques Edwin Brandenberger grew disgusted with the stained tablecloths in French cafés. Why not invent a covering that could be wiped clean? When Brandenberger squirted cloth with liquid viscose, a cellulose product, the tablecloth became

glossy but stiff. Then he tried making viscose film into transparent sheets, which he called cellophane (from the French words *cellulose* and *diaphane*, meaning diaphanous or transparent). He sold it to the motion-picture industry as a replacement for cellulose nitrate, a highly flammable film. But cellophane distorted under heat. So Brandenberger marketed it as a wrap, selling it from a fancy Paris boutique. Prices were so high that at first cellophane was used only to swathe the finest French perfumes—and was kept locked in store safes at night. Later, the impermeable film became a lifesaver in gas masks. And it revolutionized packaging of candy and cigarettes—especially once Du Pont scientists invented a moistureproof version in 1926.

By the late 1920s, industry was luring young scientists away from academia. Du Pont, in particular, was a hotbed of

Polymer Miracle
In the '40s, women got their kicks from Fiber 66, otherwise known as nylon

scientific research. The company hired a young Harvard chemist, Wallace Hume Carothers, to head its lab. Carothers, who later became the first industrial chemist ever elected to the National Academy of Sciences, believed that small molecules could be combined to form larger, more complex ones called polymers. Using this method, Carothers and his team



developed neoprene, the first synthetic rubber. Then they embarked on a quest for artificial silk. After toying with these polymers for several years, Carothers's crew developed a plastic that could be stretched into long, thin, elastic strands like bubble gum. But the new fiber melted in hot water and dissolved during dry cleaning. It took a few more years of tinkering to perfect the material, which was given the pedestrian name Fiber 66 because it had six carbon atoms on each side of the polymer.

Carothers's revolutionary fiber was later test-marketed in the bristles of Dr. West's Miracle-Tuft toothbrush.

But its official debut came on the legs of Miss

Chemistry at the 1939 World's Fair in New York—by then it was called nylon. Nylon stockings weren't widely available until May 15, 1940, marketed as N-day, when American women snapped up 5 million pairs of the sheer, sexy legwear. Demand for nylon soared during World War II, when the fiber was used to make parachutes and to reinforce tires. Carothers's discovery of polymers spawned a whole new wave of polyester fabrics, including Dacron, the synthetic wool that launched the leisure suit. (Carothers didn't live to see it. In 1937, just 19 days after applying for the Fiber 66 patent, he committed suicide.)

By then, a far bigger world of plastics was taking shape. In 1929, a B.F. Goodrich organic chemist, Waldo Semon, was trying to bind rubber to metal when he stumbled upon a polymer called polyvinyl chloride (PVC). It was a lousy adhesive, but when Semon molded it into a ball, it bounced down the hallway—unusual behavior for a synthetic rubber. "I knew I had something different," says Semon, now 99. But he didn't know what to do with it until he watched his wife, Marjorie, sew a shower curtain from rubber-lined cotton. PVC, he thought, would make the perfect waterproof coating. Semon took a sample of PVC-coated fabric into his boss's office, placed it on top of the in/out basket and dumped a decanter

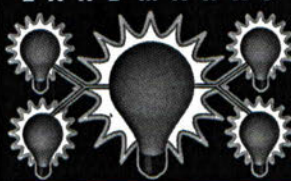
of water over it. "It scared him stiff," recalls Semon, but the papers stayed dry. Vinyl proved to be cheap and fire resistant, and it could be molded into myriad shapes. It soon appeared in thousands of products such as garden hoses, the tops of convertible cars and long-playing records.

Vinyl wasn't the only accidental plastic. In 1933 Ralph Wiley, a college student who scrubbed glassware in a Dow Chemical lab, came across one vial he couldn't clean. Wiley dubbed the substance that stymied him "eonite," after an indestructible material in the comic strip "Little Orphan Annie." Eventually it was made into a greasy, dark green film, which Dow called Saran. The military sprayed it on fighter planes to guard against sea spray; carmakers used it for upholstery. Later Dow rid the film of its green color and unpleasant odor and marketed it as Saran Wrap, the clingy cover-

ing that changed the American kitchen.

By the second half of the 20th century, the American public had become so accustomed to plastic that it had turned a bit scornful of the stuff. It was increasingly viewed as cheap, fake and destructive to the environment—"plastic" became a pejorative for anything that lacked real substance. But after Malden Mills and Patagonia marketed a synthetic sheepskin called Polar Fleece in 1981, plastic regained some of its chic. Microfiber—yes, it's a finely knit polyester—even struts onto fashion runways. And a new line of "bioplastics," biodegradable polymers derived from starches and proteins, are improving plastic's eco-image. In the past six years, 250 patents have been granted for polyester alone. It has been 30 years since Dustin Hoffman was given his famous career advice in the movie "The Graduate." It's still a pretty good tip. ■

LANDMARKS



MUSIC

THE LONG-PLAYING RECORD

■ THE LP PHONOGRAPH record may not seem exciting in this, the age of the compact disc, but when Peter Goldmark perfected it in 1948, music lovers rejoiced. Goldmark, a research scientist for Columbia Broadcasting System, bristled at the fact that the then standard 78-rpm records needed to be flipped every five minutes, and set out to devise a better platter. Others had tried and failed, but Goldmark, tinkering at work and in his free time at home, developed a 12-inch disc that played at a much-slower 33⅓ rpm. Even more crucial, perhaps, was that Goldmark's record was made of vinyl, rather than the shellac-and-clay blend previously employed. Plastic discs were not only tougher and less noisy, but also allowed for narrower grooves and therefore more music—up to half an hour per side. Finally, audiophiles could settle in for a nice long listen.

NO STICK

TEFLON

■ IT'S THE SUPERHERO OF polymers. Neither heat nor cold can hurt it, no acid can attack it. But Teflon is best known for another quality: its slipperiness. Teflon was discovered by Du Pont chemist Roy Plunkett while he was studying refrigerants in 1938. Plunkett had pumped Freon gas into a cylinder and left it in cold storage overnight. The next morning he was surprised to find the cylinder empty. He sawed the container open and found that the gas had polymerized into a powdery white solid, polytetrafluoroethylene, which he called Teflon. Manhattan Project scientists used it to prevent corrosion from uranium. In the 1960s, Du Pont spread it on kitchen pans. Later, engineer Bob Gore stretched it into Gore-Tex, the water-resistant, breathable clothing.

STRETCH

SPANDEX

■ WOMEN BREATHED A sigh of relief in 1959, the year Du Pont introduced spandex, dubbed Lycra, as a replacement for heavy-duty rubber in girdles. Spandex fibers had their roots in the polyurethane chemistry pioneered by the German firm Bayer A.G. in 1937. Re-

searchers sought to replace the cotton-wrapped rubber then used in stretchy garments. Not only was rubber heavy and unwieldy, but it was prone to overstretching. Man-made spandex fibers could be stretched to five times their length and still snap back to their original form—a better recovery than that other elastic fiber, nylon, could boast.

Spandex, usually blended with fibers like cotton, wool or polyester, has long since escaped the narrow confines of women's foundation garments. It shaped the skimpy swimwear of the 1960s, the tube tops of the '70s and the form-fitting leggings and aerobic wear of the '80s. Today, it's the stretch in elastic-waist jeans.



In these outfits, you could really feel the burn

HOW WE LIVE



The Silents Charlie Chaplin, here behind the camera, electrified the first generation of ticket buyers



Talkies Al Jolson brought sound to "The Jazz Singer" (1927); later came ear-shaking speakers and Dolby effects



Animation Kids of all ages loved Gertie the dinosaur, then Mickey the mouse. Before long, the Three Little Pigs sang and Snow White was in color.



Living Color A beam splitter and two prisms rendered Clark Gable and Vivien Leigh in three colors. Superimposed on each other, they became "Gone With the Wind."



THE MOVIES

They are the art form of our era, a spectacle that attracts the whole world

BY JACK KROLL & TESSA NAMUTH

SOME SAY THE 20TH CENTURY was actually born in 1914, when the guns of August blew away the covenants of the 19th century. But there's a strong case to be made for Dec. 28, 1895, when the first paid public showing of motion pictures took place in Paris, presented by Louis and Auguste Lumière. (Check out that incredibly fortuitous name, the Light Brothers, creating the movies, the art of light!) Although Thomas Edison had invented the Kinetoscope in 1889, his device could be seen by only one viewer at a time. Oddly, the Wizard of Menlo Park didn't see much future in projecting the pictures.

There has always been a mad hassle over who should be credited with invent-

ing movies. The history of this debate can be summed up by the roster of devices turned out by inventors in America and Europe: the phasmatrope, the phenakistoscope, the stroboscopic disk, the phantoscope, the daedalus, the zoetrope, the zoopraxiscope, the bioscope, the pantoptikon, the tachyscope and many more. But it was the Lumières who brought the movies as we know them into being, when they assembled 33 people in their 100-seat theater to be shocked and amazed by a series of one-minute epics that showed workers leaving the Lumière factory, a train arriving at a station, a baby having lunch and the first comedy smash, in which a man watering a garden gets the water smack in the kisser. The Lumières' cinématographe was an advance on Edi-

son, being both a camera and a projector.

It's doubtful if the human race will ever be as astounded by a new form of entertainment as it was by the advent of the movies. With this new art, wrote one observer, "the great potentialities of life ... shall overflow to the nethermost portions of the earth at the command of the humblest heir of the divine intelligence." There's an important point in that earliest of all movie blurbs. Movies, it was instantly seen, are something that appeals to everyone anywhere in the world. Of course this was especially true in the first quarter century of cinema, before sound. Charlie Chaplin and Buster Keaton needed no words to communicate with people from New Jersey to New Guinea. In fact, the introduction of sound was seen as an artistic catastrophe by many of the great silent-film directors.

Their concerns were blown aside in 1927 by the explosive success of Warner Brothers' "The Jazz Singer" with Al Jolson. The Warner studio, in dire financial straits, gambled everything on the Vitaphone system, in which sound on records was synchronized with the film. When Jolson, then at the peak of his reputation as an entertainer, sang numbers like "Toot Toot Tootsie Goodbye" and uttered the immortal line "You ain't heard nothin' yet, folks!" the audience leaped up and

Wide Screen

Hollywood refined the CinemaScope process dating from the 1890s and produced Panavision extravaganzas such as 1962's 'Lawrence of Arabia'



Virtual Reality After '2001,' the sky was no limit



3-D In the '50s there was an outbreak of scare-'em flicks like 'Bwana Devil' with spears hurtling toward the audience, which had to wear those silly glasses



Computer f/x 'Terminator 2: Judgment Day' morphed the rules and brought special effects to dazzling heights

cheered. This was the essence of the great populist art form of the movies: who ever rose to her feet while reading a Tolstoy novel?

Making images seem to move is an atavistic impulse that goes back to the Paleolithic cave artists. Jump-cut to 1906, when an American, J. Stuart Blackton, used stop-motion photography to make what

is credited as the first animated cartoon, "Humorous Phases of Funny Faces." Three years later the great comic-strip artist Winsor McCay anticipated Steven Spielberg with "Gertie the Dinosaur," the first animated cartoon shown on a regular theatrical program. McCay gets credit for making the first full-length animated feature in 1918. No funny faces here; his unlikely theme was "The Sinking of the Lusitania." But comedy was the natural brother of animation, driving the great comic animators from Walt Disney, whose early cartoons like "The Three Little Pigs" were sensations, to Warner Brothers with its repertory group of sterling thespians like Bugs Bunny, Porky Pig and Daffy Duck, all voiced by the immortal Mel Blanc.

While animation evolved, live-action-film makers struggled with adding color to their black-and-white universe. Many lamented the inevitable incursion of color, which they thought would mar the expressive power and beauty that had been developed by great cameramen like D. W. Griffith's Billy Bitzer, who brought the sweep of history to films like "The Birth of a Nation" and "Intolerance," and William Daniels, whose brilliant photography of Greta Garbo was a crucial factor in making her the biggest female star of her age. The master of spectacle, Cecil B. DeMille, pre-

dicted that no one would endure straining his eyes watching movies in bright color.

Color, in fact, had existed virtually since the beginning of movies. Some films, like the two great Griffith epics, had had some sequences laboriously hand-tinted, frame by frame. In Erich von Stroheim's 1924 masterpiece, "Greed," a character's pathological miserliness was expressed when Stroheim gold-tinted a scene in which she wallowed in a bed filled with gold coins. In 1915 Herbert T. Kalmus and Daniel F. Comstock formed the Technicolor Motion Picture Corp. In 1923, none other than DeMille used its two-color process in parts of "The Ten Commandments." In the early '30s, Technicolor created the first three-color process. But it was "Gone With the Wind" in 1939 that changed the palette of movies forever.

Cinema was moving closer and closer to the approximation of reality. First motion, then sound, then color—and then came the attempt to break free of two-dimensionality. Again, 3-D effects were as old as the movies, dating back to the "anaglyph" method, in which a camera photographed a scene with two lenses placed as far apart as human eyes. The resulting two images were merged (crudely) into a single stereoscopic image by special red and blue glasses worn by viewers. Refined 3-D methods were showcased in short films commissioned for the Festival of Britain in 1951. This led in the '50s to an outbreak of scare-'em 3-D movies like "Bwana Devil," with spears hurtling toward the audience, and "House of Wax," with Vincent Price turning corpses into wax exhibits.

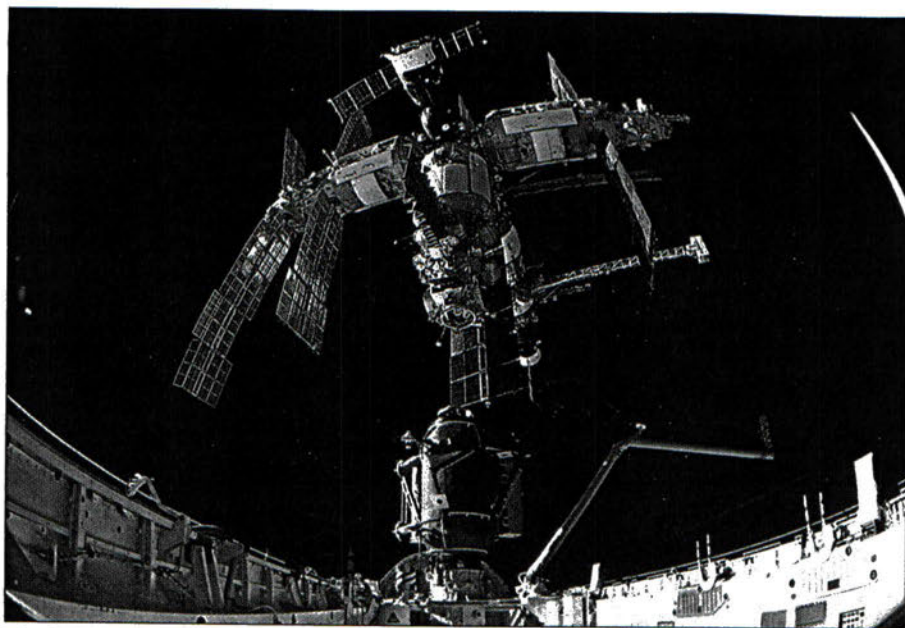
It was Hollywood that was scared, as television began to eat into its monopoly on image entertainment. Enter wide-screen

technologies like Cinerama and CinemaScope, in which Twentieth Century Fox took a French-developed technique (again, going back to the 1890s) and made the first wide-screen feature, the religious epic "The Robe" (1953).

The culmination of the wide-screen technology is today's IMAX, developed by a group of Canadians. First shown at fairs and expos, IMAX used the largest film frame in movie history, 70 mm, shown on huge screens from four to eight stories high with multidirectional sound. Still pretty much a supergimmick, IMAX is shown at 154 theaters in 22 countries, 28 equipped with IMAX's own 3-D technology. But we still await the first use of this method to create a viable storytelling film.

As movie technology continues to go where no moviegoer has gone, what is the future of the popular art form of the expiring century? "I just want to say one word to you—holograph," as the guy in "The Graduate" didn't say to Dustin Hoffman. Holography, the evocation of fully dimensional, life-like images, will almost surely lead to some movielike form. The problem, as it was at the beginning with Edison's Kinetoscope, is how to show it not to one or two viewers at a time, but to a theaterful, a community of paying spectators. Alan Rhody, editor of the trade journal Holography Marketplace, predicts: "As laser technology progresses, optical barriers are crossed, and venture capitalists become actively involved in the hologram industry, theatrical holographic presentations will become a reality." Yes, and he might have added the prospect of computer-generated presentation replacing live performances.

Today, storytelling and character are both driven, many would say imperiled,



The IMAX Frontier A scene from 'Mission to Mir' on the new giant screen

by the explosive rise of special effects. Even this goes back to the early days of film, when the marvelous Frenchman Georges Méliès made movies like the 1902 "A Trip to the Moon," in which he mixed real action and animation to create legendary sequences like the space travel-

ers' rocket hitting the man in the moon right in the eye. "King Kong" was a big breakthrough in 1933, when the masterly Willis O'Brien created, with models and stop-motion, his super-ape and an island full of prehistoric monsters. The revolutionary move in f/x came in 1968 with

Stanley Kubrick's "2001: A Space Odyssey." Helped by the twentysomething Douglas Trumbull, Kubrick won an Oscar for the tremendous special effects that even today remain the model for films about space and technology. George Lucas's "Star Wars" series is a kind of "Son of 2001"; the brainy Lucas formed Industrial Light + Magic, which became the Microsoft of special effects. The ambiguous triumph of today's special effects is that anything—even reality—can be instantly "morphed" to anything else through the ubiquitous, omnipotent technology of the computer.

Is this the final Utopia of the movies? Or will it represent the muscling-in of inexorable technological progress on the most universally human art form ever devised? Have a vision: a vast theater, filled with people wearing headsets and huge visored helmets, tuning in to a 360-degree circle of images rippling with motion, coruscating with color and sizzling with sound. Are they experiencing the work of the new D. W. Griffith, John Ford, Orson Welles, Jean Renoir, Ingmar Bergman or even Steven Spielberg and Martin Scorsese? Or are they basking in the multidimensional supersauna of techno-entertainment, tuning in to the ultimate drug of virtuality for the price of a ticket? Roll credits. ■

Compact Disc: Sound by the Numbers

In the world of recorded music, the CD—introduced in 1982—has virtually replaced LPs. CDs are smaller than LPs, hold more music and don't wear out during play, but detractors criticize the "cold" sound of digitally reproduced music.

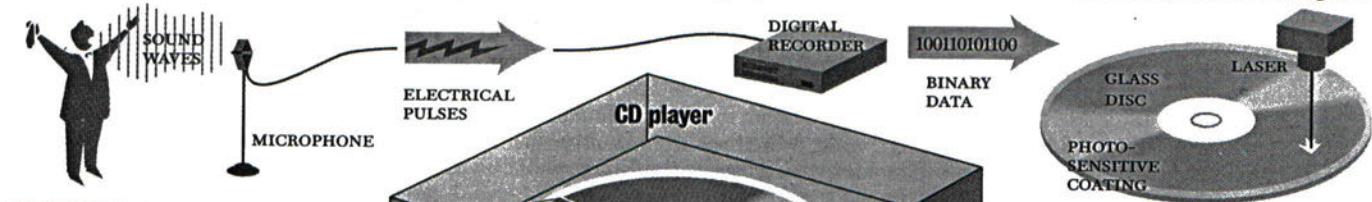
How CDs are made

1 Sound waves hit the microphone's diaphragm, creating a complex series of vibrations

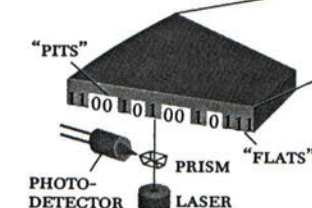
2 The microphone converts these physical vibrations into electrical pulses

3 Electrical current is converted to digital code—a binary language of 1s and 0s

4 This binary data is laser-etched onto a glass master disc, used as a mold for making CDs



How CDs are played



1 A laser scans the underside of the CD, converting the "pits" and "flats" to flashes of light

2 "On" and "off" light flashes correspond to binary code (1 represents "on", 0 is "off")

3 Binary code is converted to numerical values, used to produce an electrical current

4 The current is amplified, and converted back to sound waves by a loudspeaker

RESEARCH BY THOMAS HAYDEN, GRAPHIC BY STANFORD KAY—NEWSWEEK. SOURCE: "HOW IN THE WORLD," READERS DIGEST, 1990

How the tube was born out of a struggle between an Iowa farm boy and a wealthy entrepreneur. BY ADAM ROGERS

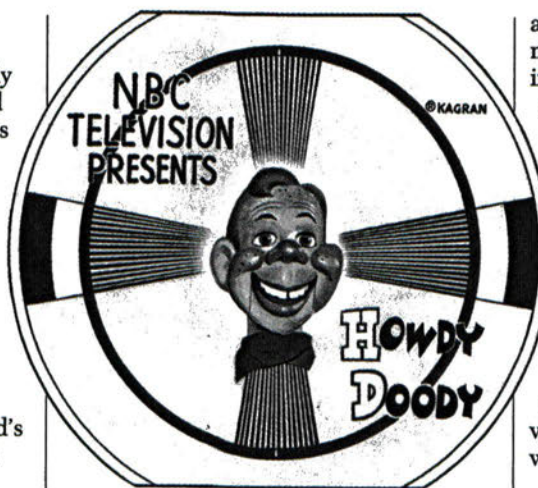
TELEVISION

THE FIRST COMMERCIAL television broadcast in America happened exactly where and when it should have—at the 1939 World's Fair in New York. That fair has been called the beginning of the future—it featured freeways, computers, robots and an opening speech by President Franklin D. Roosevelt that was televised to the few hundred television sets in the New York area at the time. A decade later there were 7 million sets in the United States.

But television didn't begin at the World's Fair. It entered the public imagination as early as 1879, when Punch cartoonist George du Maurier depicted a "telephonoscope" over the mantel of a well-heeled couple. The idea was an easy extension of the two hip interactive media of the day—the telephone and the telegraph. If it worked for sound, why not pictures? In the end, though, the invention of television came down to a race, and a contest of wills, between two men: Philo Farnsworth, a self-taught electrical engineer from an Iowa farm, and David Sarnoff, the tech-savvy marketer who started NBC.

Perhaps they should share a bit of the credit with a third man, the creator of one of those brilliant false starts that litter the history of invention. In 1883 a German engineer named Paul Nipkow devised what he called the Nipkow disk. The disk was pierced with small holes arranged on a spiral, and had a light source positioned behind it. When the disk was spun, light shining through the holes would streak across a picture, one line of light per hole. Those lines could be converted into electrical signals and transmitted to another Nipkow disk, which could in turn reconstruct the original picture on a photosensitive surface. At first, the system looked good for sending copies of documents—an early fax machine. But it seemed it would work for moving pictures as well.

The problem was that the disks had to be precisely synchronized and spin very fast—the system tended to be-



The Future in a Box From Howdy Doody to Beavis and Butt-head. You doubt progress?

come unstable. So as far back as 1908, engineers were trying to figure out an all-electronic system that would scan images with "cathode rays," streams of electrons in a vacuum tube. But how to direct the beam onto the thing you're trying to take a picture of, or onto the photosensitive screen for display?

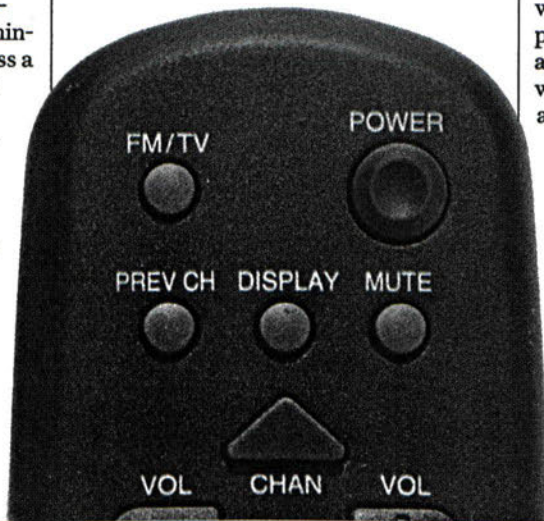
That's where Farnsworth came in. A farm boy who didn't see electricity until he was 12 years old, he proved to be something of a prodigy after discovering a stack of old technical magazines and a Delco farm generator to tinker with. In the summer of 1921, when Farnsworth was 14, he turned a horse-drawn harrow

around at the edge of a hayfield he'd just mowed and looked at the neat lines crossing the cut grass. Farnsworth realized that magnetic fields could direct a beam of electrons across an image, one line at a time, and that the resulting signals, fired at an electron-sensitive screen, would mesh so fast that the human eye would perceive a continuous picture. Over the next 20 years, Farnsworth scabbled for funding and lab space while he made incremental improvements in his device. His wife worked with him; his brother-in-law became an expert glass blower to make the vacuum tubes they needed. They had a working model by 1928.

While Farnsworth and his family were tinkering in a tiny room in San Francisco, Vladimir Zworykin, a Russian émigré, was working on cathode-ray tubes in a well-funded, well-staffed lab in New York. Zworykin, too, was able to come up with a working electronic television, and he had the advantage of the patronage of his employer, David Sarnoff of RCA. Sarnoff was a genius when it came to seeing the potential in a technology; he was the first to suggest radios for home use and a network of stations to broadcast to them. And he knew this television thing was going places.

Zworykin's work was arguably behind Farnsworth's, but that didn't suit Sarnoff. His motto was "RCA doesn't pay royalties. It collects them." By the 1930s, Sarnoff—through Zworykin—and Farnsworth were fighting it out in the patent courts. Farnsworth ended up with six basic television patents, but Sarnoff had an ace: the National Broadcasting Co., or NBC, a radio network that could offer the infrastructure for a sibling television network.

By 1951 color televisions went on sale. Broadcasters like Dave Garroway and Ernie Kovacs were beginning to define the content of television as we know it today. And the invention clearly isn't finished. Digital television will—we're told—offer pictures of unprecedented clarity and allow a seamless connection with a newer mass medium, the Internet. Maybe the technology will be ready in time for the next world's fair. ■



Get Ready for N

Some scientists think it may be possible to use tiny robots to tinker with molecules and build anything we please

BY ADAM ROGERS & DAVID A. KAPLAN

ACOW IS A COW IS A COW. GOD MAKES them, farmers raise them, we eat them—it's a simple, predictable division of responsibilities. But what is a cow really besides some grass, water and air molecules uniquely rearranged to attract flies and moo? Now consider the miracle of what the cow does: somehow it manages to take in those ingredients and become steak. Bessie—the ultimate meat machine. What, though, if we could replicate the process? What if we became masters of the molecular universe?

Imagine this kitchen scene, circa 2047: it's time to make dinner. But the fridge and oven are now obsolete. Instead, you go to a device resembling a microwave oven—we'll call it the Assembl-o-Tron. It has tubes running out the back that feed into a public plumbing system run by the DRM, the city's Department of Raw Materials. There's a keypad programmed with the family favorites. You hit F3 for sirloin, fries and a salad. The Assembl-o-Tron sucks at the DRM line for a dime's worth of elemental gunk. Then, billions of microscopic robot assemblers pull and tug at the individual atoms the DRM has provided: carbon, nitrogen, hydrogen and oxygen, maybe a few metals. In seconds, the assemblers have rearranged the elements precisely to yield the proteins and carbohydrates and whatever else makes up a good sirloin 50 years from now. Captain Kirk, it's chow time! After dinner, the garbage and fine china can be dumped back into the "Tron for "disassembly." As long as the DRM isn't offline, cooking and cleanup are forever consigned to antiquity. Now, *that's* progress.

This is the future world of nanotechnology, the study of the really, really teeny-tiny—there are a billion nanometers in a meter. That infinitesimal scale is where the real action of the universe is. It's where atoms dance with other atoms to form molecules of everything, from wood to Kevlar to Pop-Tarts. "When you start thinking what you can do if you could really position atoms wherever you dream of them, it looks like a wonderful future," says Rick Smalley, a chemist and the director of Rice University's Center for Nanoscale Science and Technology. It is today's science fiction—almost all theory still, but just close enough to plausibility to beguile physicists and chemists, biologists and engineers.

Playing games in the nanoworld holds the Promethean promise of giving society any material it wants at virtually no cost—500-story skyscrapers made from diamond rather than steel, fabulously powerful microprocessors, spaceships that have the strength of titanium but the weight of plastic, paint that changes color, "smart" fog that hovers invisibly in our homes, materializing into furniture or a bathrobe when we say so. Armadas of

medical robots will patrol the bloodstream, killing cancers and viruses or scraping out arterial blockages. In this future, we'll all die only of boredom.

Even today, the nascent science of the itty-bitty is taking form. The technology of MEMS—micro-electro-mechanical systems—already exists and has practical applications. These Lilliputian sensors, motors, gears and other micromachines—from coffee cup to speck-of-sand in size—can recognize light and sound and motion. Working in concert with microchips, MEMS can "think" and then take action. That's what a whisker-size sensor in an airbag does. Or a blood-pressure kit and carbon-monoxide detector for use at home. These very basic sensing devices are part of a \$2 billion industry that some experts predict will be worth more than \$100 billion by 2010. "Microprocessors defined the 1980s and cheap lasers allowed the telecommunications revolution of the '90s," says Paul Saffo, an analyst with the Institute for the Future in Menlo Park, Calif. "MEMS and sensors generally will shape the first decade of the next century."

As MEMS become ever smaller and cheaper—even disposable—they'll become ubiquitous. Several cities already are equipping utility poles with sensors that can "hear" gunfire and pinpoint location; one day they may be able to recognize specific voices. Planes will no longer have traditional flaps, but instead thousands of sensing devices—"peach fuzz"—that will control movement. Materials like concrete will become smart, able to adapt, for example, to the shaking in an earthquake. Today, public toilets can recognize our presence (by infrared sensors); tomorrow, virtually everything in our physical world will be watched by some device.

As spectacular as these kinds of gadgets may be, though, it is the far smaller realm of nanotechnology that may ultimately change the lives of our children. MEMS will tie together the digital and analog world, allowing computers to interact with inanimate objects—houses, say, could be programmed to adjust their energy requirements to the needs of their inhabitants and those of the neighbors. Nanotech lets us in on creation itself: if we have the constituent molecules, we can do anything.

The idea for nanotechnology started with Richard Feynman, the legendary physicist. In late 1959, Feynman gave a speech at Caltech called "There's Plenty of Room at the Bottom." Near the end of his talk, Feynman posed the ultimate challenge of matter. "I am not afraid to consider the final question ... can [we] arrange atoms the way we want, all the way down." What in the laws of physics said otherwise?

Feynman's idea lay largely dormant until 1981, when a 26-year-old MIT grad student named K. Eric Drexler published a paper in the Proceedings of the National Academy of Sciences titled "Molecular Engineering: An Approach to the Development of General Capabilities for Molecular Manipulation." In it,

Nanotechnology



Drexler argued that DNA and nature's own synthesis of protein provided a kind of "existence proof"—it must work because it does—that human beings should be able to assemble molecules. The trick, he realized, was devising the tiny machinery necessary to snap together the atomic Legos. These "nanobots" would be the workers in nanoscale construction zones. Build them so they can reproduce themselves, and when you make one you've got a trillion, thereby facilitating unimaginable feats of engineering—Genesis, by any other name.

DREXLER CONTINUES TO WRITE PAPERS. BUT the gospel of nanotechnology is now preached by his wife, Chris Peterson, who runs the Foresight Institute they set up as a nanotech clearinghouse. "If molecular machines already exist naturally, like the ones inside a cell," Peterson says, "it's not an unreasonable goal to set ourselves to build similar systems."

But how do you build a nanobot?

Nanoists like to cite work already done on atomic structures. In 1989, for example, scientists using a scanning probe microscope were able to arrange 35 xenon atoms on a nickel surface to form the letters of their employer, IBM. Scanning probe microscopy (SPM) involves dragging a tiny tip across the surface of an object; the point is sharp enough to "feel" individual atoms, its motion sensed by computer right down to the angstrom (one tenth of a nanometer). It's a tricky business, since the tip breaks easily. With some finesse, SPM can be used for harder tasks. In

1996, another team of IBM physicists in Zurich built a nanoscale abacus, with each "bead" consisting of a carbon molecule.

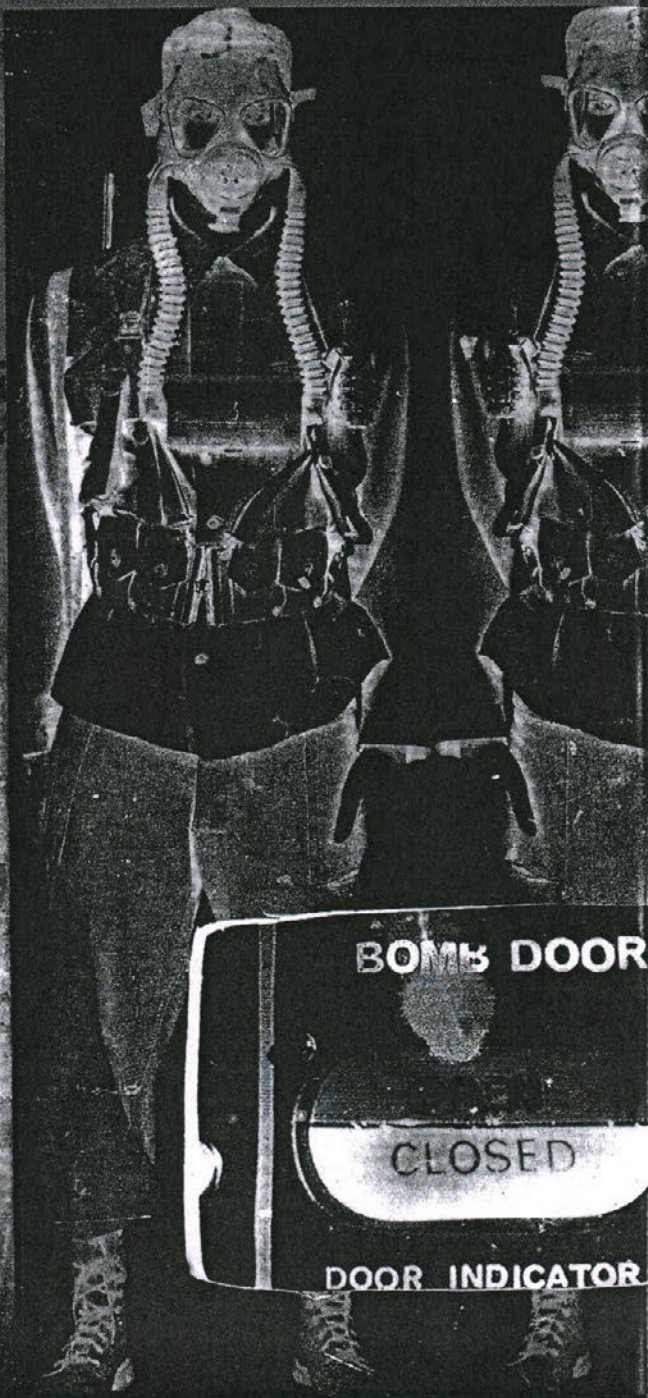
Not just any carbon molecule, but a "buckyball"—60 carbon atoms arranged in the shape of a soccer ball, with the same structure as the geodesic dome popularized by Buckminster Fuller. Buckyballs were discovered in 1985 and now represent the most important component of nano design. Strung together, they become "buckytubes" or "carbon nanotubes." They're being called the "ultimate fiber"—hollow cylinders of carbon that weigh a fraction of steel but have 100 times the strength. Buckytubes are roughly 10 nanometers wide and have amazing traits: they're virtually unbreakable, they're good conductors of electricity and they're almost inert chemically. All that suggests that someday buckytubes may be the "nanofingers" used to control teenyweeny devices; their conductivity also means they may become molecular wires, leading to a new generation of computers. "You can see how we're beginning to dream bold dreams," says Smalley, who won the Nobel Prize for codiscovering buckyballs.

Even so, buckytubes represent a far cry from the self-replicating assemblers necessary in Drexlerland. The fact remains that it's all theoretical: nobody's close to making one. "I am deeply concerned that a universal assembler is flat-out impossible," says Smalley, who of all people appreciates the magnificence of scientific discovery. No one knew about buckyballs or buckytubes until he came along. No, nanotech may lie forever beyond the grasp of scientists who would usurp nature. But that wouldn't be all bad. Do we really want a world where any Joe with a bale of hay and a bucket of water can make a great steak?

H O W W

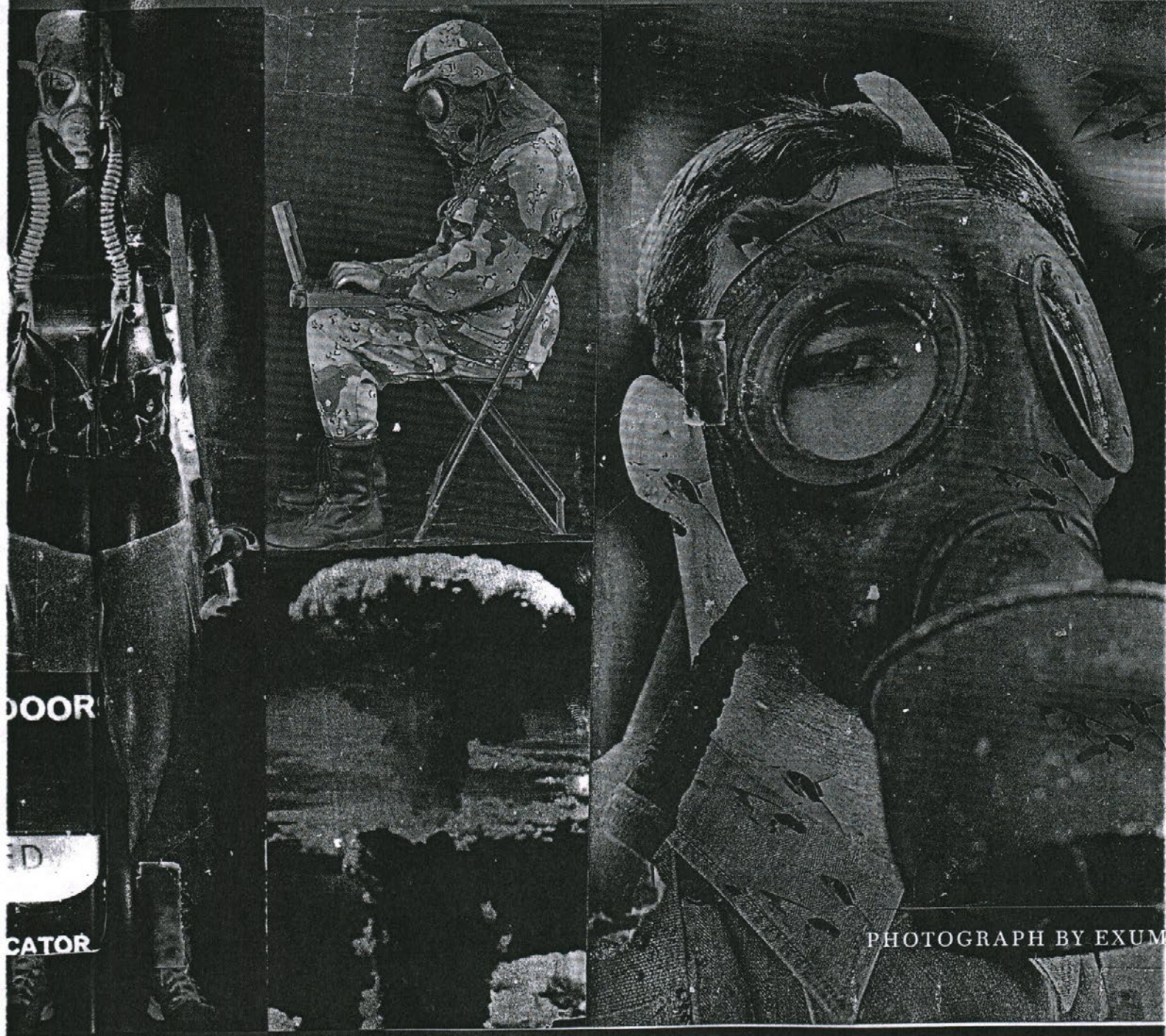


THE GODS OF WAR SMILED ON THE 20TH CENTURY. WORLD War I introduced the tank and poison gas. World War II brought us radar, rockets and the atomic bomb. Mankind has paid a heavy price in blood and devastation. But it is also possible to see a



THE FIGHT

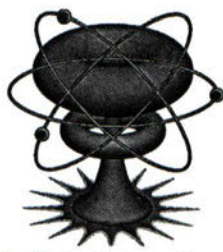
LD
has
a
glimmer of light through the smoke. Radar inspired huge advances in astronomy, medicine and weather prediction. Rockets have carried men to the moon and cameras to the planets. And nuclear bombs, by their very horror, may have put an end to another of the century's ugly military innovations, total war.



PHOTOGRAPH BY EXUM

THE ATOMIC BOMB

Nuclear weapons may have achieved at least one blessing for mankind: putting an end to world war. BY RICHARD RHODES



its fissioning, ran for a hundred thousand years and shut itself down. Its nuclear waste didn't wander and has long since decayed to lead.

French mining experts discovered the remains of several such natural reactors in Gabon in 1972. By then, science imitating nature, workers in many countries were pouring concrete for water-moderated, man-made nuclear reactors to generate electricity, and six nations were stockpiling atomic and hydrogen bombs.

Two German chemists studying uranium, Otto Hahn and Fritz Strassmann, discovered nuclear fission in Nazi Germany in December 1938, nine months before the beginning of World War II in Europe. When the chemists published their finding the following month, the scientific community was amazed. No one had ever seen such an energetic reaction: fire one low-energy neutron into a uranium atom and the atom split apart and released a burst of energy 10 million times as intense.

Such ferocious output made it immediately obvious to physicists everywhere that the discovery could lead to a vastly destructive new kind of bomb. Jewish physicists in England and America

who had escaped Nazi Germany were horrified. Fearing a German head start, Hungarians Leo Szilard, Eugene Wigner and Edward Teller, plus Albert Einstein, an earlier arrival, alerted Franklin Roosevelt. The president, realizing that possession of such a weapon would be the only defense against an enemy similarly armed, gave the go-ahead for a top-priority research effort. The British, already at war, contributed a detailed proposal, and in October 1941 the Manhattan Project was born.

It cost as much to make the first three bombs as it would cost two decades later to send men to the moon. What began on a benchtop in Germany in 1938 became an industry comparable in scale to the U.S. automobile industry of the day. Vast secret factories went up in Tennessee that drew megawatts of TVA electricity and employed tens of thousands of workers. The Columbia River was partly diverted to cool powerful graphite-and-uranium production reactors in the state of Washington. Tons of uranium ore entered one end of the system; a few grams of pure uranium and the new man-made element plutonium came out the other. Once a week an army security man carried the week's output in an ordinary suitcase by passenger train to a new secret laboratory high on a mesa at Los Alamos, N.M., where the first bombs were to be built. "Gadgets," lab director J. Robert Oppenheimer dubbed them when the laboratory set up shop behind barbed wire in April 1943.

Oppenheimer, a charismatic theoretical physi-

cist, guided a crack team of world-class scientists at Los Alamos. The two different bombs they devised over the next 28 months, Little Boy and Fat Man, fissioned baseball-size cores of uranium or plutonium to deliver explosions equivalent to thousands of tons of TNT. Designing such awesome weapons required inventing whole new technologies: electrical detonators with microsecond timing, high explosives shaped into lenses that focused shock waves to compress solid metal, diagnostic cameras spinning a million frames a second, plutonium's bizarre metallurgy.

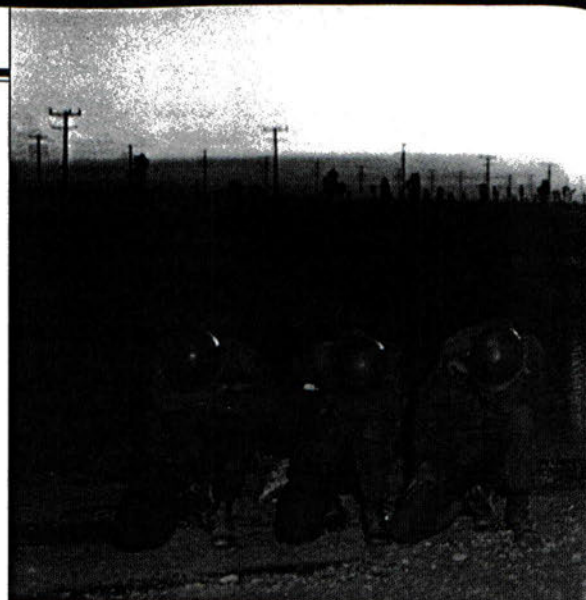
The first Fat Man exploded on a tower in a barren stretch of New Mexican desert before dawn on July 16, 1945, confirming the success of this immense commitment of people and resources. "There was an enormous ball of fire which grew and grew and it rolled as it grew," Columbia University physicist I. I. Rabi remembered. "It looked menacing. It seemed to come toward one." Rabi saw the test's deeper portents as well: "A new thing had just been born; a new control; a new understanding of man, which man had acquired over nature."

To recruit his remarkable team, Oppenheimer had whispered that the bombs they would build would not only end World War II but might also end war itself. Certainly they ended the Pacific war. Of the 76,000 buildings in the Japanese port city of Hiroshima, bombed on Aug. 6, Little Boy damaged or destroyed 70,000—48,000 of them totally. Ninety percent of all Hiroshima's medical personnel were disabled or killed. At least 70,000 people died by the

end of the month; more died later of the effects of fire, blast and radiation. A second Fat Man, twice as powerful as Little Boy, similarly decimated Nagasaki on Aug. 9. A third Fat Man was waiting in the wings; Oppenheimer thought he could produce six a month beginning in October. Japanese Emperor Hirohito specifically cited "a new and most cruel bomb" in his historic broadcast of Aug. 15, when he ordered his people to lay down their arms.

Was Oppenheimer right? Did the development of nuclear weapons put an end to war? Not all war, obviously, but world-scale war became increasingly unthinkable after those brutal August shocks. Across the second half of the century—an era one historian has called the "long peace"—tens of thousands of bombs would be built and stockpiled, but in all those years not one was ever exploded in anger.

Why such unprecedented restraint? Because a proliferating balance of terror made nuclear war suicidal. A Soviet scientific team under physicist Igor Kurchatov started small-scale development of an atomic bomb in Moscow early in 1943, after spies in England and the United States alerted Stalin to the Manhattan Project. The Soviet dictator suspected a hoax, but the evidence of Hiroshima and Nagasaki two years later persuaded him to order an

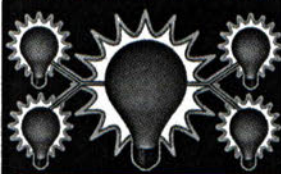


About-Face During a 1957 test, U.S. soldiers turned to screen the flash; radiation was not so easily avoided

all-out Russian effort. By then, two Los Alamos physicists, German émigré Klaus Fuchs and an American, Theodore Alvin Hall, had independently passed detailed plans to the KGB. The British began a bomb project immediately after the Japanese surrendered. France under Charles de Gaulle soon weighed in. Even Sweden launched a small bomb program in those early days but eventually shut it down.

The United States temporized for two years before beginning to improve and stockpile nuclear weapons in earnest: as late as April 1947 there were no working atomic bombs in the American arsenal, though the cold war had begun dividing the world by then and Soviet conventional

LANDMARKS



FIRE FIGHT NAPALM

■ BEFORE THERE WERE nuclear weapons, there was napalm—a compound of jellied gasoline made infamous for all time by the photo of a Vietnamese girl running naked from her burning village. A research team led by a Harvard chemist, Louis F. Fieser, developed the substance during World War II and named it after two key ingredients, aluminum napthenate and coconut palm oil. Compared with plain gasoline, napalm burns more slowly (there-

by igniting more secondary fires) and can be propelled a greater distance in flamethrowers. Dropped from an airplane, it can ignite an area as big as a football field, disabling or destroying a tank without requiring a direct hit. Sprayed into a trench and ignited, it can suck up enough oxygen to suffocate

anyone caught inside. Napalm land mines, consisting of 55-gallon drums rigged to phosphorous grenades, were used in Korea. Fifteen-thousand-pound bombs of "jellied slurry," a similar product, were dropped in the gulf war to "scare people and clear helicopter zones," according to the air force.



Fireballs of napalm seared the jungles—and the memories—of Vietnam

Napalm sticks to anything it touches, and burns at temperatures as high as 3,000 degrees.

WHIRLED WAR

THE HELICOPTER

■ THE FIRST HELICOPTERS were smashing successes, so to speak. In 1907 the brothers Louis and Jacques Bréguet built one in France that rose two inches off the ground. Later that same year a helicopter built by French bicycle dealer Paul Cornu maintained an altitude of at least one foot for about 20 seconds before it crashed. It was Igor Sikorsky, a Russian mechanical engineer, who was largely responsible for developing the modern helicopter in-

dustry. Sikorsky built his first helicopter in 1909, but it wouldn't fly. Ten years later he immigrated to the United States. In September 1939 his company unveiled the VS-300, a copter with a rotor over the cabin and a smaller vertical rotor at the tail for stability. It was the first American helicopter capable of sustained flight. Sikorsky mass-produced a similar one for the Allies, which found copters superior to planes for detecting German subs. The industry got a huge lift during the Korean and Vietnam wars when helicopters were used extensively to move troops and equipment. Now designers are working to reduce their noise and vibration—with an



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forces in Europe were expanding. Harry Truman, determined to pay off the war deficit and judging that the world's only nuclear power could afford to reduce its conventional forces, cut the defense budget to the bone. When the Pentagon realized in 1948 that the civilian Atomic Energy Commission was legally required to build as many bombs as the military certified it needed—and that the commission would bear the expense—official military requirements soared from a few hundred bombs to, eventually, tens of thousands. The Soviet Union was a serious threat, but “overkill,” as it came to be called—making the rubble bounce—had more to do with interservice rivalry in both the United States and the U.S.S.R. than with military reality.

When U.S. “sniffer” planes picked up fallout from the first Soviet atomic-bomb test, on Aug. 29, 1949, two years ahead of CIA predictions, Washington panicked: suddenly Russia had nuclear potential to go with its massive conventional advantage. A few wise heads, including Rabi, saw that nuclear parity might make the Soviets amenable to international control and called for renewed diplomacy. But hawks, encouraged by an ambitious Edward Teller, clamored for a new, unique capability: the hydrogen bomb. The Joint Chiefs heard about the hydrogen bomb for the first time on Oct. 13 and decided on the spot that the United States had to build it before the Russians did. Truman concurred, announcing his decision on Jan. 31, 1950. “I never forgave Truman,” Rabi would say bitterly. “For him to have alerted the world that we were going

to make a hydrogen bomb at a time when we didn't even know how to make one was one of the worst things he could have done.” Teller had sold Washington a pig in a poke.

Inventing the hydrogen bomb turned out to be a far harder job than the atomic bomb had been. Calculations on some of the earliest digital computers proved that the design Teller had banked on was a dud. He was near despair when an urbane Polish mathematician at Los Alamos, Stanislaw Ulam, showed him the way to a breakthrough. The two-stage design that resulted, tested on the Pacific atoll of Eniwetok on Nov. 1, 1952, yielded a terrifying 10.4 megatons—a thousand times the power of the Hiroshima bomb. The Soviets worked out multiple staging in 1955 and tested a 58-megaton monster in 1961, the largest ever exploded. British, French and Chinese hydrogen bombs followed. Israel, India, Pakistan and South Africa developed more modest atomic capabilities.

The motive for going nuclear was always defensive, though national prestige also figured in. The United States built the bomb because it feared a German lead, Soviet Russia to counter the United States, Britain and France to acquire an independent anti-Soviet deterrent, China to counter the United States and the U.S.S.R., India to counter China, Pakistan to counter India, Israel because it was surrounded by hostile Arab states, apartheid South Africa to ward off black Africa. Before it gave up power, the white South African government dismantled its small nuclear arsenal, the only act of unilateral nuclear disarmament yet recorded.

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eye toward use by commuters.

ROLLING THUNDER THE TANK

■ THEY ARE TRACTORS TO war. The earliest experiments with armored vehicles date from 1908; they essentially went nowhere. But with the onset of trench warfare in World War I, and its dreadful battlefield stalemate, the military needed a vehicle that could cross muddy, shell-pocked terrain. It fell to the British Admiralty to develop one (the British Army, by one account, refused to work on the project). Designers based their models on tractors that used treads. Officially known as a landship—remember, it was a naval vessel—it was

called a water tank by developers to confuse enemy spies. Covered with armor and carrying six guns each, hundreds of British tanks lumbered through the German lines at the Battle of Cambrai in November 1917. Surprised by their success, the British failed to exploit the breakthrough.

BULL'S EYE SMART BOMBS

■ A WEAPON THAT MISSES its target is a weapon wasted. Frustrated in Vietnam by bombs that whiffed, the U.S. Air Force in 1965 charged de-



On the attack, from World War I to the gulf

fense contractors with developing a new class of weapon. The results were the first “smart bombs,” which could be steered on target using tiny TV cameras, infrared sensors or laser homing systems. In the gulf war, smart bombs hit their targets about half the time, far better than unguided munitions. The latest weapons are smarter still.

HOW WE FIGHT

Every U.S. president since Truman and every Soviet leader after Stalin said publicly that using nuclear weapons was inconceivable, and so it has proved to be. Not deadlocked, as in Korea, nor even defeat, as in Vietnam and Afghanistan, would ever justify escalation. The danger was too great. "In the real world of real political leaders," John Kennedy's and Lyndon Johnson's national-security adviser, McGeorge Bundy, wrote in 1969, "... a decision that would bring even one hydrogen bomb on one city of one's own country would be recognized in advance as a catastrophic blunder; ten bombs on ten cities would be a disaster beyond history; and a hundred bombs on a hundred cities are unthinkable."

Small, cheap and portable, with essentially unlimited destructive capacity, nuclear weapons deny advantage to aggressor and defender alike. Lesser wars continue and will continue until the world community is sufficiently impressed with their futility to forge new instruments of protection and new forms of citizenship. But world war has at least been revealed to be a historical interlude in human history that began when the industrial capacity of entire nations could be mobilized for war and ended when a few hundred bombs could destroy that capacity in a matter of hours. In the long history of human slaughter that is no small achievement.

An equal achievement has been the application of nuclear fission to peaceful purposes. Nuclear power plants in 32 countries today supply more than 17 percent of the world's electricity. Americans have been



The Physicist Who Knew Sin Oppenheimer with Gen. Leslie Groves at test site

taught to fear nuclear power, but the United States has more installed capacity than any other country. France is second—75 percent of French electricity is nuclear, which has reduced French air pollution fivefold—followed by Russia and Japan. Chernobyl was an anomaly: a flawed design, illegal in the West, recklessly mishandled by a criminal regime.

Air pollution, increasing demand and depletion of fossil fuels make it a sure bet that natural gas and nuclear power will be the prime sources of energy in the 21st century: China, South Asia and the industrializing Third World have already begun ambitious nuclear power programs. Nuclear reactors breed plutonium as they burn uranium; the

"spent" fuel that affluent America calls nuclear waste and prepares to bury is a nearly unlimited source of energy that other nuclear nations value and recycle. (U.S. recycling was halted in 1979 to discourage weapons proliferation, but no nuclear power makes bombs from reactor-grade plutonium, and no terrorist group could—it's unreliable.) Like the natural reactors of Gabon, power reactors can transmute nuclear waste—including the tons of plutonium removed from the tens of thousands of nuclear weapons that the United States and Russia are dismantling as the arms race winds down—to less dangerous forms.

"The physicists have known sin," Robert Oppenheimer once famously said. He meant their pure science had fallen into a world of hard consequences. So long as civilization continues, we will have knowledge of how to destroy ourselves in nuclear war. But a world without nuclear weapons isn't a pipe dream; the time will come when deterrence means mothballed factories capable of delivering warheads in three months rather than nuclear submarines capable of delivering warheads in half an hour. Self-interest will dictate the stand-down, because nations growing more prosperous in a nuclear-powered world will have ever more to lose. That prospect and all this history, taken together, mean that the release of nuclear energy was arguably the most important human discovery since fire.

RHODES is the Pulitzer Prize-winning author of "The Making of the Atomic Bomb" and "Dark Sun."



A gas mask was a doughboy's best friend

CHEMICAL WARFARE

POISON GAS

■ THE SPARTANS BEGAN using chemicals in battle as early as 400 B.C. by launching bombs made of sulfur and pitch. But the first deadly gas attack wasn't till April 1915, when the German Army dropped chlorine gas over the Allied trenches outside Ypres, Belgium. Within months the British retaliated with a chlorine

attack, and the deadly race was on. In 1918 both sides used mustard gas, which seeped through masks and clothing to burn skin and sear lungs. Despite the Geneva Protocol of 1925 banning chemical warfare, it was used in the '30s by Japan against China, by Italy against Ethiopia and by both sides in the Iran-Iraq war in the '80s. A global convention banning the making and stockpiling of chemical-warfare agents

was drawn up in 1993. So far, 104 nations have signed it.

JUMPERS

THE PARACHUTE

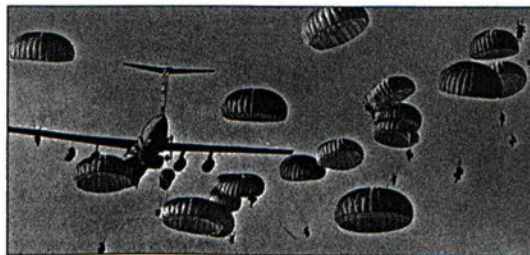
■ PARACHUTES HAVE HAD their ups and downs. Leonardo da Vinci designed one in 1495. In the late 18th century Frenchmen used them for sport, to jump off towers and out of balloons. A New Yorker, Leo Stevens, developed

the first manually operated parachute in 1908, but its linen-and-cotton canopies proved too weak for use from powered aircraft. Finally, in 1922, Lt. Harold Harris of the U.S. Army made the first emergency jump from an airplane without injury, using a chute made of silk.

BODY ARMOR

THE BULLETPROOF VEST

■ CHAIN MAIL? TOO heavy. Suits of armor? They rust. Shields? Too unwieldy. The quest for a lightweight but powerful body armor was unfulfilled until a Du Pont chemist whipped up a new batch of petrochemicals one day in 1965. Stephanie Kwolek was looking for a fiber to re-



It's a simple formula: No rip cord, no 82d Airborne



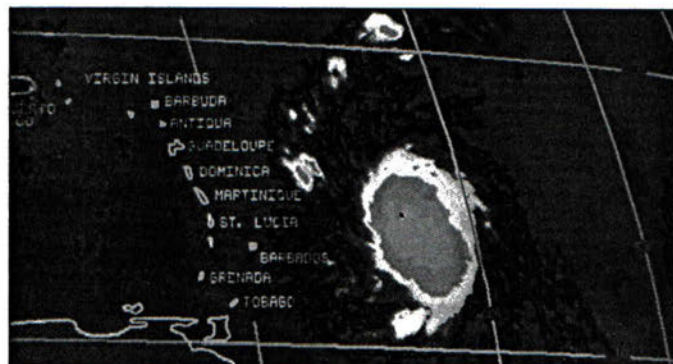
A Kevlar-coated member of New York's Finest

inforce radial tires. She found it in a miracle polymer that later became Kevlar. It was an astonishing five times stronger than steel. A colleague, Joe Rivers, tailored Kevlar into the bulletproof vest. Now the vests are standard issue for police officers. U.S. infantry troops wear Kevlar helmets—and flak jackets into which ceramic plates can be inserted to stop enemy rounds.



Weather forecasting, deep-space astronomy, even MRI scanners in hospitals owe a debt to this key wartime discovery. BY ROBERT BUDERI

RADAR



Look Up, Look Down Radio telescopes in the Very Large Array in New Mexico, an image of Hurricane Hugo made from airborne radar

EARLY ON THE CALM AND misty morning of Sept. 6, 1940, with the Battle of Britain raging and a German invasion of England imminent, the Canadian liner *Duchess of Richmond* slipped into Halifax Harbor in Nova Scotia. Aboard was a small party of British officers and scientists assigned to escort a black metal box that held valuable, but raw, military technologies. Chief among these treasures was Britain's most precious secret: a revolutionary radar transmitter called the cavity magnetron.

The magnetron went straight to Washington, kicking off one of the century's seminal technological thrillers. Some 30 months before the atomic-bomb project opened in Los Alamos, N.M., top U.S. physicists were secretly recruited to develop radar devices based on the British invention. Their pioneering systems—for bombing through overcast, hunting U-boats, gun control and much else—proved so critical to the Allied cause that the American historian James Phinney Baxter III proclaimed the magnetron “the most valuable cargo ever

brought to our shores.” And Baxter made that assessment in 1946, well before radar's peacetime spinoffs became apparent. In addition to prompting enormous advances in air-traffic control and weather forecasting, radar contributed directly to Nobel Prizes for nuclear magnetic resonance (the basis for the MRI machines in today's hospitals), the transistor and the maser, an extremely powerful amplifier that led to the laser. It vastly expanded our knowledge of the cosmos, helping reveal the strange universe of pulsars and quasars. Radar even gave busy cooks the microwave oven. Says Dale R. Corson, president emeritus of Cornell University, who cut his teeth on the magnetron project: “Scientists-turned-engineers learned to manipulate microwaves in a thousand ingenious ways and won World War II. After the war they used the technology to open scientific worlds and create whole new industries. It is a fabulous legacy.”

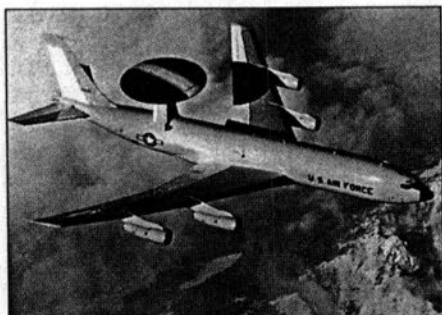
“Radar” is an acronym for radio detection and ranging. In a nutshell, the technology involves sending out a radio-wave pulse. If the waves strike a ship, plane or other object, a portion of the energy is re-

flected back to the transmitting station. Since radio signals travel at the speed of light, timing the journey allows the object's distance to be calculated. Various other tricks, such as measuring the angle and direction of incoming echoes, can pinpoint a target's exact location.

Though the magnetron marked a critical advance, a primitive form of radar, powered by more conventional transmitters, was invented long before World War II. In 1904 German engineer Christian Hülsmeyer patented the short-lived *telomobiloskop*, a collision-prevention device for ships that worked much like a searchlight only with radio waves in place of visible rays. The first modern system was cobbled together in December 1934 at the Naval Research Laboratory in Washington, but others were soon under development in Germany, France, Russia, Italy and Britain.

Only the British made radar the backbone of their defense system. In January 1935, alarmed by Hitler's rise to power, government advisers asked atmospheric researcher Robert Watson-Watt to assess the feasibility of a death ray that might zap enemy pilots in the cockpit. The Scotsman

HOW WE FIGHT



May the Hertz Be With You An AWACS spy plane flying on patrol, a chef using a Radarange oven, the 1940s ancestor of the modern microwave oven



dismissed that notion but suggested instead what he called "radio detection as opposed to radio destruction." A secret project was launched, and by the time war was declared, Britain had deployed its Chain Home network, radar towers up to 300 feet tall that ringed the country's south and east coasts, able to spot enemy bombers about 100 miles off.

Even as the black box arrived in America, the network provided the crucial edge in the Battle of Britain. But the Chain used radio signals with a long wavelength of about 10 meters. This meant that the system worked best in daylight, when a pilot's sharp eyes could correct for errors of several miles inherent in long wavelengths. The magnetron was designed to correct this weakness as the Germans moved to night attacks. Its wavelength was 100 times shorter—10 centimeters—and it could be fitted onto fighter planes so pilots could find their quarries on even the darkest nights.

But war-strapped British industry was unable to perfect the still roughshod magnetrons, so Prime Minister Winston Churchill reached out to his future American allies. The United States hurriedly established a secret lab at the Massachusetts Institute of Technology to exploit the magnetron. Dubbed the Radiation Laboratory,

the facility opened in November 1940, staffed by a small body of the country's top physicists, among them: director Lee DuBridge, a future Caltech president; Columbia University's I. I. Rabi, and Luis Alvarez, later famous for his theory that asteroids caused the dinosaurs' extinction. In all, 10 of these recruits would win the Nobel Prize.

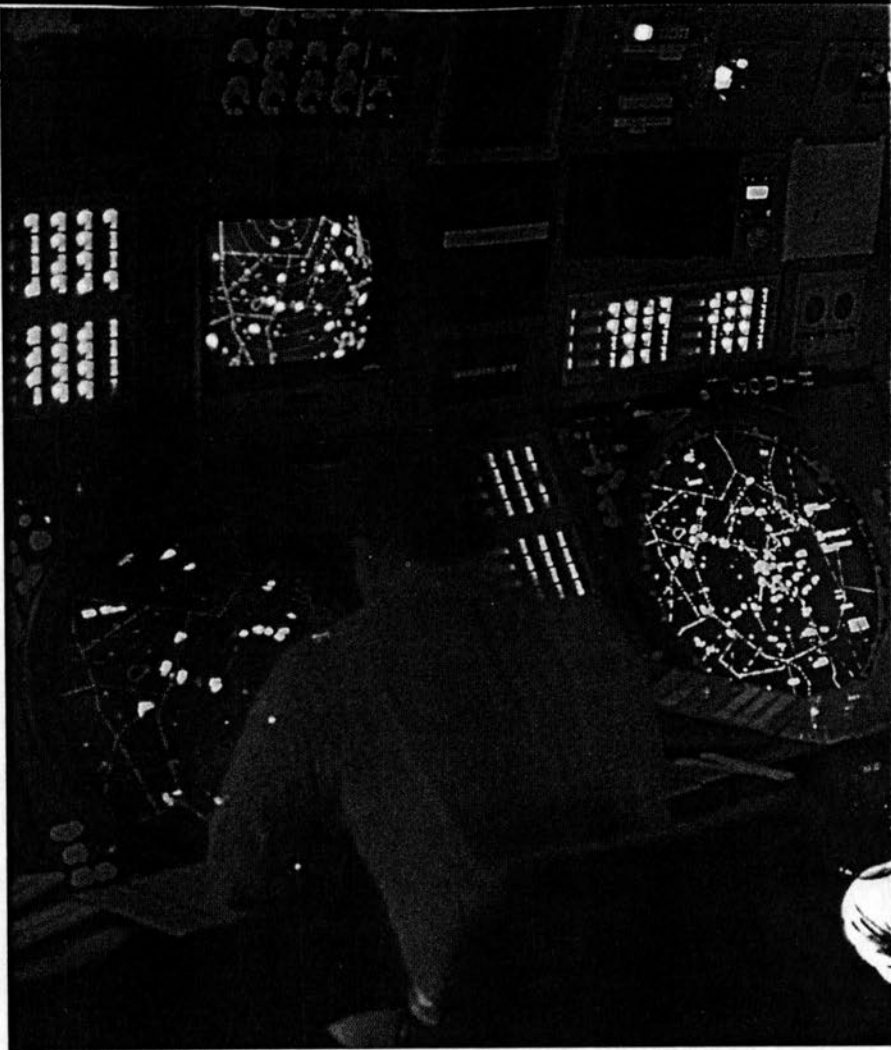
They worked fast and well, bolstered by innovations from military and industrial organizations. In 1942 conventional radar—without magnetrons—provided crucial warning of Japanese air attacks at the Battles of Midway and the Coral Sea; the Imperial Navy had no such edge. Then, in 1943, planes equipped with the Rad Lab's magnetron systems began patrolling the North Atlantic and turned the tide against Germany's U-boats, which had devastated Allied shipping in the early years of the war. Equipped with radar, American and British planes were able to track and destroy the submarines. American submarines hunting Japanese merchantmen with microwave radar did more damage than the U-boats. Radar-targeted bombing took center stage in Europe and the Pacific. The Rad Lab's airborne interception radar remained the Royal Air Force standard until 1957. Its navigation system became the worldwide grid Loran, which is still active. By the end

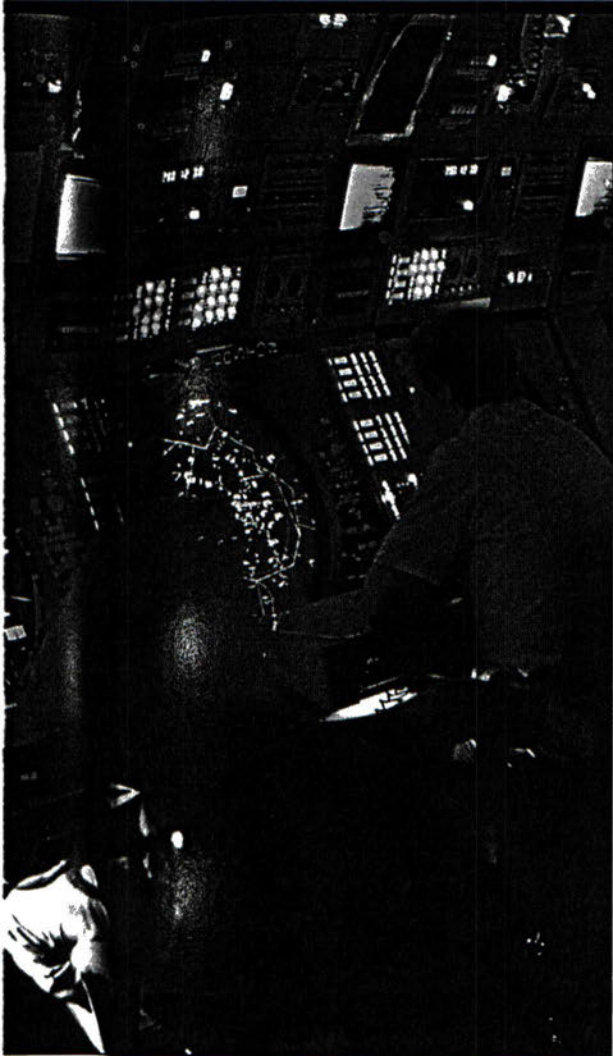
of the war, many weapons experts concluded that the atomic bomb had only ended the war; radar won it.

And the war supplied only half the story of radar's triumphs. After the Japanese surrender in August 1945, the Rad Lab published a 28-volume series recording all the advances spawned by the new technology in such areas as antennas, wave propagation, waveguides and transmitters. The spinoffs came quickly. AT&T relied on radar know-how to extend its microwave long-distance telephone network. Late in 1945 Raytheon engineer Percy Spencer reportedly stood near a working magnetron and noticed his candy bar melting. That led to the Radarange, the first microwave oven. Even today, magnetrons form the core of these popular kitchen appliances.

Luis Alvarez immediately began plotting a linear accelerator powered by 600 surplus radar oscillators. His Microwave Early Warning radar became the main air-traffic-control system for guiding planes between airports, while his Ground Controlled Approach radar landing set proved vital in guiding planes through heavy fogs during the 1949 Berlin airlift.

A single wartime event provided the key to several postwar discoveries. In the winter of 1943–44 the Rad Lab's top priority was producing a bombing radar at





Masters of the Skies Air-traffic controllers monitor their radar screens in the tower of Boston's Logan Airport

the extremely short wavelength of 1.25 cm. Everything went beautifully, but by April the echoes had grown noticeably weaker. It turned out that in the increasing humidity of spring, water-vapor molecules in the atmosphere were absorbing part of the signal.

That discovery inspired Edward Purcell's pioneering experiment with nuclear magnetic resonance on Dec. 10, 1945: Purcell, who had led the Rad Lab investigation into the vanishing-signal mystery, realized that by studying the energy absorbed by protons instead of molecules, one could unveil the inner workings of the hydrogen atom. This paved the way for several advances, including magnetic resonance imaging machines, which measure the energy absorbed by different tissues—including tumors—to produce detailed internal images of the body. Through a more indirect route, the same phenomenon set Bell Labs radar researcher Charles Townes on the path to the maser.

Radar quickly made its mark on a variety of other fronts. Wartime studies aimed at understanding and improving the sensitive semiconductor crystals used to detect radar echoes laid critical groundwork for the invention of the tran-

sistor in December 1947. The technology was also turned skyward, as electronics veterans scavenged surplus equipment to obtain images of meteor showers and other astronomical phenomena. By the early 1960s, radar signals had been bounced off Venus to provide the first highly accurate measurement of the Earth-Venus distance, from which came a greatly improved solar-system model. Radar's subsequent triumphs include mapping the Venusian surface, most dramatically via the spacecraft Magellan.

A variation on radar astronomy is radio astronomy. Instead of bouncing signals off targets, scientists listen for the radio "noise" streaming in from pulsars, quasars and a variety of unseen objects. Soon after World War II, Australian researchers led by Edward (Taffy) Bowen, who had helped escort the cavity magnetron to America, used wartime radar equipment to detect the first "radio stars," which turned out to be supernovas and colliding galaxies.

Back on Earth, radar began snaring speeders. To the delight of the press, a Canadian policeman caught Robert Watson-Watt with a radar device in 1954. He didn't contest the ticket. Just paid his fine and went on his way.

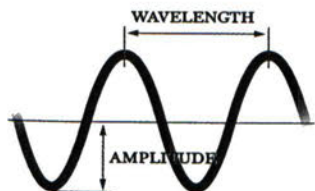
BUDERI is the author of *"The Invention That Changed the World,"* a history of radar.

Radar: Listening for the Echoes

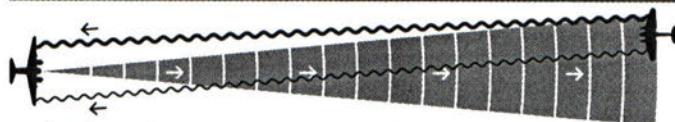
Radar detects a distant object by emitting radio waves much as bats emit sound waves. Echoes produced when the waves bounce off an object provide information about its exact location.

Anatomy of a radar wave

Frequency is determined by wavelength, or the distance covered in one crest-to-crest cycle. Frequency is expressed in cycles per second, or Hertz (Hz).



In World War II, radar helped night fighters defend Britain



Early fighter planes sent out radar signals from the nose and received echoes on each wing. If returned signals were unbalanced, the target was off to one side or above or below the fighter plane.



When incoming signals were equal, the target was dead ahead.

From making instant popcorn to finding distant galaxies, radar waves play a role from the home to the heavens



Air-traffic control
Signals help controllers monitor and land planes.



Weather prediction
Doppler radar can tell hurricanes from tornadoes.



Microwave cooking
Microwaves radiate through food to heat it quickly.



Speed of baseball
Radar guns measure pitches, also highway speeders.



Subterranean search Waves travel up to 100 ft. belowground.



Burglar alarms
Sensors detect the movements of an intruder.



Radiotelescopes
They spot pulsars, quasars and other distant objects.

RESEARCH BY KIMBERLY MARTINEAU. ILLUSTRATION BY CHRISTOPH BLUMRICH—NEWSWEEK.

How radar was invented



Scottish scientist Robert Watson-Watt revolutionized warfare with his conception of the first radar defense system in 1935. By 1939, Britain had installed an extensive warning network on its shores to detect enemy planes before they could attack. Scientists had been tinkering with radio waves long before; in 1887, Heinrich Hertz generated and detected the first such waves in a lab on his homemade oscillator. (Frequency units still bear his name today.) Hertz's work led to radio communications in the late 1890s and provided the foundation for the invention of radar.

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The engines that put astronauts into space today spring from the German V-2s that bombed London during World War II. BY RUSSELL WATSON & JOHN BARRY



ROCKETS

THE BEST-KNOWN EQUATION of the 20th century is $E=mc^2$, Einstein's statement linking energy, matter and the speed of light. But another formula— $V=c \log_e M_i/M_f$ —has had at least as much impact on modern life. That's the equation relating the speed of a rocket to its other key characteristics: its weight and the efficiency of its motor. If you can get V up to 15,000 miles per hour, you can hold a missile in suborbital flight long enough to hit a city halfway round the world. Get V up to 17,000 mph, and you can put a satellite into orbit. And if V goes to 25,000 mph, you can break free of Earth's gravitational pull and fly to the moon.

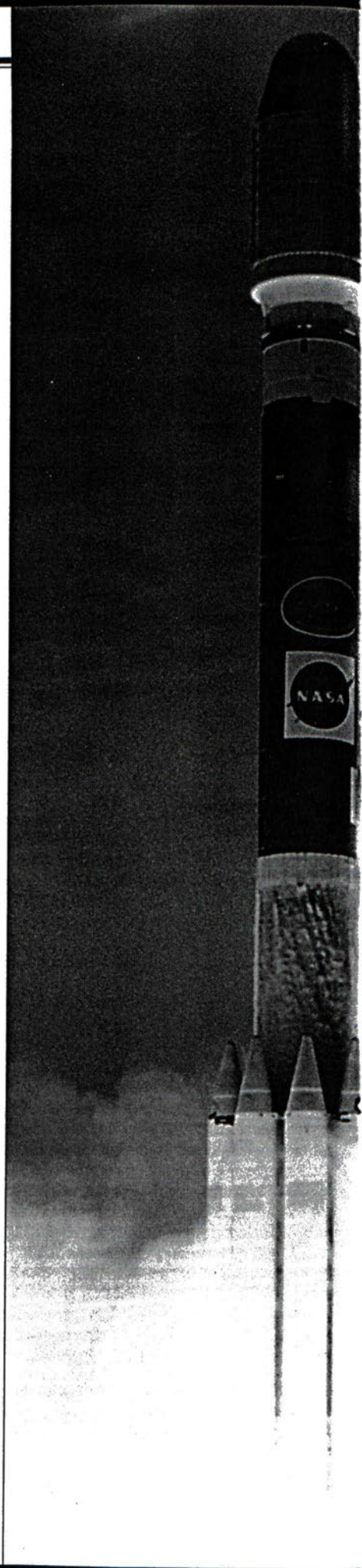
The age of the space rocket began on Oct. 3, 1942, on a small Baltic island off the north coast of Germany, when the Nazis' Peenemünde project conducted the first successful test of its A-4, later known to the world as the V-2. Riding a fiery column of burning gas, the operational V-2 scraped the underside of space, achieving a speed of nearly 3,500 mph, which was enough to give it a range of almost 190 miles. "We have invaded space with our rocket for the first time," Col. Walter Dornberger, the project director, boasted at a celebratory dinner in the Peenemünde officers' club on the evening after the first launch. Dornberger reminded his colleagues that their most urgent job was to perfect the rocket as a weapon. Space travel, he said, would be

Changing Places Von Braun worked for the Nazis, then paved NASA's way to the moon

"a peacetime task." But when Dornberger's colleagues finally turned their talents to space travel, they were playing for another team. Led by Wernher von Braun, Germany's best and brightest rocket men made it possible for the United States to win the cold-war race to the moon.

The Germans didn't invent the rocket, but they did devise the engines, fuel pumps and guidance system that made it work for both intercontinental warfare and space travel. In its most primitive form—a tube packed with gunpowder—the rocket was invented by the Chinese in the early 13th century. More than 500 years later, William Congreve, a British Army colonel, mass-produced a crude rocket that could carry a 20-pound warhead nearly three miles. Fired en masse, the weapons were devastating: Copenhagen was burned to the ground by a barrage of 25,000 Congreve rockets in 1807, during the Napoleonic Wars. A few years later the British Navy's bombardment of Fort Mifflin inspired Francis Scott Key to write about "the rocket's red glare."

In this century many brilliant scientists and engineers worked on developing rockets. Robert Goddard, a physics professor at Clark University in Massachusetts, flew model rockets from his Aunt Effie's strawberry patch. In 1926 he became the first man to build and fly a liquid-fueled rocket.





Liftoff They're a true child of the century, carrying payloads of destruction—and the hopes and aspirations of the human species

Goddard pioneered many of the features found on liquid-fueled rockets to this day. But he was the archetypal lone inventor and suspicious of publicity; he published so little that his work had scant impact at the time. Konstantin Tsiolkovsky, an obscure Russian math teacher, was perhaps the greatest theoretician in the history of rocketry, figuring out virtually all the equations that govern rocket propulsion. Unlike Goddard, he did publish. But his papers were ignored—until the German rocket program began to burgeon in the 1920s.

During World War II many relatively small rockets were used, ranging from shoulder-fired antitank weapons ("bazookas") to multibarrel field artillery ("Stalin organs"). But none of those weapons could come close to penetrating space, as the V-2 did. The Germans built their revolutionary rockets with single-minded brutality, freely spending the lives of slave laborers. Concentration-camp inmates toiled in tunnels at Nordhausen, in the Harz Mountains of central Germany, to build about 6,000 V-2s. About 20,000 prisoners died on the job. In one tunnel, Gallery 39, the fumes from the galvanizing shop were so toxic and the ventilation so poor that the life expectancy of the prisoners working there was less than one month.

The V-2 might have won the war for Germany, but Hitler delayed its development after dreaming one night that the rocket would never be operational against England. He changed his mind later, asserting: "This is the decisive weapon of the war." About 1,000 V-2s hit southern England between September 1944 and late March 1945. Only about 2,700 people were

killed, because the guidance systems could not pinpoint prime targets. But the menace alone—the rockets slammed into London without warning, traveling at more than three times the speed of sound—traumatized Winston Churchill's government. For the Nazis, however, it was too late. Advancing Allied armies overran the V-2 bases. As the end neared, von Braun led 118 of his colleagues on a march to the West, where they could surrender to the Americans instead of the Russians.

The Germans did good work for their new employers. They built huge rockets fueled by liquid hydrogen and liquid oxygen. The émigrés designed so well that the big rockets used for today's space missions are merely improved models of their 30-year-old designs. The man who headed production of the giant Saturn V rocket, which took the Apollo astronauts to the moon in 1969, was Arthur Rudolph, who had been technical director at Nordhausen. After the moon landing, Rudolph was awarded NASA's highest decoration, the Distinguished Service Medal.

Then, in 1982, the Justice Department accused him of responsibility for the deaths of thousands of slave laborers. He denied the charges but admitted under oath that he once ordered workers to watch when 57 slave laborers were hanged outside his office. Rudolph gave up his U.S. citizenship and returned to Germany, where he lived quietly until his death last year. "The Americans made me a hero, and then they threw me out," he complained not long before his death. A few of his old German colleagues still live in retirement around Huntsville, Ala., where they built rockets for America's space program and its nuclear arsenal. They avoid publicity, fearful of Nazi-hunters. Their accomplishments live on, for war or for peace.

The Space Dividend

FROM GLOBAL telecommunication networks to Tang, space research has resulted in some pretty handy products back on Earth. Among the hundreds of spinoffs:

■ **Cleanup Hit:** The Dustbuster got its start when Black & Decker was asked to develop cordless tools for sampling lunar rocks and soil.

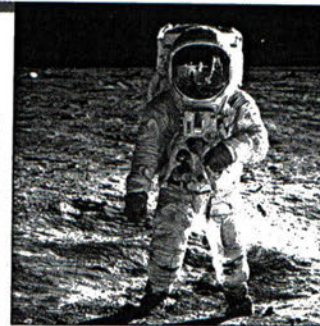
■ **Defending Liberty:** The Golden Gate Bridge and the Statue of Liberty are kept corrosion-free by

coatings developed to protect launch pads.

■ **Sunny Sums:** The same type of solar cells that power the \$1.5 billion Hubble Space Telescope keep a \$5 calculator adding and subtracting.

■ **Flub Dub:** The heart-rate monitors used on exercise machines were developed to keep track of astronauts' exertion.

■ **Clear Vision:** The scratch-resistant coating that makes plastic eyeglass lenses practical was first developed to protect



He went to the moon—you got scratch-free glasses

plastic spacecraft parts.

■ **Outer Shell:** The fabric used for Apollo-era spacesuits now covers the Georgia Dome in Atlanta and airport terminals in Denver.

Tomorrow's New

The day is not far off when the computer chip and the robot will be mobilized as the military's shock troops

BY RUSSELL WATSON & JOHN BARRY

There is not one compelling reason to buy a single additional bomber, submarine or tank today, save the preservation of the industrial base. Yet even this is a dubious cause.

—Lt. Col. Ralph Peters

IN THE CORRIDORS OF THE PENTAGON, LT. COL. Ralph Peters is known as one of the most intellectually gifted American soldiers of his generation. His argument, spelled out in a dozen essays that circulate like *samizdat* among army colleagues and defense buffs, is that the military is buying the wrong weapons to counter the wrong challenges. Now that the cold war is over, three simultaneous revolutions are underway in the armed forces: new missions, new expectations and new weapons. Under the circumstances, it's no surprise that the navy and air force are developing radically new weapons to use at sea and in the air. But if Peters is right, over the next 15 to 20 years even the earthbound army will have to reinvent itself.

During the cold war, U.S. ground forces were configured, above all else, to stop the Soviet Union from conquering Western Europe. Now, in a world that's no longer bipolar, the mission has already changed. The comfortable Western world watches in horror as ancient hatreds burst out in places like Bosnia, Chechnya, Rwanda, Somalia and Algeria. Peters predicts a world of perpetual menace in which a handful of successful nations are "islands of stability and wealth in a world with burgeoning populations, collapsing infrastructure, deadly cities and a genius for violence." This Hobbesian view is widely shared in the Pentagon. "The future is not Son of Desert Storm but Stepchild of Chechnya," says Gen. Charles Krulak, the commandant of the Marine Corps. "Imagine an enemy with the tenacity and ferocity of a Chechen rebel but armed with a weapon system that, if it can sense you, will kill you. That's what I think we are going to be fighting in the year 2015."

Inevitably, traditional great-power rivalries also will revive. The end of the cold war did not usher in a peaceful new Age of Aquarius; it merely imposed a surface calm that conceals mounting pressures. Over the next decade or two some of those pressures could lead to war: the rise of a stronger and more assertive China, the struggle for control of the Persian Gulf (and soon, for control of the Caspian Basin, also rich in oil and natural gas), impending shortages of such natural resources as water, and the ultimate resurgence of Russia.

As they prepare to face a new array of dangers, military planners must factor in a new set of expectations. It has become an article of faith in the Pentagon that, after the disaster in Vietnam and

the walkover in the Persian Gulf, the American people will no longer tolerate heavy U.S. casualties; in fact, so squeamish has the public become that it doesn't even want to see the wholesale slaughter of an enemy. The only way to achieve a relatively bloodless victory over a well-armed opponent is to deploy so much force, so swiftly, that the enemy is overcome by what military analyst Harlan Ullman calls "a regime of shock and awe." It's the technique of the street mugger: sudden, stunning violence that paralyzes the victim's will to fight back. So if you are a military planner looking out into the 21st century, what you want is an arsenal of new weapons that will produce "shock and awe." The process of developing such an arsenal is what defense thinkers call "the revolution in military affairs"—a concept so important that, in military speak, it rates an acronym: RMA.

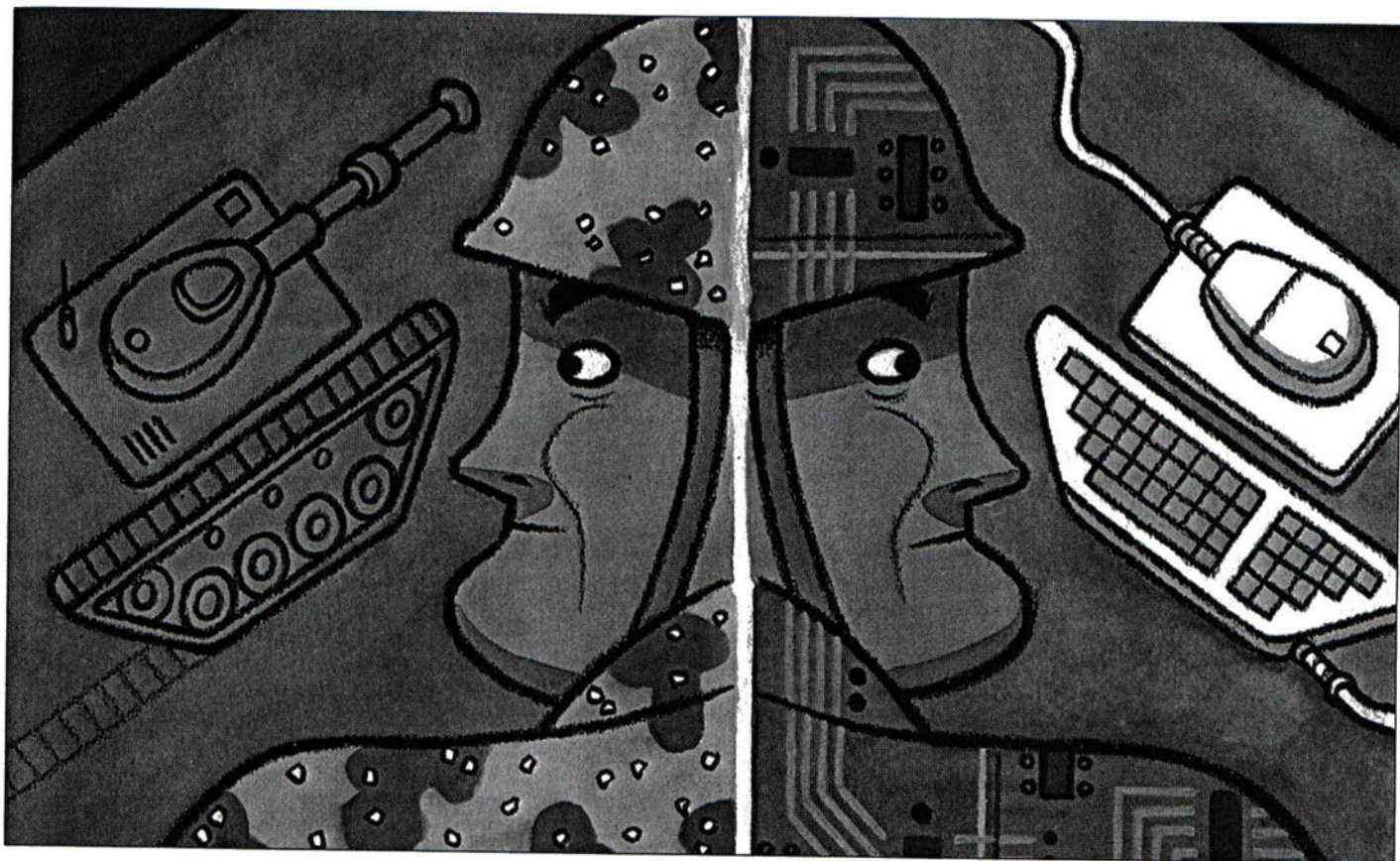
Over the centuries there have been relatively few genuinely revolutionary advances in military technology. Most lists would include the stirrup (which made it possible to have a disciplined cavalry), the bow (history's first rapid-shooting, long-range fire-and-forget weapon), gunpowder, aircraft with precision bomb-sights, and, of course, nuclear weapons. It was Soviet military thinkers, of all people, who identified the current RMA and coined the term back in the 1980s. They foresaw a rapidly approaching era in which a battlefield could be minutely scanned from air or space and weapons fired so accurately from long range (thanks to on-board target-seeking devices) that conventional munitions could destroy armies on a scale previously possible only with nuclear weapons. The realization that the Soviet Union did not, and would not, possess the computer or sensor capabilities to produce such weapons—and so, in the long run, must inevitably face defeat at Western hands—was a significant factor behind Mikhail Gorbachev's decision to sue for peace.

The essence of this revolution is simple enough. It's the power of the microprocessor—the computer chip—applied to warfare. Which means that, for at least the next 15 years or so, the ongoing RMA greatly favors the world's dominant microchip manufacturer, the United States.

When fully developed, here's how the new fighting system will work, thanks to the microchip. High-endurance robot aircraft circle over remote terrain for days at a time. Their sensors spot a formation of enemy tanks. The information is radioed to a satellite, which distributes it to half a dozen designated receivers on the ground. Computers select the artillery battery best located to strike the new targets; they flash the coordinates to that battery and no other. Using signals from a constellation of global-positioning satellites overhead, chips in the battery's targeting computer calculate the precise location of the tanks in relation to the battery, thus working out the correct azimuth and elevation needed to hit the enemy. Computers orient the battery and fire its rockets.

As they arc across the 30 miles or so between the battery and its

Face of Battle



targets, the rockets spew a cluster of mini-projectiles. Each has a sensor in its nose and a computer inside, enabling the little projectiles to detect the characteristic heat signature of tank exhausts, ignoring the trucks that travel with the enemy squadron. In the last few seconds of flight, the projectiles use on-board rockets to accelerate, hurtling down onto the least protected part of the tank, its turret hatch. Robot craft circling tirelessly overhead—so high that soldiers on the ground never knew they were there—sense the explosions that mark the death of each tank. The news is flashed back, again by satellite, to the screen of the unit commander, telling him what has just happened.

PIE IN THE SKY? NO, ALL OF THESE DEVICES ARE for real. Some of the hardware is still in the prototype stage, and some is still being designed, as are most of the communications links. The high-endurance robot aircraft is under development, with the code name Darkstar, by a Lockheed Martin/Boeing team for the Pentagon's Advanced Research Projects Agency. The sensors the aircraft will carry already exist and have been put to use: during the gulf war, manned reconnaissance planes employed them to spot Iraqi tank columns on the move 100 miles away. The rockets

are also in the field, known as the Army Tactical Missile System (the acronym is ATACMS; say it properly and it sounds like "at-tack-'ems"). The tank-killing mini-bombs are called BAT (Brilliant Anti-Tank) munitions; they have been built but are still being tested. Current attack helicopters and fighter bombers also can fire self-guiding mini-rockets.

Adopting radically new technology is a leap of faith, especially for military leaders, who are keenly aware that their misjudgments can have expensive and deadly consequences. Gen. Dennis Reimer, the army chief of staff, worries about the unpredictability of the challenges ahead. "Most people won't want to take us on head to head, tank to tank. You have to look at the possibilities for asymmetric warfare," he says, enumerating some examples: "Terrorist acts inside the U.S., as a means of striking against conventional [warfare] options we have elsewhere [in the world]. On the battlefield, civilians clustered around high-value targets, to make it very difficult for us to use even precision-guided munitions against those targets. All the way up to weapons of mass destruction." In the Pentagon, "asymmetric warfare" is a vogue phrase; it refers to the weapon or threat you're not prepared to counteract. It is often said that generals are always preparing to fight the last war, the one they know how to fight. These days, the best minds in the business are trying to prepare for a war no one has ever fought. ■



THE MEASURE OF our century's medical progress can be seen in the life of a child. Before she's born, her parents can watch her move, thanks to a sonogram. She will be inoculated against the once fearsome diseases of youth, now all but gone from our midst and our imaginations. Antibiotics will stamp out her ear infections before they can blossom into rheumatic fever. If a mystery illness should waylay her, magnetic

WE HEAL

resonance imaging (MRI) will explore every nook and cranny of her body till the source is found—and then surgeons will remove it or drugs will kill it. Even more amazing, she can anticipate knowing her great-grandparents. Though they were born in a less medically advanced age, they will have lived long enough to reap the fruits of a century of invention.

PHOTOGRAPH BY ABRAMS & LACAGNINA

Starting with penicillin, the 'wonder drugs' did a brilliant job of combating bacterial infections and saving lives. But they also created a dangerous threat—new strains of bacteria that resist them. BY MARY HAGER

ANTIBIOTICS



EVERY SCHOOLCHILD MUST BE FAMILIAR with the story of Alexander Fleming and the discovery of a bacteria-killing mold he called penicillin. What they probably don't know is that having found the mold in 1928, he didn't do anything much with it. It was not until 1938 that two Oxford University scientists, Howard Florey and Ernst Chain, went back to Fleming's mold, eventually found a way to produce penicillin

and, by 1942, showed it could be used to treat infections. (For their work, the three shared the 1945 Nobel Prize in Physiology or Medicine.) Once purified and available in usable quantities, penicillin was an instant success. It became an important weapon for the Allies in the last years of World War II, saving thousands of soldiers who otherwise would have died from infected wounds.

After the war, penicillin and the other new "wonder drugs" that were being developed were at last available to use against such life-threatening diseases as syphilis, pneumonia, tuberculosis and bacterial meningitis. "Antibiotics gave physicians the opportunity to intervene in these infectious diseases for the first time," says Dr. Mitchell Cohen, head of the bacterial-disease division at the Centers for Disease Control and Prevention. "If you had a sick patient who had a 50 percent chance of dying, you could give a drug and drop the death rate to less than 1 percent. This was a phenomenal advance."

It was an advance that transformed medicine. The idea of a drug that cures a specific illness is a peculiarly modern one. Well into the 19th century, most medications were prescribed as "tonics" for the patient's general condition. The noted bacteriologist Paul Ehrlich coined the term "magic bullet" for a drug that was targeted at a certain disease-causing microbe and applied it to his own concoction, Salvarsan, which was introduced in 1910 as a treatment for syphilis. Sulfa drugs to prevent sepsis in wounds and to treat certain infectious diseases followed in the 1930s. Soon the public began to expect the same kind of "cure"

for all medical problems. Cancer chemotherapy, antiviral agents and new drugs to control blood pressure, serum cholesterol, gastric secretions and the symptoms of schizophrenia were just a few of the fruits of the revolution in pharmacology that began with penicillin.

"Antibiotic," a term coined by soil microbiologist Selman Waksman of Rutgers University, discoverer of streptomycin, may not have been the best choice of name. "Antibacterial" might have been better. A literal translation of antibiotic suggests the drugs are effective against all kinds of living organisms, with the result that many people look to antibiotics as a miracle cure for all ailments. But antibiotics have no effect on viruses and other disease-causing organisms. Many viruses can be controlled with good vaccines—a noted exception is HIV, which causes AIDS—but vaccines are generally not effective against bacterial infections, such as staphylococci and streptococcus.

And antibiotics have proved a double-edged sword. Fleming himself anticipated that bacteria would figure out ways around the new drugs. Within four years of the first use of penicillin, some types of staph infections were already showing signs of immunity to the drug.

Staphylococcus aureus is an especially nasty bug and one of the most common causes of infection in the world. It offers a particularly chilling example of the emergence and the persistent re-emergence of resistant strains. Through history, people with staph infections often died, but, says Dr. Anthony Fauci, head of the National Institute on Allergy and Infectious Diseases, "that never happens in modern times." Staphylococcus was initially very sensitive to penicillin. When penicillin resistance developed, physicians turned to the next line of defense, which was another antibiotic called methicillin. That worked until the '70s. By then medicine had an ace in the hole in the form of vancomycin. Now cases of partial resistance to vancomycin are being reported, and it may not be long before strains with full resistance emerge. "If resistance does spread and we don't have a good drug to replace vancomycin, we're in trouble," warns Fauci. "This is a serious infection."

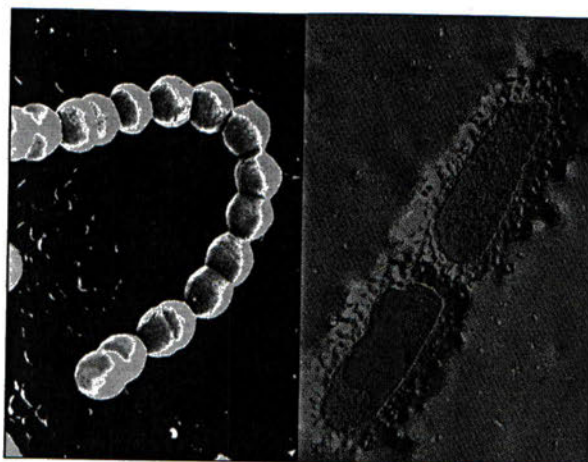
If penicillin came from a chance discovery in a petri dish, the drugs that followed were the result of a more systematic hunt. Waksman, searching soil samples for other antibiotics,

Face-Off Antibiotics (top right, lower left) are on our side. But the bugs (top left, lower right) are making a comeback.

selected 10 promising microorganisms from more than 10,000 cultures. Among them was streptomycin, isolated in 1943, which turned out to kill the bacteria that caused common urinary-tract infections and others that caused meningitis. It also was the first drug of any kind that helped people suffering from one of mankind's greatest scourges, tuberculosis.

Yet there were problems with streptomycin. It had side effects not seen with penicillin. The doses needed to cure tuberculosis could cause kidney damage and temporary deafness. And bacteria quickly became resistant to the drug. Scientists immediately started looking for other drugs with the same effectiveness but without those shortcomings. Over the years they came up with a string of alternatives, including neomycin, kanamycin, gentamicin and tobramycin.

Other scientists began looking through soil samples acquired from all corners of the world. In 1947 Yale University micro-



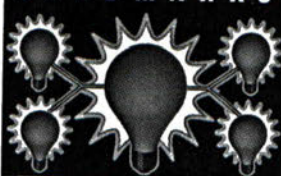
Common Culprits The world teems with potentially troublesome bacteria like streptococcus type A (left) and *E. coli*

biologist Paul Burkholder, working with the Parke-Davis Co., discovered a substance that seemed to kill a wide variety of bacteria; it had turned up in a sample scooped from a field near Caracas, Venezuela. The compound, named Chloromycetin, or chloramphenicol, was the first of the broad-spectrum antibiotics to work against previously untreatable diseases such as typhoid, typhus and Rocky Mountain spotted fever.

By the '80s, with so many antibiotics already on the market, drugmakers had lost interest in developing new ones. The threat from resistance brought some firms back to antibiotic research, trying to foil the strategies bacteria employ to become resistant. But doctors worry that their arsenal of pharmaceutical weapons against drug-resistant bacteria is becoming seriously depleted. "More of the large companies have gotten back into antibiotic research because they've seen the need," says Dr. Stuart Levy of Tufts School of Medicine, author of "The Antibiotic Paradox," "but we will still not have the new drugs by 2000."

In the meantime, Cohen argues for a return to tried and true public-health measures, including more frequent hand-washing by health-care and food workers, isolation of patients with resistant infections and improved sewage treatment and water purity, especially in developing countries. In the jet age, it doesn't matter where resistant strains evolve. "If we can prevent people from getting infected, we won't need to treat," he points out. If that doesn't work, mankind could be in for a few rough years as scientists try once more to catch up with an extremely formidable foe.

LANDMARKS



PREVENTION VACCINES

■ THE BASIC IDEA PRE-dates the 20th century. The great Edward Jenner first used a vaccine in 1796, for smallpox. In 1881 Louis Pasteur realized the science of vaccination could be used to immunize people against a variety of illnesses, such as anthrax and rabies. A

vaccine—a weakened or killed virus—triggers antibodies in healthy persons to ward off diseases. The first big test in this century was polio. Dr. Karl Landsteiner determined in 1909 that the virus thrived in the central nervous system. But it wasn't until 1955 that Jonas Salk announced the first effective polio vaccine. Overcoming Salk's contamination problems, Albert Sabin developed an oral vaccine in 1960. It was so successful that in 1994 the World Health Organization declared polio eradicated.



THUMP, THUMP THE PACEMAKER

■ HOW MANY INVENTORS does it take to keep a heart beating? In 1932 an American scientist named Albert S. Hyman hypothesized that a man-made pacemaker could replace the electrical impulses from the brain that stimulated nerves in the heart. His invention resembled a miniature sewing machine that attached to the heart through wires inserted in the chest. By the late 1950s, Sweden's Rune Elmqvist and Ake Senning had invented a battery-powered pacemaker that could be implanted in the chest, and Britain's Wilson Greatbatch had come up with a casing to shield the heart from battery chemicals. Since then technology has continued to improve, making the little machines

A schoolchild getting a vaccination in 1954

as light as nine grams and able to run for months on lithium or nuclear-powered batteries. The result: more than half a million people have been fitted with pacemakers worldwide.

A, B, AB, O

BLOOD TYPING

■ IN 1901 THE AUSTRIAN Karl Landsteiner found that there are different types of blood and that mixing them often results in life-threatening hemolysis, the destruction of red blood cells. The types were determined by antigens on the surface of red blood cells, which he named A and B. Blood type AB has both; type O, neither. Years later, Landsteiner and Alexander S. Wiener found another key blood group, Rh. Their work made transfusions safe.

IN YOUR EYE THE CONTACT LENS

■ GERMAN SCIENTIST Adolph Fick wrote an eye-catching paper in 1888: why not make thin lenses that could rest right on the cornea and correct faulty vision? It would take decades for technology to catch up. By



Don't drop it on the carpet

the end of the 19th century, two companies were making lenses out of blown or ground glass, bulky things that covered not just the cornea but also the whites of the eye. It wasn't until 1948 that Kevin Tuohy invented a modern soft-plastic lens that covered just the cornea.



How doctors learned to peer beneath our skin to see what might be wrong without using surgery

BY BETTYANNE KEVLES

BODY IMAGING

NOT LONG AGO A FRIEND of mine collapsed in the weight room at our gym. The next thing he recalls is awakening in an ambulance, where a sympathetic paramedic inquired about his medical insurance. In the emergency room, he proceeded to have an ultrasound for his heart (it was OK), a CT scan (computerized images using X-rays) and an MR (magnetic resonance) image. The last two revealed a brain tumor. In the next few weeks he had a special nuclear scan called a PET (positron emission tomograph) that tracked the functions of his brain and gave his neurologist—he now had a specialist in his corner—a picture of his problem.

These images are routine in modern medicine, but at the start of the century none of them was attainable because, with one exception—X-rays—the technologies did not exist. If we think of the inside of the living body as a planet awaiting exploration, the area mapped in 1901 was akin to the geography of Cape Cod. The rest of the human planet awaited surveyors.

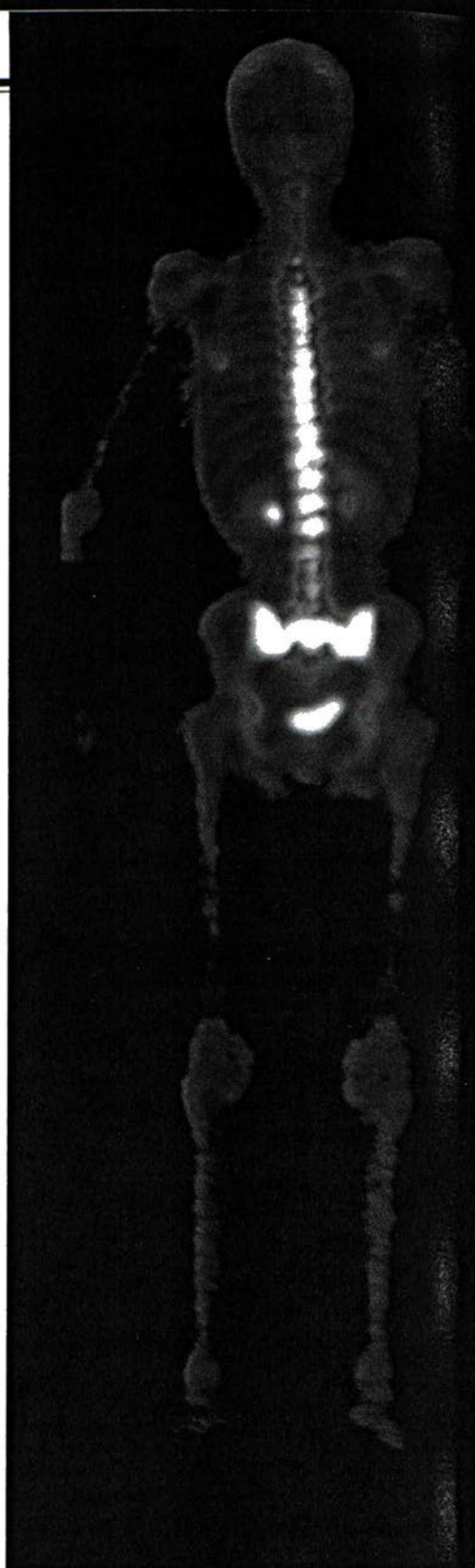
Diagnostic Boon MR imaging is much less risky than exploratory surgery

X-rays, discovered in 1895 by Wilhelm Roentgen, were still a novelty in 1901 when President William McKinley, standing before a crowd at the Pan American Exhibition in Buffalo, N.Y., was shot in the abdomen. No one suggested trying to find the bullet with the X-ray machine that gleamed in the exhibition's Hall of Science 50 yards away. In 1901 X-ray machines depended on gas-filled glass tubes that often shattered, and patients frequently suffered burns—some from the vagaries of portable electric generators and some, we know now, from the effects of ionizing radiation. During the eight days McKinley lingered, his doctors, fearing to risk his life and their reputations, eschewed the newfangled instrument.

Others with greater vision realized the significance of X-rays. Just two months later Roentgen won the first Nobel Prize in Physics. Corporations like General Electric invested heavily in developing the technology. At GE, William David Coolidge first improved the light bulb by replacing carbon with a tungsten filament.

Then he put tungsten filaments in X-ray tubes. They were better, but remained fragile until Coolidge pumped out the gas. This vacuum X-ray tube was clinic-ready in 1913. Stable, reliable and safer because there was less scattered radiation, the Coolidge tube brought radiology into routine medical practice just in time to go to the front in World War I.

Like most modern wars, World War I was good for medicine. By 1917 every bel-





Seeing Double With nuclear medicine, body surveyors can explore the inner workings of man

ligerent army had mobile X-ray units. Occasionally, medics saw an odd phenomenon that presaged the next wave of imaging improvements. The accidental introduction of air into a wounded soldier's head made the inside visible on an X-ray. In 1919 an American brain surgeon deliberately injected air into a patient's skull, X-rayed it

and demonstrated the effectiveness of air as a contrast agent. Other contrast agents followed, including iodine, which is opaque to radiation. French doctors safely injected iodine suspended in oil to get images of the interior of the spine.

In the 1920s doctors were frustrated by their inability to see beneath the rib cage into the lungs and heart. The solution came from the observation that X-rays of pregnant women did not show a fetus if the fetus was moving. Working separately, four inventors patented machines in which either the X-ray source or the patient, or both, would move, thus blurring out bones on top of the organ doctors wanted to see. These images were called tomographs—a word coined from the Greek *tomo*, for section or slice.

World War II was even more fruitful for medical progress, thanks in part to the invention of the atomic bomb. It led to a proliferation of nuclear reactors, which were used to produce radioactive isotopes. The Atomic Energy Commission began distributing these isotopes to hospitals in 1946. In the early 1950s physicians injected consenting patients with small amounts of short-lived radioactive molecules that they could follow with Geiger counters as the molecules traveled through the bloodstream. The resulting "images" were often no more than zigzagging tracks on carbon paper.

Twenty years later, medical physicists, using advanced radioisotope technology, would inject radio-labeled chemicals into the bloodstream. The incredible result: a time-release photograph of metabolic function—the body in action.

This imaging technology, called PET, can today let doctors watch the flow rate of blood or watch how the brain uses energy to add or subtract or remember a name.

But PET's journey from a crude scribble to a computerized section of a living brain required the discovery of the correct mathematical formulas to process the data. In

the mid-'60s, many of its pioneers did not believe that computers, with their limited memories, would ever be able to handle the mass of data needed to create these images. And so began the search for the right equation.

The search became the obsession of Alan Cormack, a South African physicist who moved to Tufts University in 1962. While filling in briefly in a hospital radiology department several years earlier, Cormack had been surprised at the excess radiation patients absorbed during radiation therapy. He figured that if narrow beams of X-rays passed through a body, the density of each kind of tissue they traversed could be found by subtracting the amount of radiation passed through from the known quantity of radiation each beam carried. This information could be used to form an image of a slice within the body, which, with the eventual aid of computers, would reconstruct from that a seemingly three-dimensional image. In 1963 he demonstrated a crude prototype of what became the CT scanner. But no one seemed interested.

At almost the same time in England, Godfrey Hounsfield, an engineer at the music company EMI, realized he could get an image of a slice inside an object by sending X-ray beams through it from a variety of angles. He knew that it would take thousands of mathematical equations to reconstruct an image from this data, but he was confident computers could handle them. EMI, flush with profits from Beatles records, agreed to fund the project. Houns-

Inner Vision Digital X-rays now appear directly on computer screens



field demonstrated the first CT machine in London in October 1971. Crude and slow by today's standards, it was nevertheless good enough to reveal a brain tumor and save a patient's life. Within a year American hospitals raced to buy EMI's machines and companies raced to patent their own. In 1979 Cormack and Hounsfield shared the Nobel Prize in Physiology or Medicine for the invention of computerized tomography.

Almost immediately PET researchers, using the CT computer formulas, got excellent images. Within the same decade, chemists applied these formulas to an altogether different kind of machine. Magnetic resonance imaging reconstructs images from data generated by protons inside the nuclei of hydrogen atoms. When placed in a strong magnetic field and bombarded with radio waves, these protons emit signals that computers can turn into a picture.

MR imaging was a major step forward. The problem with CT scans was that they were based on X-rays, which could not



Deep Focus MR images peer through bone and into the brain

make images of the inside of bones. MR could image slices of soft tissue and get details within the bones themselves. PET, which followed MR imaging into the clinic, shows slices of functions inside the body from radioactive isotopes. By the late 1980s computerized imaging had reached ultrasound, which records data from sound waves in images of blood flow and the movement of human fetuses inside the womb. By the late 1990s the digital revolution had caught up with the original X-rays,

which today are increasingly being produced directly on computer screens without the intermediary stage of film.

The medical advances from all this have been enormous, as have been the bills. But the cost in anguish and dollars to patients has been reduced with the virtual disappearance of exploratory surgery. Money saved in the operating room seems instead to have gone to purchase these expensive imaging machines.

Today the human planet is almost completely mapped, and medical imagers are focusing on manufacturing cheaper, faster

models that unify different technologies. Corporate economics no longer fosters much long-term research. Great corporate laboratories of the past, from GE to EMI, are shadows of their original selves, and medical economics no longer indulges big-ticket items. But faster and cheaper is an incentive, too, and where this will lead may surprise us all.

KEVLES is the author of "Naked to the Bone," a history of medical imaging in the 20th century.

The Pill That Transformed America

BY CLAUDIA KALB

FROM THE DAY SHE opened her first clinic in 1916, Margaret Sanger longed for a simple, reliable, noninvasive birth-control technique: a pill. Traditional "barrier" methods failed too often. They were overmatched by human error, mechanical failure and the ever-present factor of lust. Finally, in 1951 Sanger found a wealthy kindred spirit to fund her dream. She teamed up with Katharine McCormick, an MIT graduate whose father-in-law, Cyrus McCormick, had invented the mechanical reaper. Together they set out to help people prevent reaping what they were about to sow.

First, they needed a biologist. They found him in Gregory Pincus, head of the Worcester (Mass.) Foundation for Experimental Biology. Pincus was renowned for his breakthrough work fertilizing rabbit eggs in a test tube—and he was a man who rev-



eled in meeting a challenge.

McCormick gave Pincus a \$40,000 check. (She would be the pill's chief benefactor, contributing almost \$2 million to the research.) Two strokes of good fortune followed quickly. First, chemists working separately in Mexico City and Chicago produced the pill's

key ingredient, an oral form of progesterone. Back in 1928 the hormone, whose name comes from the Latin *pro* (in favor of) *gestare* (to bear), had been identified as central to sustaining pregnancy, and researchers thought it could be a critical ingredient in contraception. Later, scientists injected the hormone into rabbits: tricked into thinking they were pregnant, the animals stopped ovulating. But it wasn't until the early 1950s that chemists learned how to produce progesterone in a synthetic, oral form—just in time for Pincus.

His second lucky break came in 1952, when he bumped into the highly regarded Boston gynecologist Dr. John Rock, who was also studying progesterone. The two were an ideal match. Pincus had tested the hormone on animals, but not yet on women. Rock had the patients.

Massachusetts, where anti-contraception laws were among the staunchest in the

nation, was an unlikely birthplace for the pill. Pincus and Rock, who was a prominent Roman Catholic, worked in secrecy. In 1954 Rock undertook the first clinical trial of Pincus's oral contraceptive on 50 volunteers with spectacular results: not a single ovulation. When larger trials were needed, the two moved their experiments out of the country—to Puerto Rico and Haiti. Both were successful.

The pill, from launch to FDA approval, took less than a decade—a remarkable feat. It has plenty of critics, foremost among them the Catholic Church. Even feminists attacked it as a male creation with harmful side effects, including blood clots and depression; the complications have since been limited by fine-tuning hormonal dosages. In recent years, expensive litigation and other controversies have slowed investment in alternative methods. The pill remains in common use, and it's hard to think of a pharmaceutical that's had a greater effect on American life and mores.

Surgeon, Drop That Scalpel

Just as the 20th century has brought us more powerful treatments, the 21st seems poised to deliver gentler ones

BY GEOFFREY COWLEY & ANNE UNDERWOOD

IT HAS BEEN A CENTURY OF MEDICAL WONDERS. Vaccines have all but vanquished such killers as polio and diphtheria. We've learned to control our moods, fertility and blood pressure with pills. And surgeons routinely fix or replace our failing joints and organs. Yet we continue to pay a high price for these marvels. Lifesaving surgery often maims—and our miracle drugs cause all manner of devastating side effects. In any given year, roughly 63,000 Americans die from taking prescription drugs as intended, and many more are sickened or injured. (By comparison, AIDS claimed about 26,000 American lives last year; homicide, 21,000.) It's nice to live in a world where pimples are curable. It would be nicer if the cure didn't cause birth defects.

Fortunately, a second revolution is underway. Just as the 20th century has brought us ever more powerful treatments, the 21st seems poised to deliver gentler ones. Surgeons are learning to work through keyholes rather than manholes, and drugmakers are reformulating common medications to make them less noxious. If other emerging innovations fulfill their promise, radio waves will soon replace old-fashioned scalpels in many operations, and light-activated drugs will spare cancer patients the slashing and poisoning they now endure. In short, we'll accomplish more by doing less.

Surgeons have been on to this idea for a decade. The trend toward smaller incisions started during the 1980s, when gynecologists discovered they could treat some conditions without inflicting the footlong abdominal wounds that custom dictated. Instead of slicing their patients from hip to hip to remove cysts or clear blocked fallopian tubes, maverick surgeons started piercing the abdomen with slender probes that house miniaturized lights, cameras and surgical tools. Since then surgeons have adapted the same technique to a stunning array of procedures. Diseased gallbladders, appendixes, spleens, colons and adrenal glands are almost always removed through keyhole incisions today.

The list of eligible organs is still growing. Last summer Loretta McCord of Willingboro, N.J., was all set to have a kidney removed the old-fashioned way. She was in fine health, but her 33-year-old son, Patrick, was suffering from end-stage renal dis-

ease and needed a compatible donor organ. Kidneys can be devilishly hard to extract; the standard procedure involves slicing the donor laterally, from navel to spine, then removing a piece of rib to gain access. But McCord's doctors tried a different approach. Instead of severing her torso, her surgeon detached the organ with instruments inserted through several half-inch keyholes, then extracted it through a three-inch incision. The transfer to Patrick went smoothly (implanting a kidney is far simpler than removing one), and McCord was back on her feet within days. "If I had three kidneys I'd donate another one," she says. "There's nothing to it."

Traditional heart or brain surgery can make kidney extraction look like child's play. But even these procedures are growing less invasive. Instead of sawing through the breastbone and holding



the rib cage open with a ratchet, heart surgeons now perform some bypasses and valve replacements through keyhole incisions. And patients are emerging from some brain operations without so much as a Band-Aid on their heads. Until recently, surgeons had to sever the skull to remove tumors from the pituitary (a tiny gland inconveniently located near the center of the brain). Recovery took three to four months. But a skilled surgeon can now operate on the gland by snaking tiny implements up through the nostrils. "For the first couple of hours the patient may

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have a bit of a headache," says Dr. Thomas Gennarelli, chief of neurosurgery at Allegheny University in Philadelphia. "But that's about it. They're back at work three to five days later."

Smaller instruments are not the only reason surgery is growing less bloody. Specialists are discovering that well-targeted radio waves can alleviate everything from joint injuries to prostate tumors without the pain or complications of traditional surgery. Consider the experience of Brent Jones, a 34-year-old tight end for the San Francisco 49ers. He feared his career was finished last year when a 330-pound lineman smashed into him, dislocating his trick left shoulder. A shoulder slips out of joint because the bands of ligament holding bone ends together get frayed or stretched too much. Surgeons can tighten a damaged ligament by stitching small folds into it, but that requires splaying the joint—a serious business. Rehabilitation takes months of painful therapy, and folding the ligaments can permanently restrict the patient's range of motion.

Jones managed to avoid all that. Instead of cutting his shoulder open, the team's physician, Dr. Michael Dillingham, inserted a tiny electrode into the damaged joint and heated the ligament with radio waves until it had shrunk back to scale. "It's like heating a piece of bacon," he says. "The tissue just shrinks on the spot." One

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could do the same thing with hot water, but that would cause substantial burns. By using a radio-wave generator, the surgeon can release heat in measured doses and aim it precisely enough to spare surrounding tissues. Like other athletes who have tried the new technique, Jones required no hospital stay. And he was back on the field in five weeks, his range of motion unchanged. "People used to get [ligament] surgery so they'd be comfortable doing simple things like picking up a glass of water," says Richard Quick, the women's swimming coach at Stanford University. "With this technique, I've had swimmers come back and better their times."

RADIO-FREQUENCY TECHNOLOGY COULD AFFECT a lot more than sports medicine. With a little extra wattage, the same waves that shrink ligaments can destroy tumors and other unwanted tissues. Every year tens of thousands of women opt for hysterectomies to alleviate abnormal uterine bleeding. With a new radio-frequency device called ThermoChoice, a gynecologist can simply remove the dysfunctional uterine lining. The procedure takes eight minutes and involves no cutting at all. The doctor vaginally inserts a balloon containing a radio-frequency probe, then fills the balloon with sterile fluid and heats it to destroy the tissue. Urologists, meanwhile, are beginning to use waves instead of blades to treat the benign prostate enlargement

that afflicts a third of all men over 50. Other possibilities abound. Advanced Closure Systems of Sunnyvale, Calif., is developing a suture system in which adhesives cured by radio waves take the place of stitches or staples. And a company called Cardiac Pathways is pursuing the use of radio-frequency probes to treat arrhythmias. If an electrode-tipped catheter could harmlessly deaden malfunctioning portions of the heart muscle, says CEO William Starling, a quick zap might one day spare people the chronic nuisance of an implantable defibrillator.

The need for gentler treatments isn't confined to surgery. From aspirin to Zolof, almost any drug you can name has a significant downside. But scientists are now finding that those drawbacks can sometimes be eliminated. Remember Seldane? It's the nonsedating allergy treatment that swept the market back in the late 1980s. Though Seldane (known generically as terfenadine) didn't cause drowsiness, it turned out to cause potentially fatal arrhythmias when taken with grapefruit juice or with certain other drugs such as erythromycin. When that problem came to light, scientists at a Massachusetts company called Sepracor started tinkering with the terfenadine molecule. They knew that the liver broke terfenadine into several pieces, or metabolites. Only one of those metabolites, a smaller molecule called fexofenadine, had any therapeutic effect.

The others were either useless or harmful. Sepracor patented the discovery and licensed it to Seldane's maker, Hoechst Marion Roussel (which now claims it made the discovery on its own). The result was Allegra, an allergy treatment that leaves the user alert without creating other hazards.

Allegra has swept the market since its introduction last year, and Sepracor is now working on more palatable versions of a dozen other drugs. Its next target is albuterol, the bronchodilator sold under the brand names Ventolin and Proventil. Albuterol can quell asthma attacks by relaxing the smooth muscle cells that line the constricted airways. But it also causes hyperactivity, heart palpitations and tremors. In heavy users, it can even exacerbate asthma. That's because, like many medications, albuterol is actually two drugs in one. Its molecules are all chemically identical, but, like gloves, they come in two mirror-image configurations. The "right-handed" molecule works primarily to relax constricted airways, but its sinister twin disrupts cellular activities in other parts of the body. By ridding albuterol of its left "isomer," Sepracor has developed a new compound that not only lacks side effects but works at one fourth the conventional dose. The new compound, known as levalbuterol, could reach the market next year.

The quest for more narrowly targeted medicines extends far beyond Sepracor. Hoffmann-La Roche has just won approval to market a new formulation of Invirase, its blockbuster AIDS drug, in a gel cap that places three to 10 times as much active ingredient in the patient's bloodstream without significantly raising the dose. Eli Lilly and Co. is developing a new class of drugs called selective estrogen receptor modulators (SERMs), which are designed to help postmenopausal women ward off osteoporosis and heart disease without increasing their risk of breast and uterine cancer, as today's estrogens do. A company called Celgene is even working on safer versions of thalidomide, an extremely versatile medication known mainly for causing birth defects in babies exposed during gestation. None of these drugs will make medical treatment risk-free, and there will always be limits to what surgeons can accomplish through scopes the size of drinking straws. But if current trends continue, the techniques of the 21st century will make ours seem as quaint and barbaric as bloodletting.