

start

Drivers of Change 2006



Impulsionadores de Mudança

eNova
2006.12.07
Lisbon, Portugal

Dr Chris Luebke
Director for Global Foresight + Innovation
foresight@arup.com

Drivers of Change 2006

SIX working assumptions [pontos de partida]

a **BUNCH** of futures

four **GLOBAL** futures

your **OPINION**

five **STEEP** factors

my **STEEP**

more **STEEP**

IMPLICATIONS

[ACTIONS]

conclusion

Drivers of Change 2006

SIX working assumptions

a BUNCH of futures

your GLOBAL futures

your OPINION

five STEEP factors

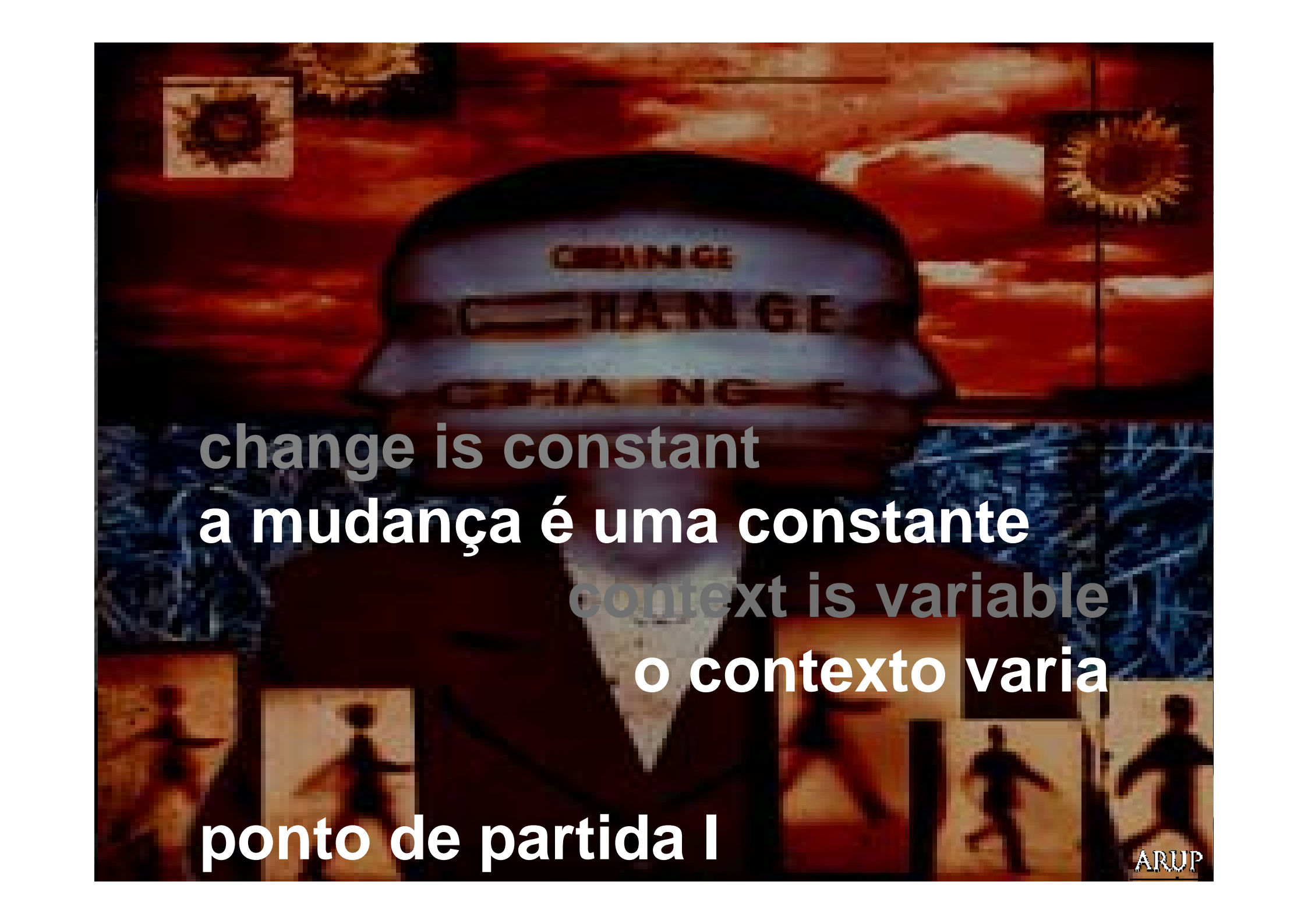
my STEEP

more STEEP

IMPLICATIONS

ACTIONS

conclusion



change is constant
a mudança é uma constante
context is variable
o contexto varia

ponto de partida I




gut + heart + head
estômago + coração + cabeça

ponto de partida II



the wisdom of crowds
emergence
a emergência da sabedoria
das multidões

ponto de partida III



**Temos de partilhar
UM PLANETA**

ponto de partida IV

context
parts that precede and
follow a word or passage
and fix its precise
meaning; circumstances

ARUP



only humans make boxes
apenas os seres humanos
constróiem caixas


context

parts that precede and
follow a word or passage
and fix its precise

meaning; circumstances

ponto de partida V

ARUP



noONE has the key
ninguém tem a chave

ponto de partida VI

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parts that precede and
follow a word or passage
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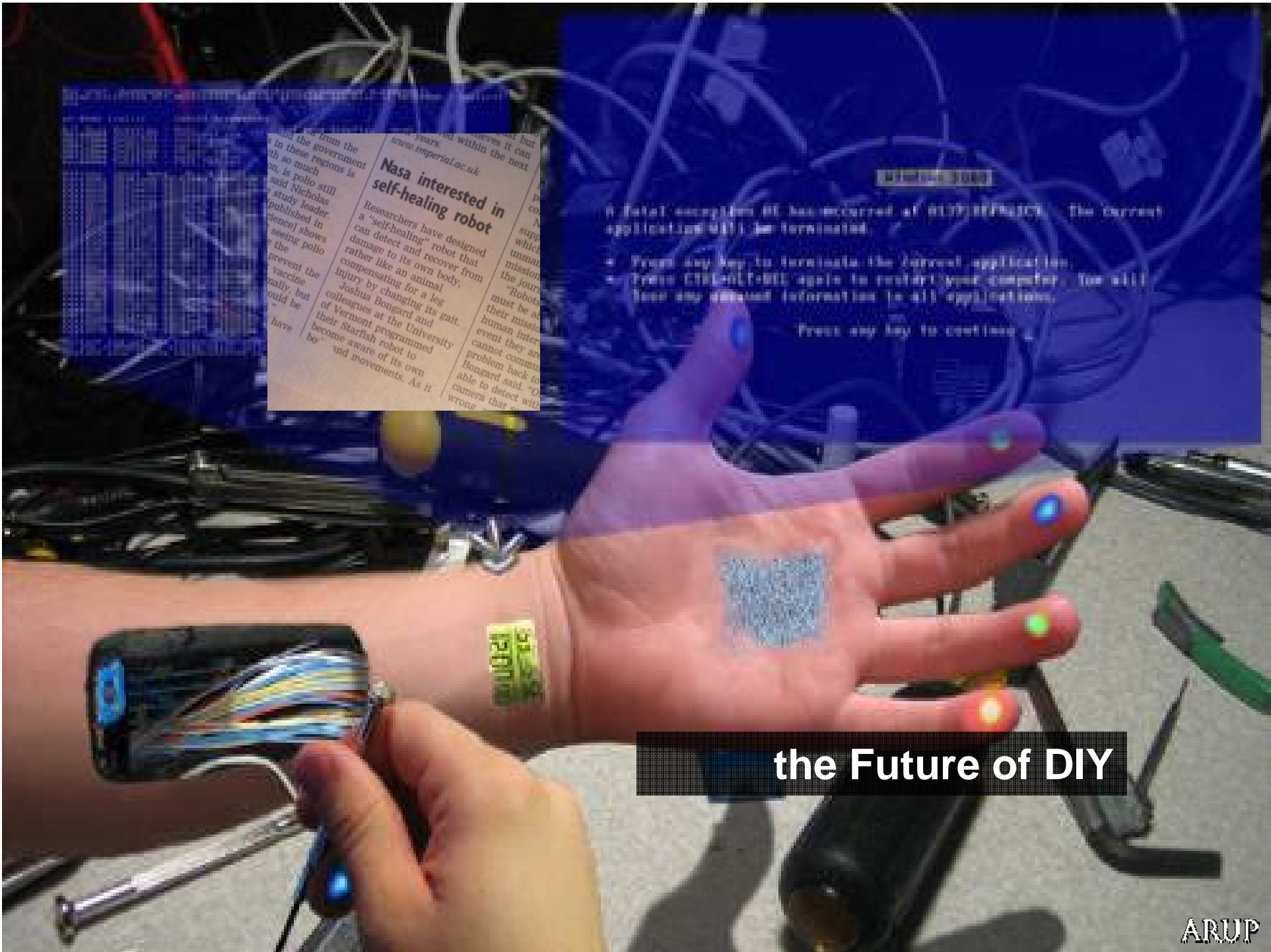
meaning; circumstances



the Future



the Future Nanny



...from the
...the government
...in these regions is
...with so much
...on, is polio still
...said Nicholas
...study leader
...published in
...science) shows
...seeing polio
...the
...prevent the
...vaccine
...nally, but
...ould be
...have

...years.
...ed within the next
...www.imperial.ac.uk

Nasa interested in self-healing robot

Researchers have designed a "self-healing" robot that can detect and recover from damage to its own body, rather like an animal compensating for a leg injury by changing its gait.

Joshua Bongard and colleagues at the University of Vermont programmed their Starfish robot to become aware of its own movements. As it

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...Robots
...must be at
...their missio
...human inter
...event they are
...cannot commu
...Bongard back to
...able to detect with
...camera that
...wrong

Fatal exception 0E has occurred at 0070000000. The current application will be terminated.

Press any key to terminate the current application.

Press CTRL+ALT+DEL again to restart your computer. You will lose any unsaved information in all applications.

Press any key to continue

the Future of DIY



the Future of Drugs



the Future of Art

Worth 1000.com

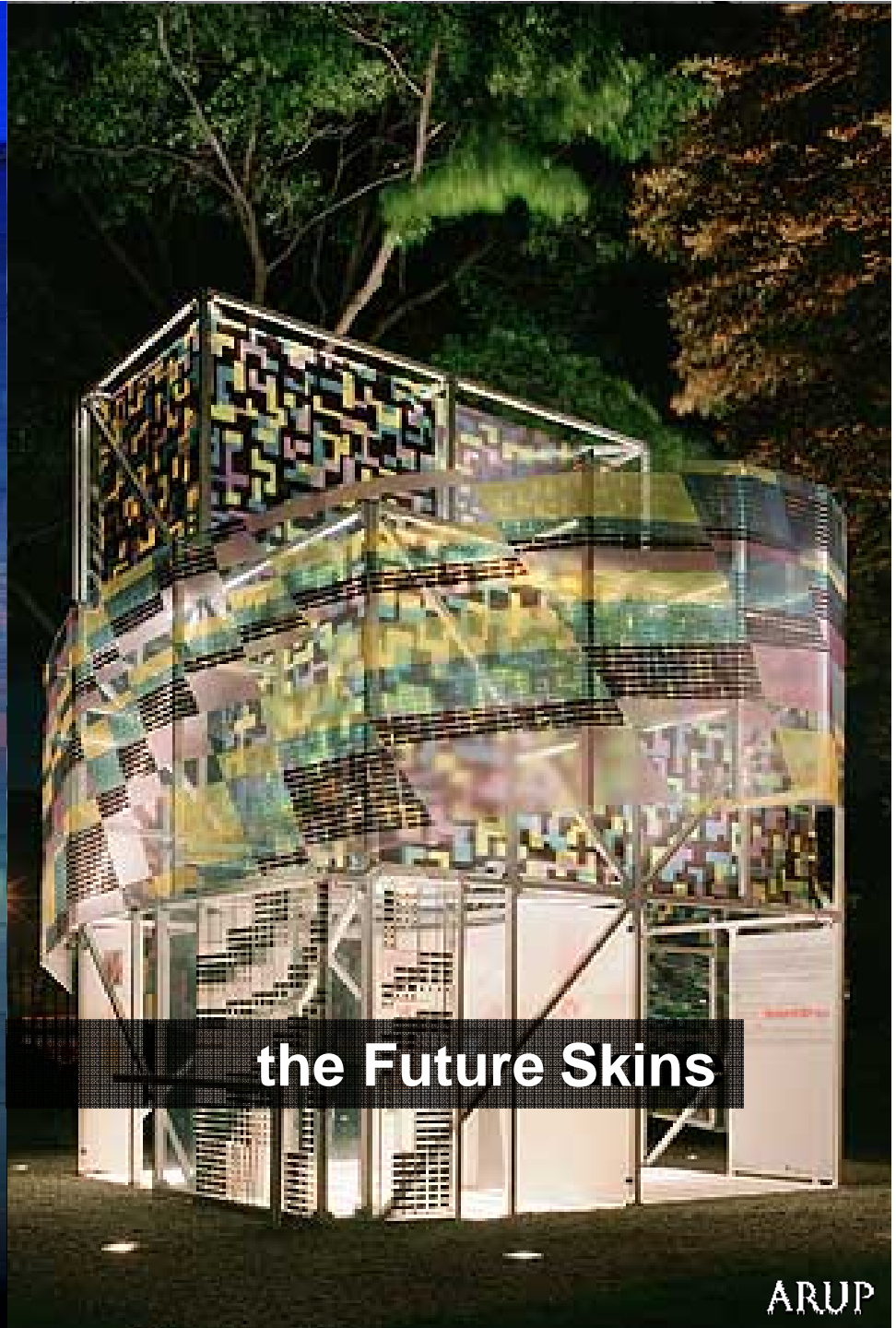
ARUP



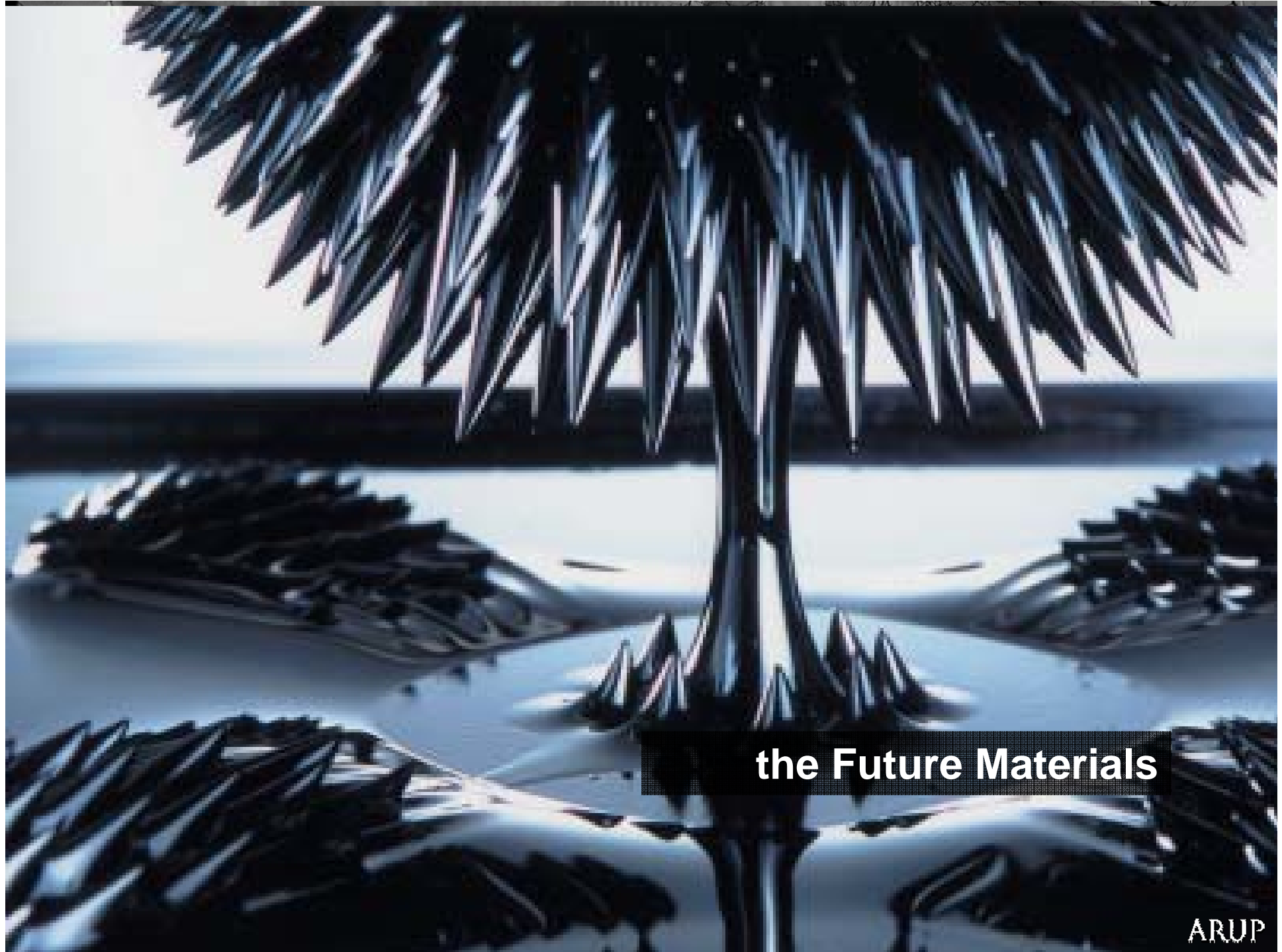
the Future of Racing



Michael Blayenberg



the Future Skins



the Future Materials



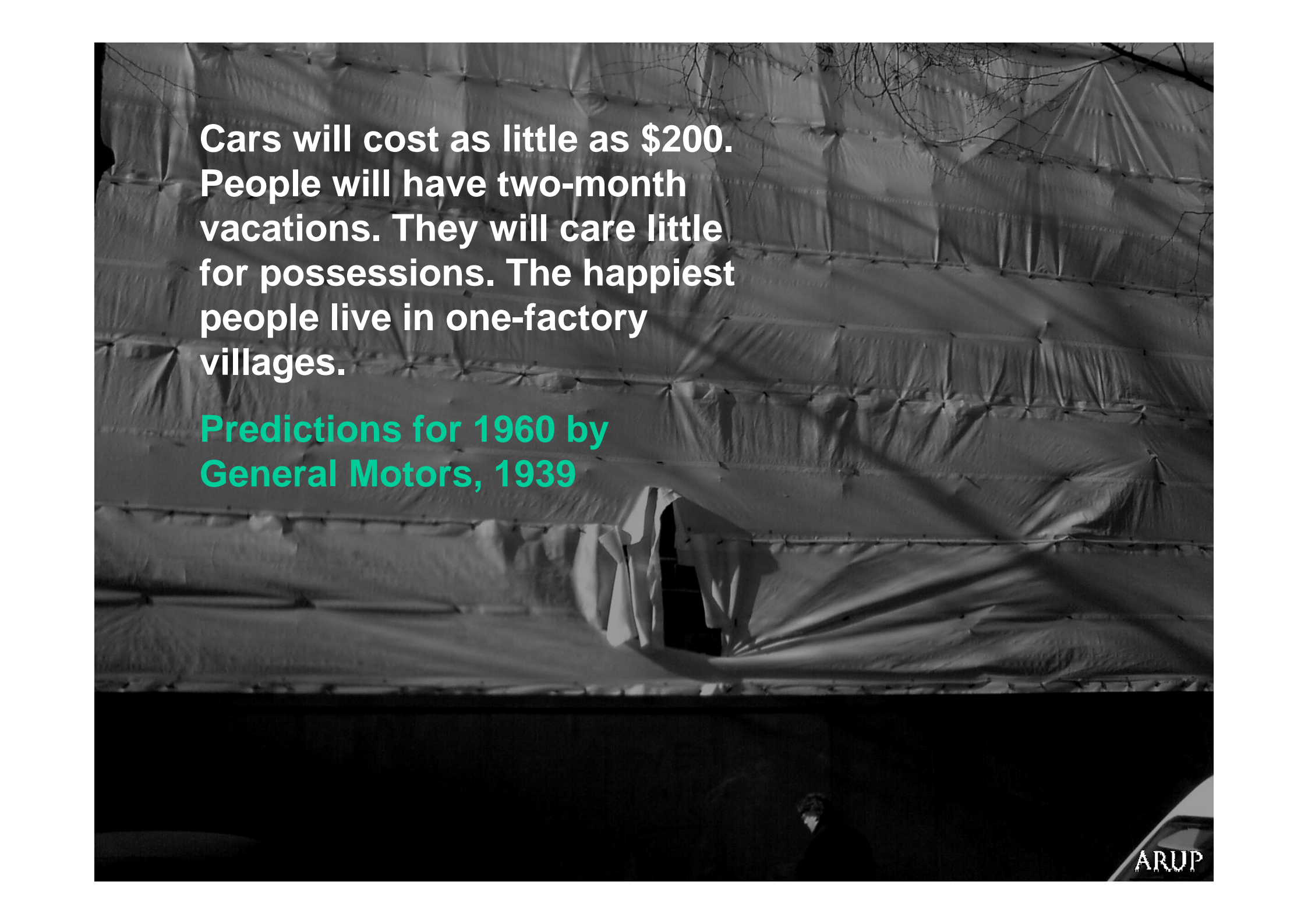
**the Future
is over sold
and under
imagined**

640k ought to be enough for anyone.

Bill Gates

$$\begin{array}{r} 7 \\ + 4 \\ \hline \end{array} \quad \begin{array}{r} 15 \\ \times 3 \\ \hline \end{array}$$





**Cars will cost as little as \$200.
People will have two-month
vacations. They will care little
for possessions. The happiest
people live in one-factory
villages.**

**Predictions for 1960 by
General Motors, 1939**

This is the City of TOMORROW—

*Pedestrians—
Express Traffic—
Local Traffic—
— each will be given
a clear path by 1960**

—predicts **NORMAN BEL GEDDES,**
authority on future trends

**When traffic delays and confusion seem hopeless, remember that men of vision are working on the problem. Already traffic engineers are planning city streets and country highways free from stop and go . . .*

- *1. Sidewalks will be elevated— you'll walk and shop ABOVE Main Street, actually cross OVER it.*
- *2. Local traffic will use the FREE, width of the streets below— no sidewalks, no parked cars. Loading and unloading will be done INSIDE the buildings.*
- *3. High-speed, long-distance traffic will have its own elevated, one-way lanes, no stop lights or intersections.*

..but TODAY, 4 miles in 5 are Stop and Go

STOP-AND-GO driving is not only annoying, but also is the most costly kind you do.

One stop can waste enough gasoline to take you 5 city blocks . . . and 30 stops a day is the nation-wide average!

While traffic authorities are planning "The City of Tomorrow," Shell engineers have developed a fuel . . . Super-Shell . . . to meet to-

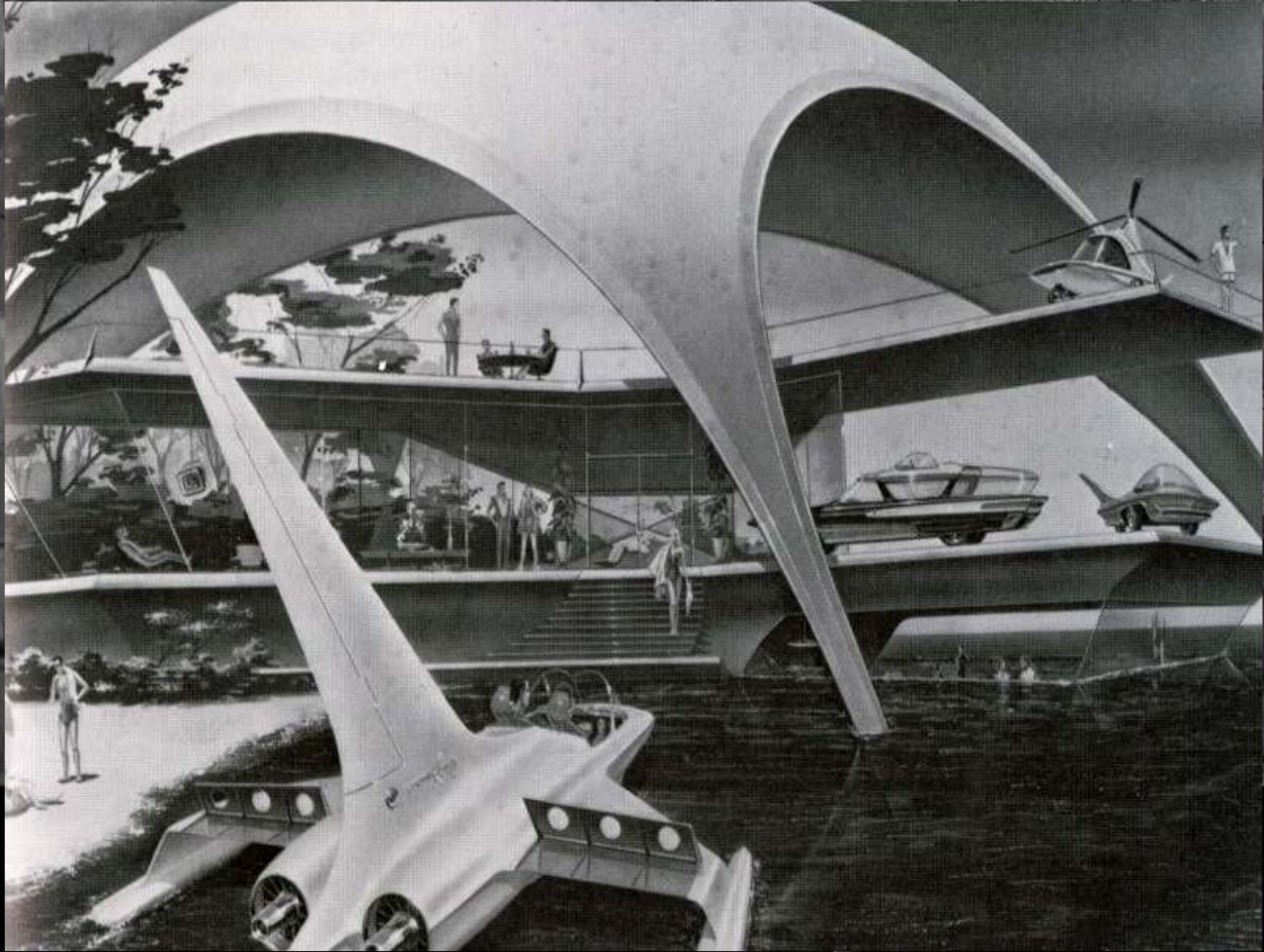
day's driving problem TODAY.

They have found a way to re-arrange the chemical structure of gasoline . . . actually to balance it.

Automotive engineers term Super-Shell "more-digestible," because at all speeds it is converted so QUICKLY, so COMPLETELY into power.

Save by the regular use of Super-Shell. A Shell dealer is near you.







about 100 years ago...

the Future
is over sold and under
imagined

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10-hour work day established in
France



about 100 years ago...

10-hour work day established in France
**Night-shift work for women
internationally forbidden**



about 100 years ago...

10-hour work day established in France
Night-shift work for women internationally
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**New York policeman arrested a
woman for smoking a cigarette in
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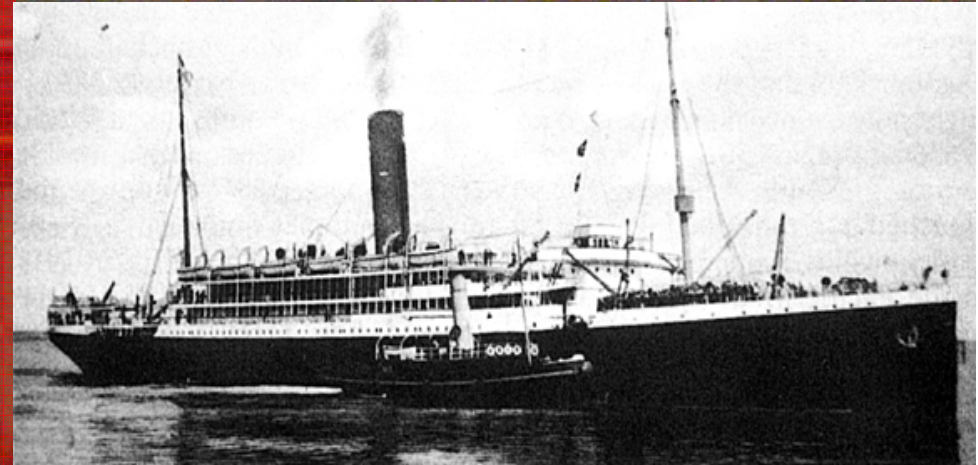
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Rolls-Royce was founded

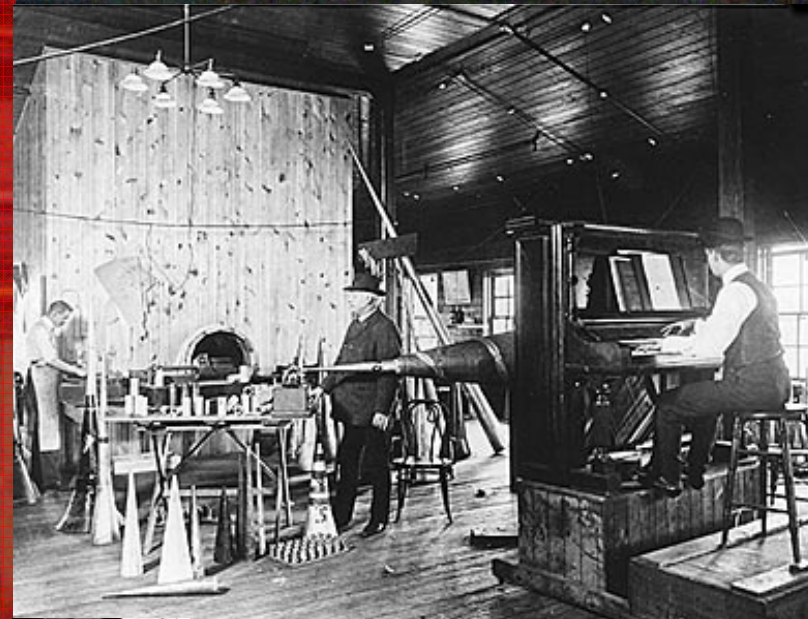


PHOTO CREDIT: CORBIS / HULTON-DEUTSCH COLLECTION



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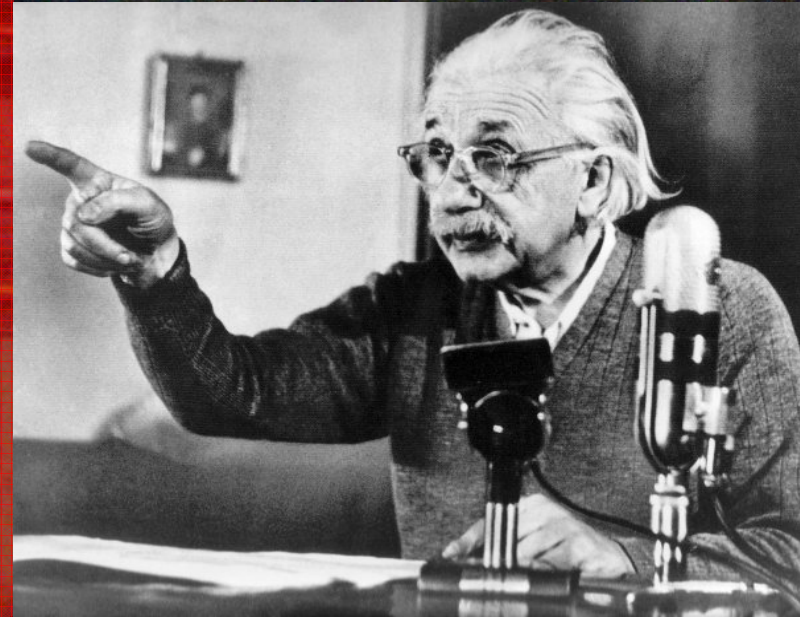
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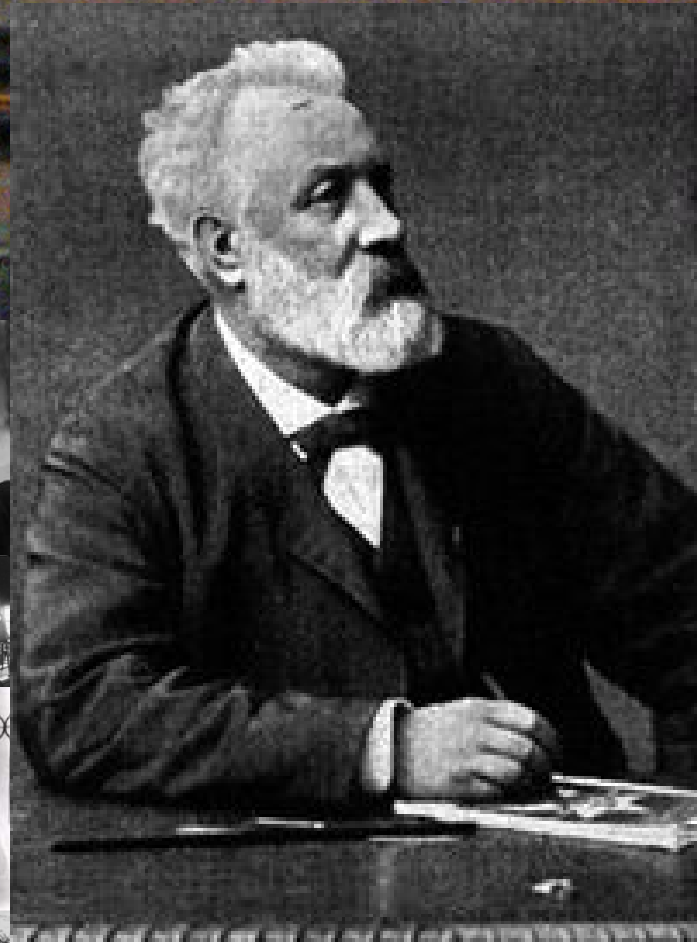
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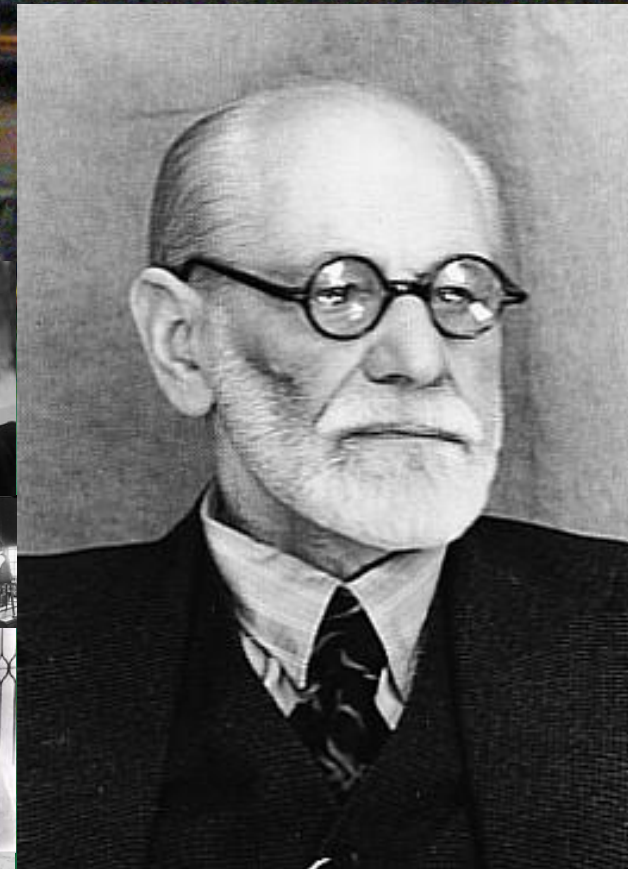
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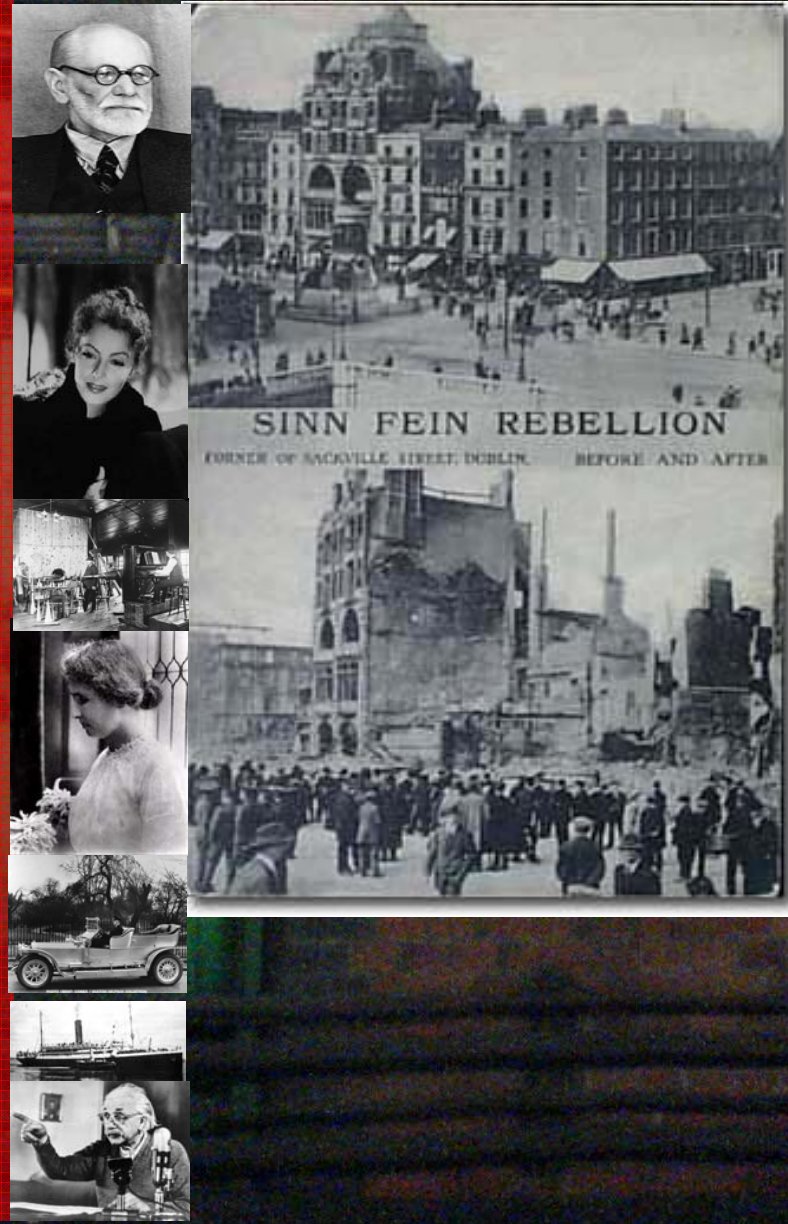
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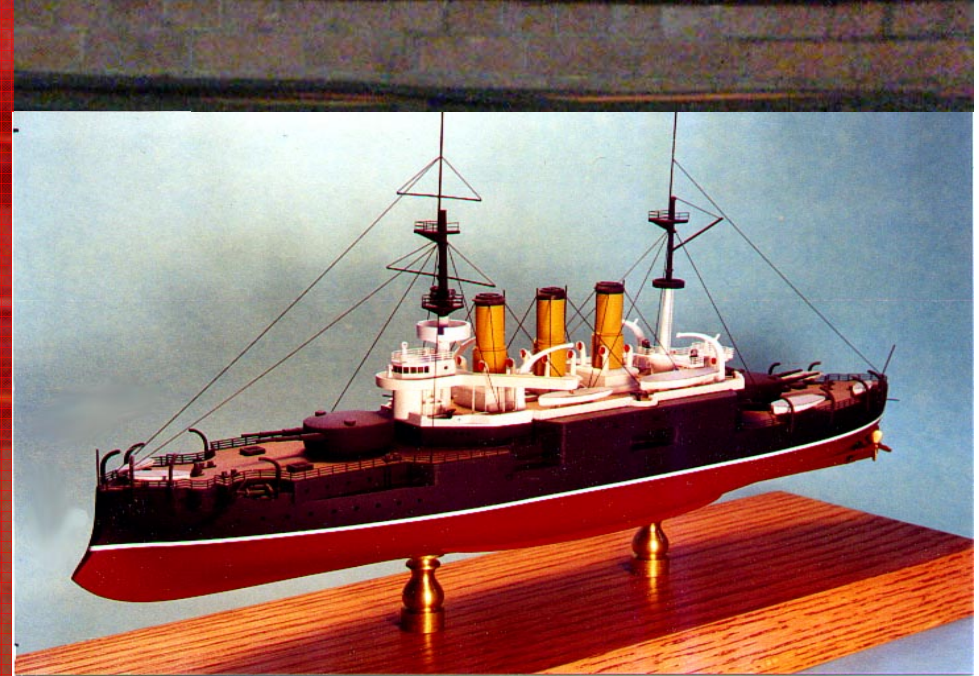
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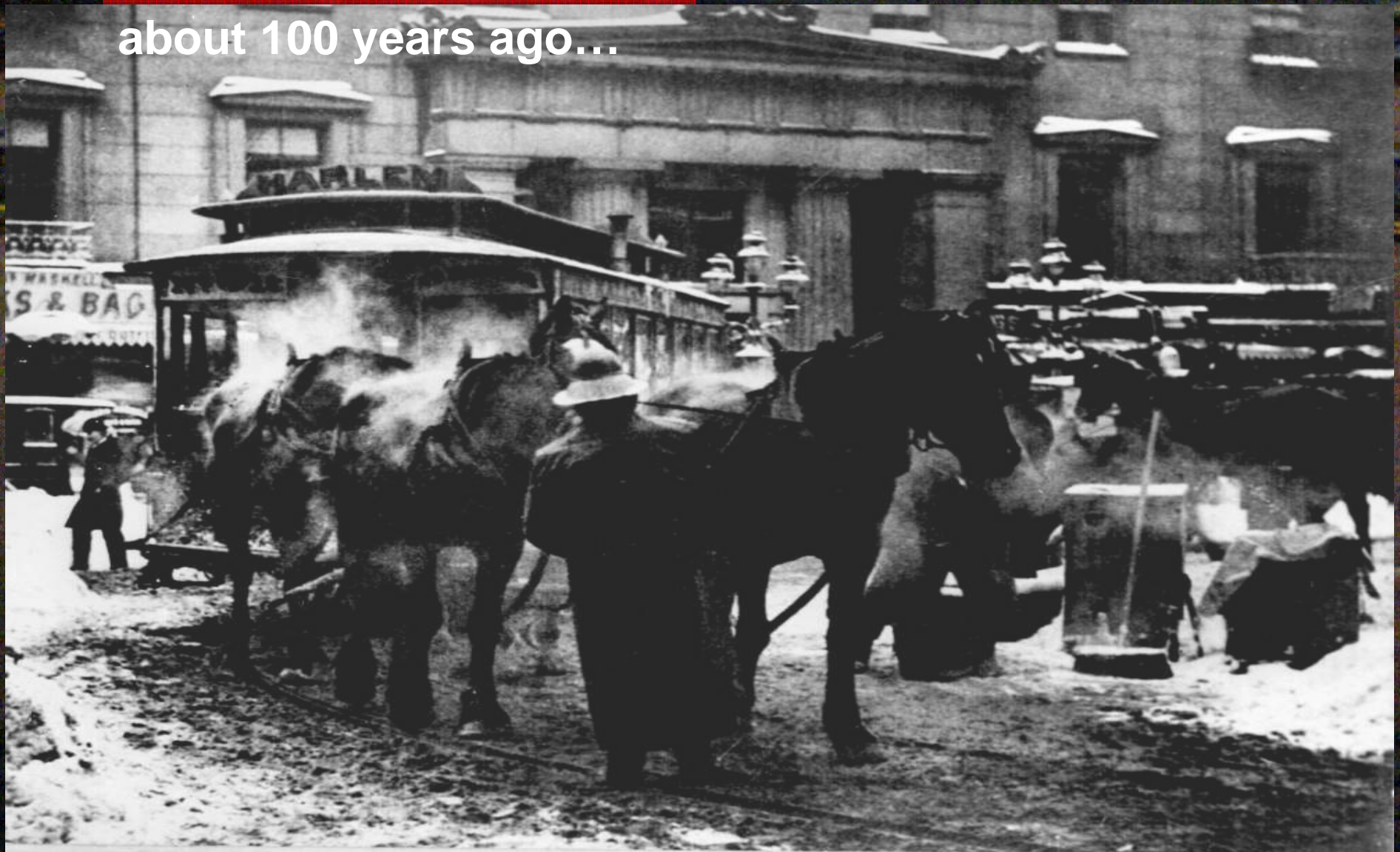


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Army strengths [in millions]: Russia 13; Germany 7.9; Austria-Hungary 7.4; France 4.8; Italy 3

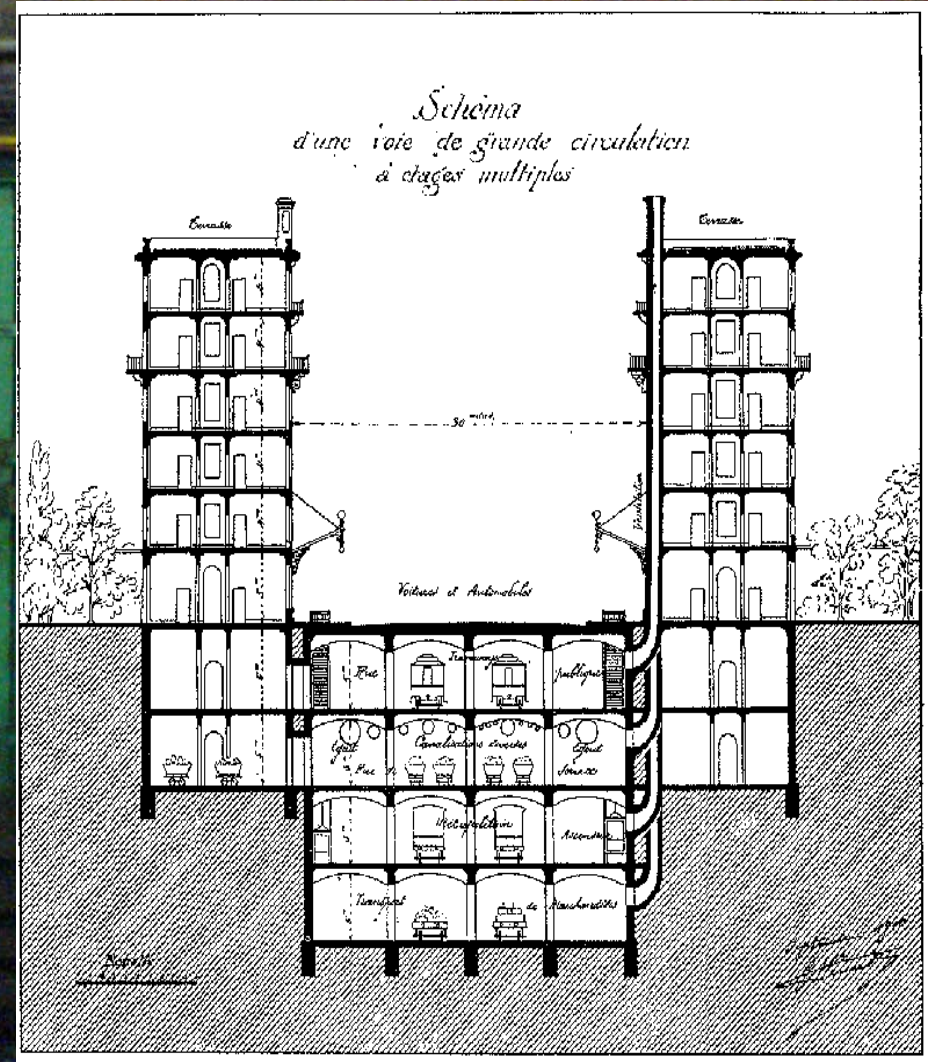
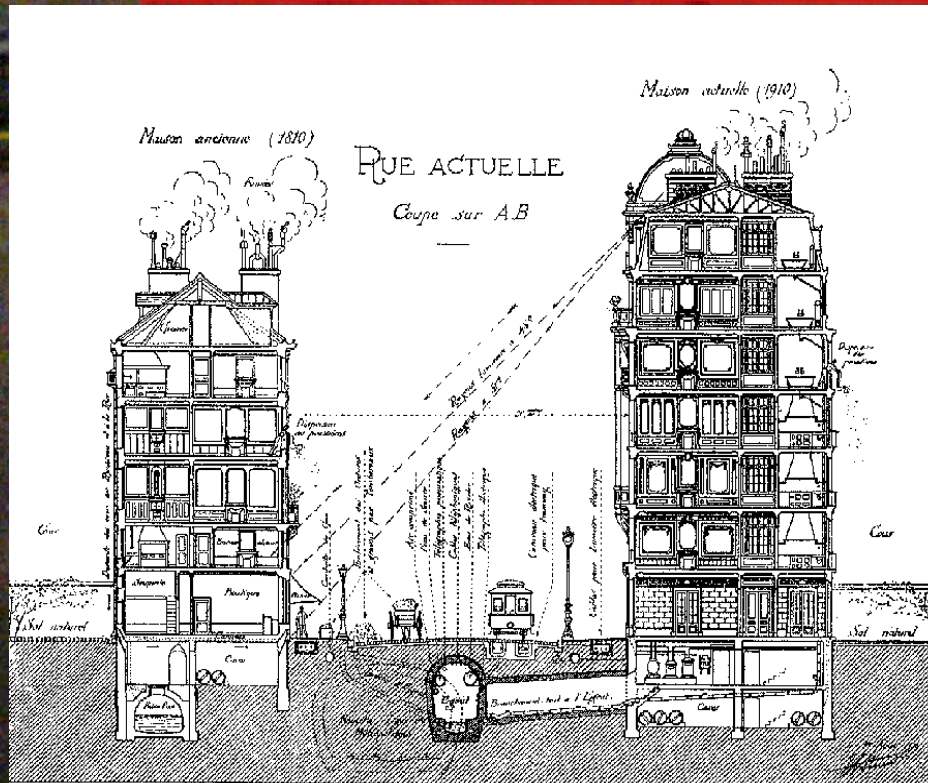


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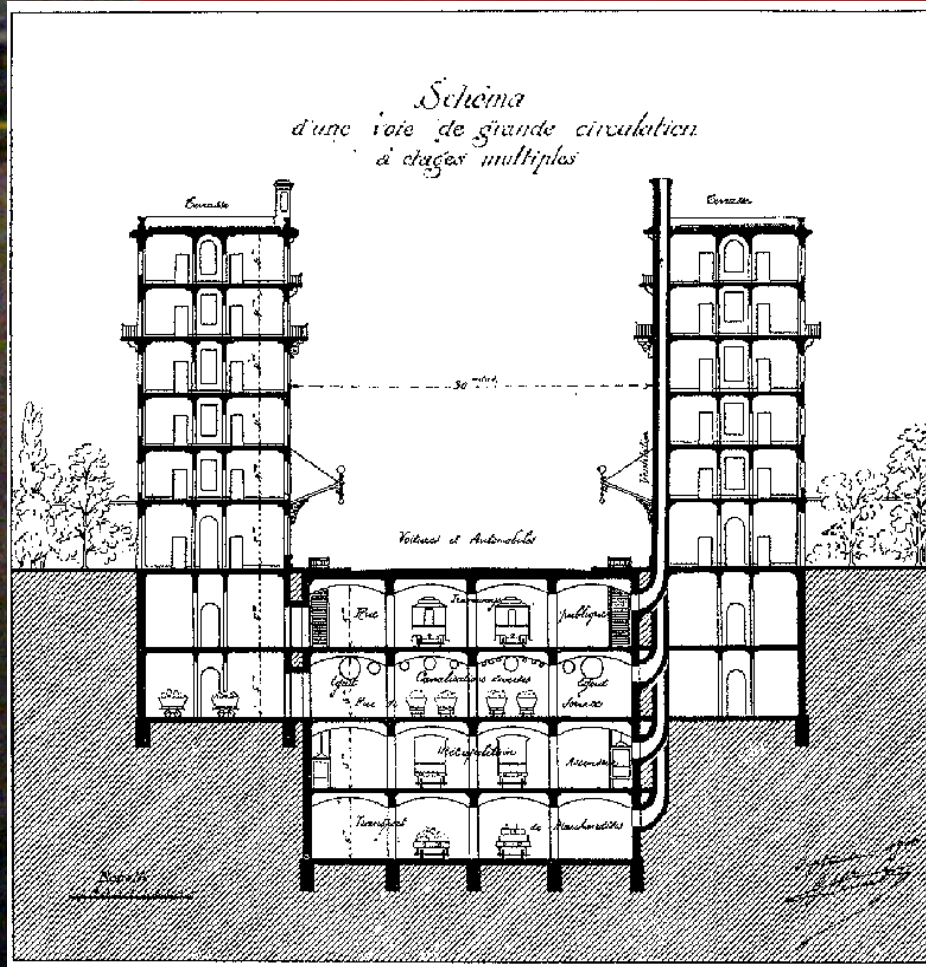
London will sink in horse manure

about 100 years ago...



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Army strengths [in millions]: Russia 13; Germany
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Hénard presented his future city
ideas to the RIBA in London

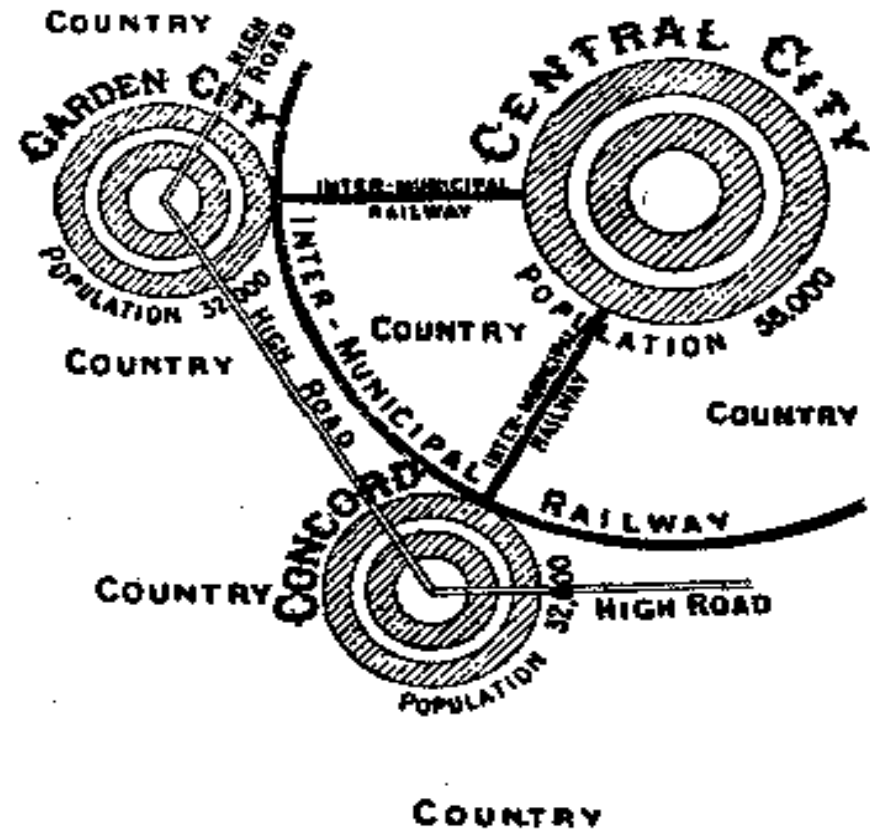
about 100 years ago...



N^o 5.

DIAGRAM

**ILLUSTRATING CORRECT PRINCIPLE
OF A CITY'S GROWTH - OPEN COUNTRY
EVER NEAR AT HAND, AND RAPID
COMMUNICATION BETWEEN OFF-SHOOTS.**



100 years ago...

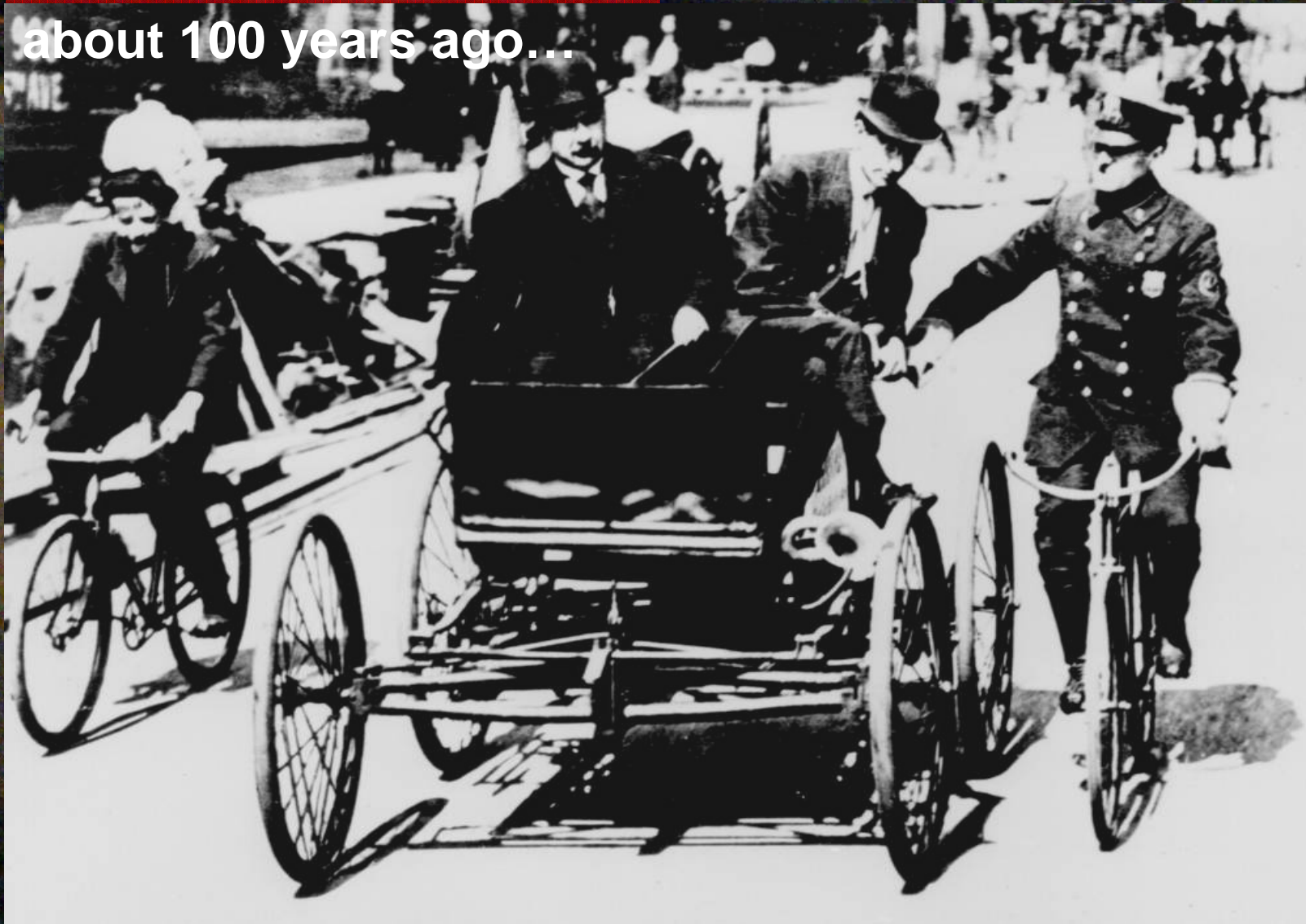


soaring dreams and grand visions

100 years ago...

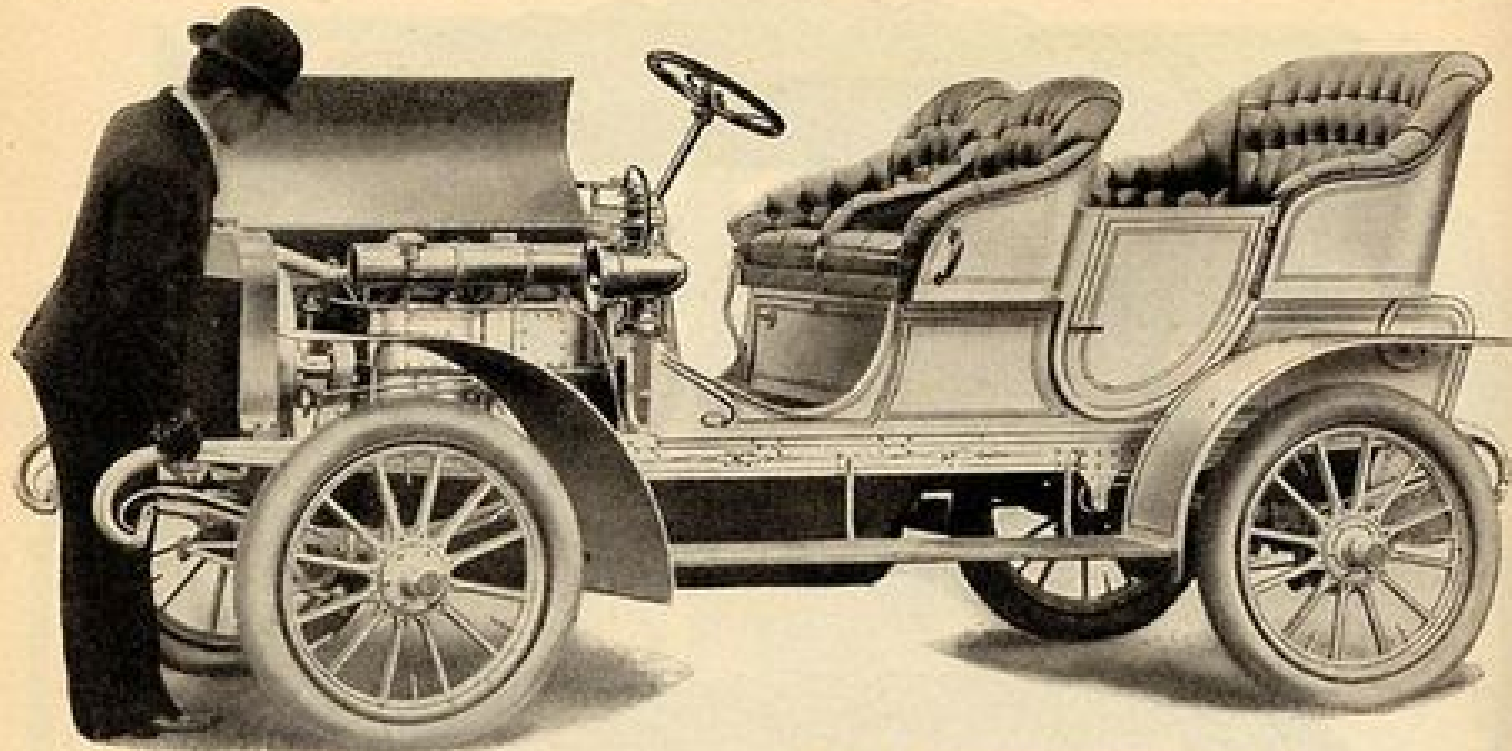


about 100 years ago...



conflicting values and conflicting cultures

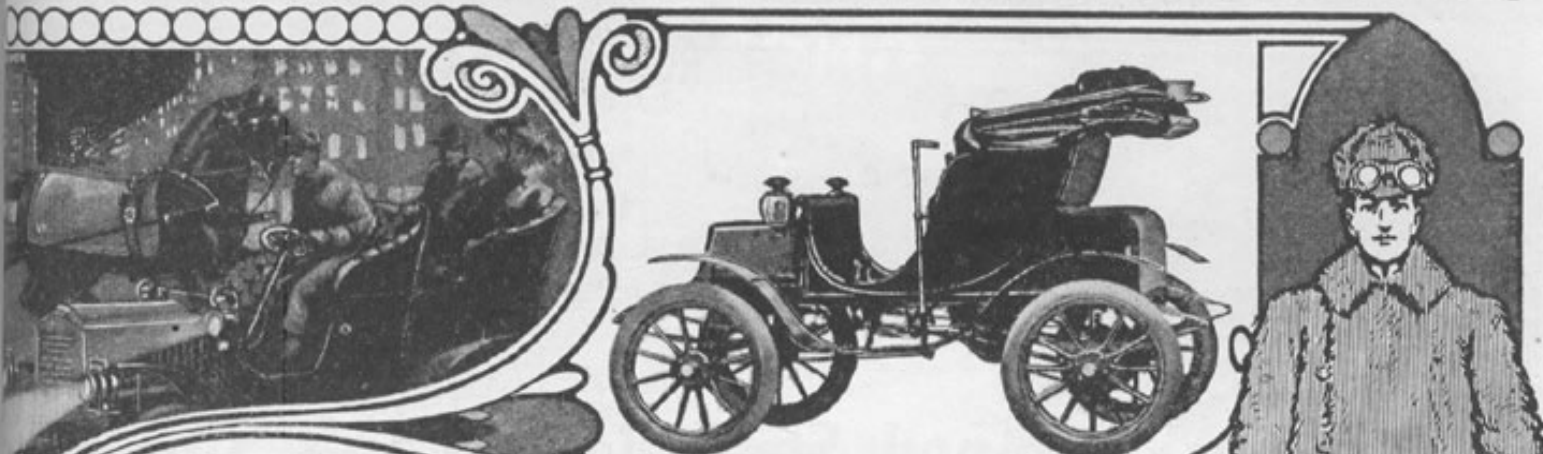
HARPER'S MAGAZINE ADVERTISER.



Model C	16-20	Horse-power..	\$1800
Model B.....	24-30	Horse-power..	\$2500
Model B, Limousine.....	24-30	Horse-power..	\$3500
Model A.....	40-50	Horse-power..	\$3500
Model A, Limousine.....	40-50	Horse-power..	\$4500

The Accessible WINTON of 1905.

STUDEBAKER



AUTOMOBILES

"THE AUTOMOBILE WITH A REPUTATION BEHIND IT"

ELECTRIC The handsome 1905 Victoria Phaeton presented herewith is indisputably the most satisfactory electric automobile yet produced. Especially designed for city and suburban driving, its superior springs—"STUDEBAKER QUALITY," also give it unprecedented ease over rough roadways. The mechanism for its operation and control is the simplest and surest ever put into an electric car. In every feature it shows the touch of the builder who has studied and mastered.

GASOLINE The 1905 STUDEBAKER GASOLINE AUTOMOBILE for distance touring possesses more admirable features than have yet been assembled in one car. Most notable are its ease of starting (by one turn of the crank), sure control by foot lever, absence of vibration, and the accessibility of all working parts.

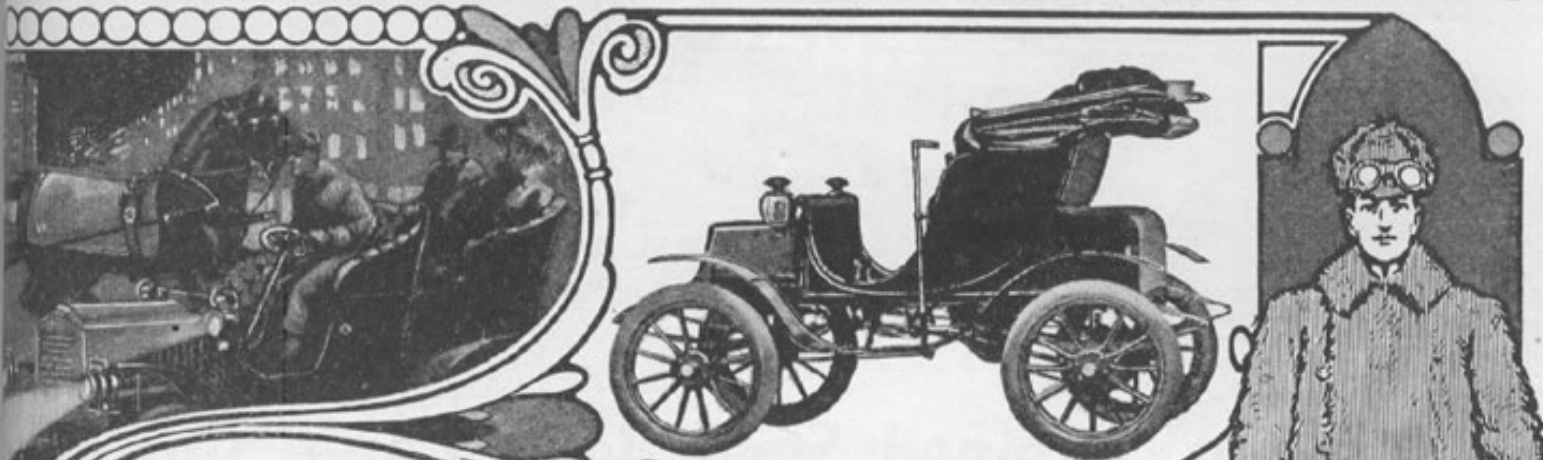
Catalogue showing every type of electric and gasoline vehicle sent on request.

STUDEBAKER AUTOMOBILE COMPANY, SOUTH BEND, INDIANA

MEMBER ASSOCIATION OF LICENSED AUTOMOBILE MANUFACTURERS

Agencies in all principal cities. See opposite page.

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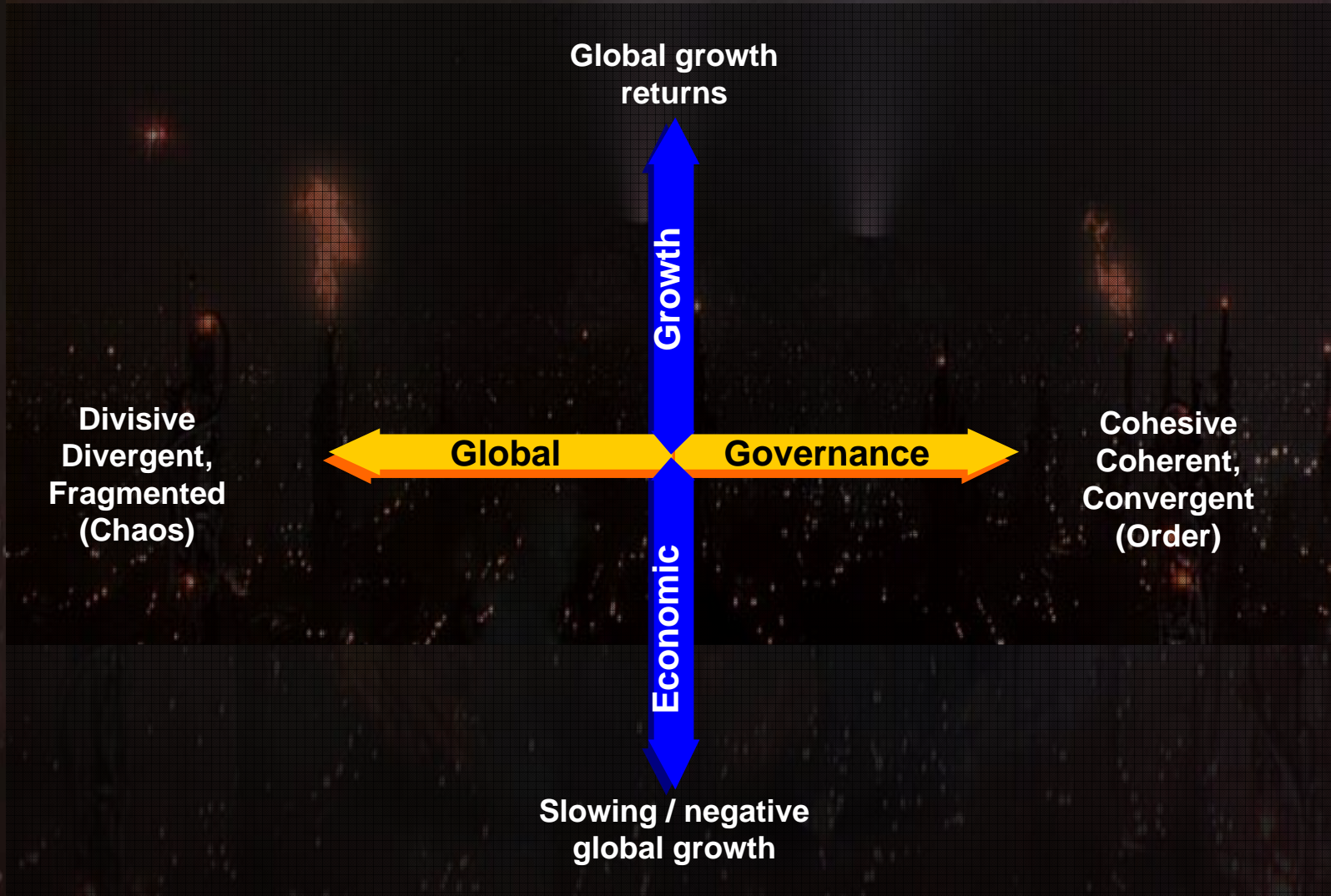
more **STEEP**

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global scenarios to 2025



global scenarios to 2025

“Bloc Islands”

- World economies recover at varying speeds,
- More regional economic and trading blocs form
- Policy initiatives stimulate local/regional growth
- Global dynamics driven by ideological differences
- Labour reforms impact growth and employment
- Technology and productivity gains are strong drivers of economic recovery

“Reglobalization”

- Iran and US announce new trade agreements
- UN restructured and revitalized; new council members
- Terrorism & geo-political instability contained
- Strong global economic performance
- WTO’s strength and influence increases
- Inflation growth slow, but steady
- Global dynamics driven by open economies

“Flat-Lining”

- “L”-shaped global economy - no growth
- Rising isolationism and protectionism
- Switzerland and Japan become the road map for an increasing number of economies
- Consumer confidence hits new lows
- Governments re-nationalize utilities
- UN / WTO significantly fractionalize

“Global Yo-Yo”

- “W”-shaped economic growth – contraction cycles
- Governments and business band together
- Financial & terrorist shocks curtail economic rebounds
- Economies labour under an expansionary public sector
- Greater risk of systemic shocks to the global financial system with rising risk premiums

Global Governance

Growth
Economic

bloc islands

economic growth, reduced cohesion

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- Technology and productivity gains are strong drivers of economic recovery
- Regional trade tariffs
- Bilateral trade agreements
- Racial crimes increase
- Regional disputes for resources increase
- China trade pact re-ratified with India
- Learning to live with fragmentation and fluctuation

HEADLINES

African Immigrants INVADE
Portugal
POWER Outage AGAIN!!!!
SAUDI Sinks thru Artic flooding
LISBON Christmas TREE TOPS
the WORLD RECORD!!!
VR now RR
[virtual reality now real reality]
PEACE Between Christians and
Muslims
GOLD Discovered in Alentejo

reglobalization

economic growth scenarios, enhanced global governance

HEADLINES

- Iraqi and Iran announce new trade agreements
- US/UN rapprochement
- Terrorism & geo-political instability contained
- Strong global economic performance
- WTO's strength and influence largely unchecked
- Low rates of Inflation
- Global dynamics driven by open economies
- Poor demand better conditions
- Global justices appointed by UN/World Court
- Aging process understood and reversible
- Euthanasia on demand
- Improved property rights in third world

AFRICA is the NEW market

CHINA+INDIA agree to new currency

BUDDAH IS BACK!

WTO regionalized

**BRAZILIAN RAINFORESTS
EXPAND**

IBERIAN Economy GOES SOLAR

Children above 12 get the vote!

**LISBON marks 75% voter
participation**

flat-lining

economic shrinkage, global chaos

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- Airlines renationalized due to lack of passengers
- Redevelopment of agricultural economies
- Micro-economics more important than macro
- Liquid digital passports implanted in newborns
- WWW collapses
- Bartering now the standard method of trade
- National Health services collapse

HEADLINES

REBELS AGAIN!

**FOOTBALLERS Banned from
Foreign Clubs**

**Professional Sportpeople salaries at
all time low!**

POVERTY increasing

Education DEVALUED !

Women kept at home

global yo-yo

economic shrinkage, global cohesion

HEADLINES

- “W”-shaped economic growth – contraction cycles
- Governments and business band together
- Financial & terrorist shocks curtail economic rebounds
- Economies labour under an expansionary public sector
- Greater risk of systemic shocks to global financial system with rising risk premiums
- Middle East stabilizes
- Newsgroups replacing Newspapers
- Global ice age looming
- Virtual community membership peaks
- Energy shortages rampant
- Central African Cultural resurgence
- Entrepreneurship encouraged over global corporations

BUSH arrested for world abuse

Suicide rate increasing

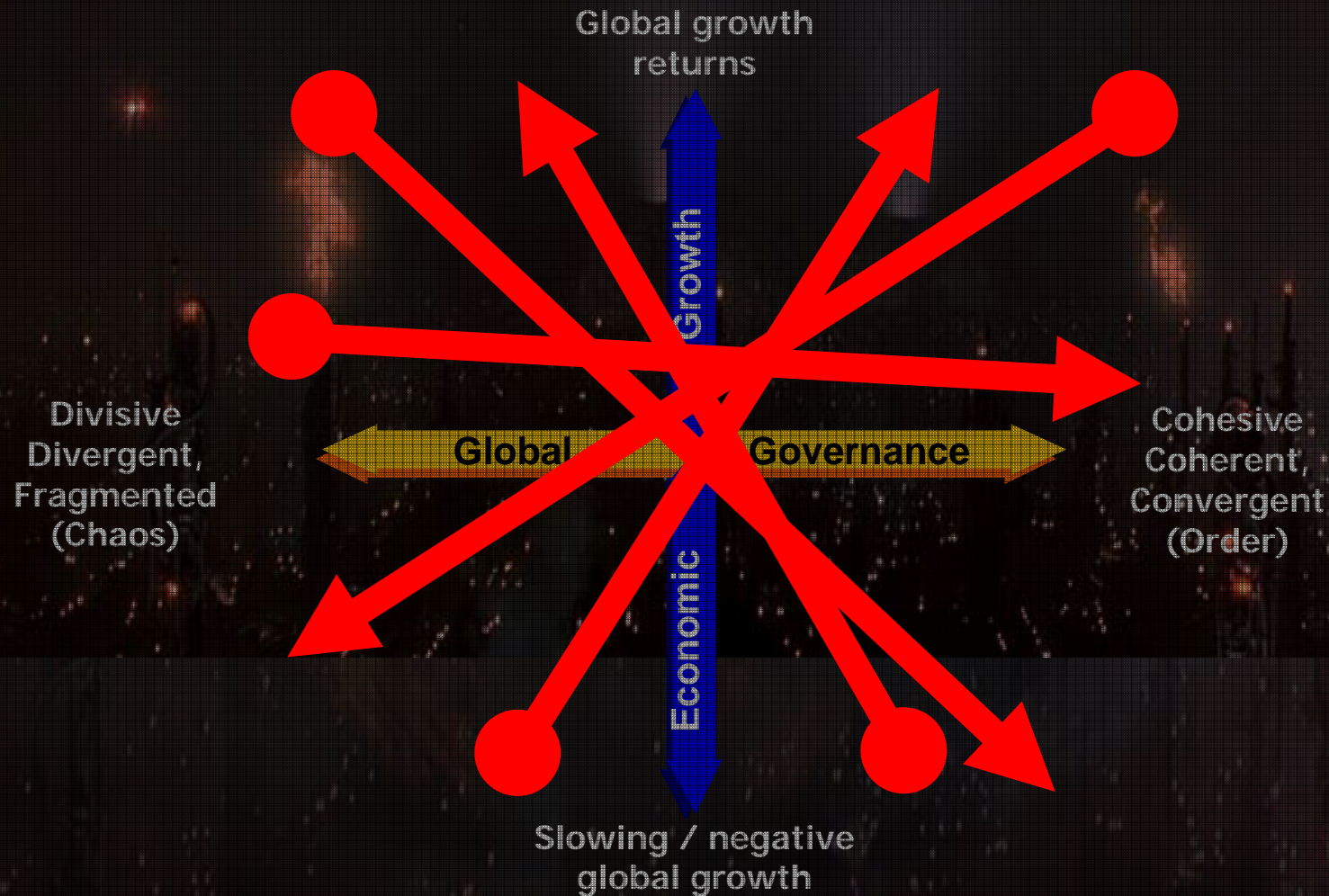
Nuclear Plant explodes!

TERRORISTS UNITE!

Energy Hackers proliferate

WORLD CUP cancelled!

this groups's opinion?



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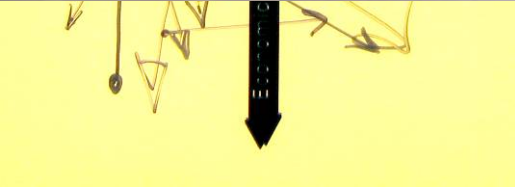
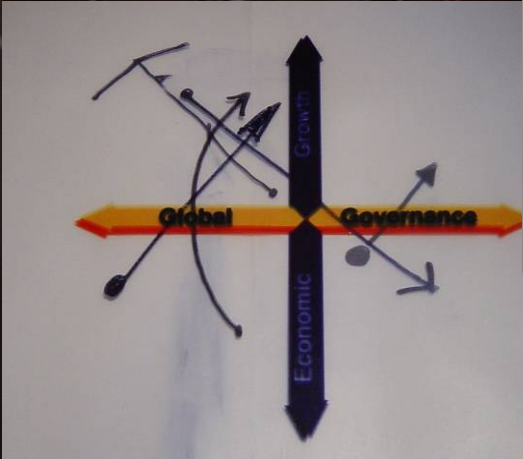
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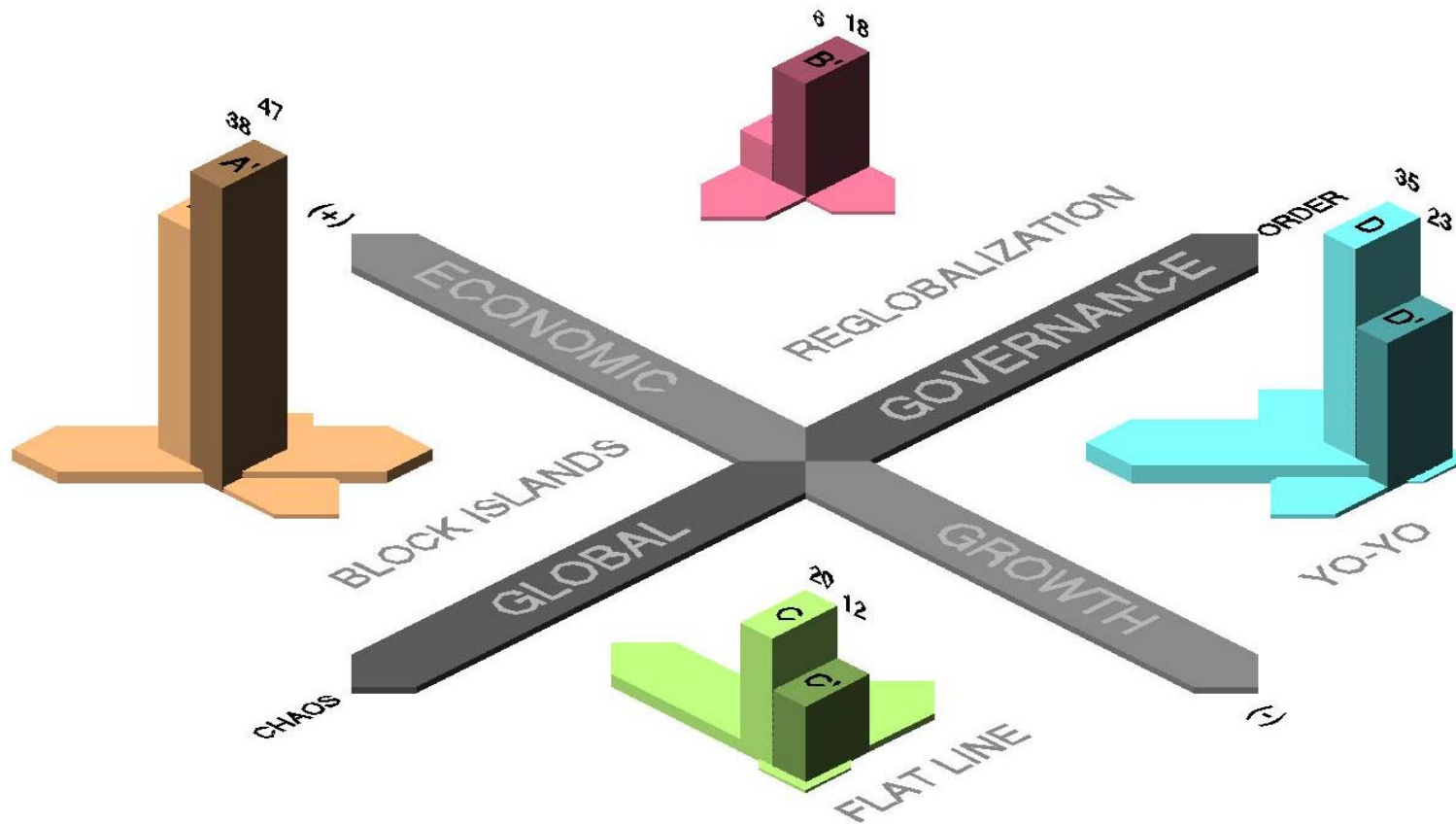


our future...???



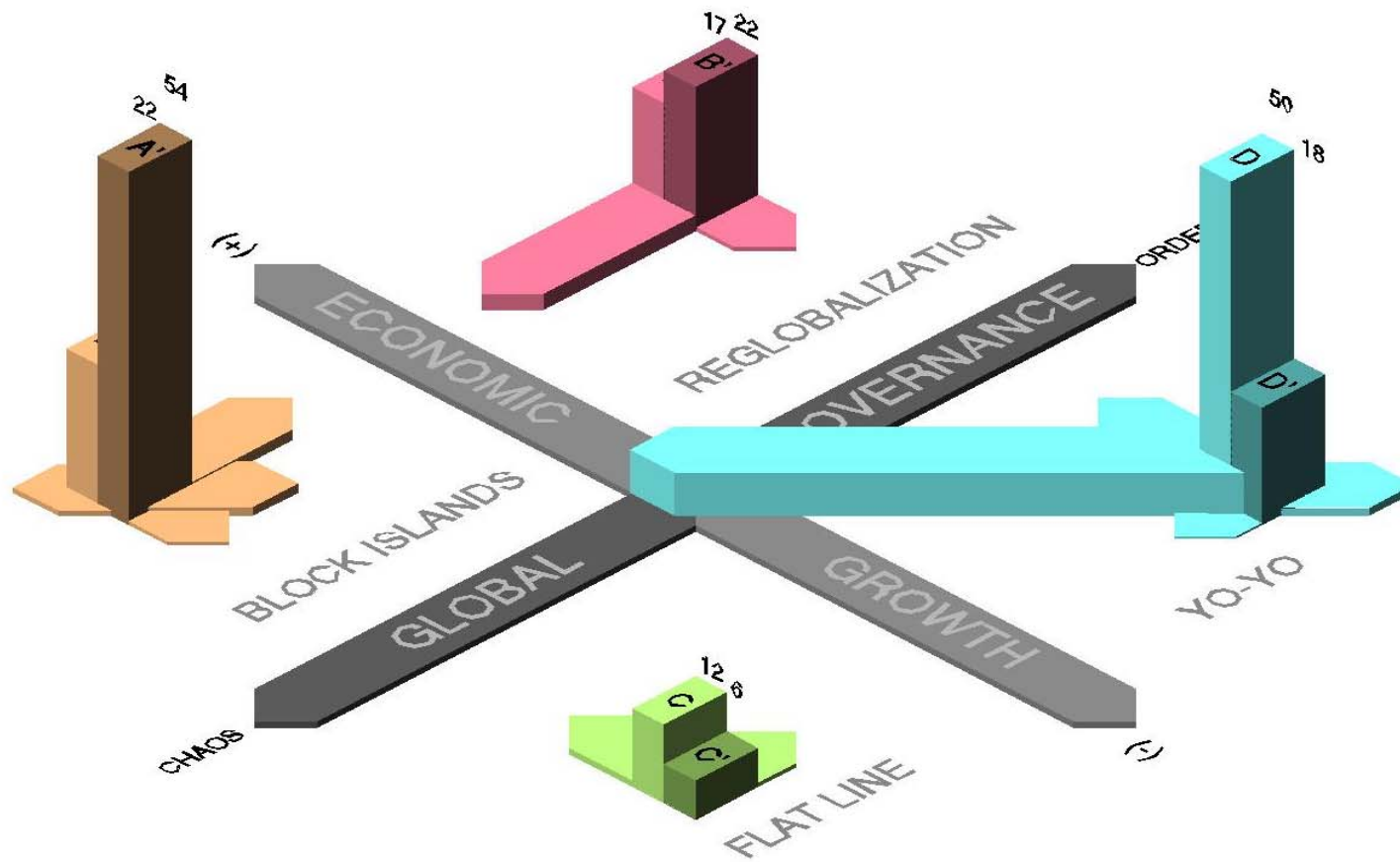
a view from USA

Global Scenario Workshop
USA Summary



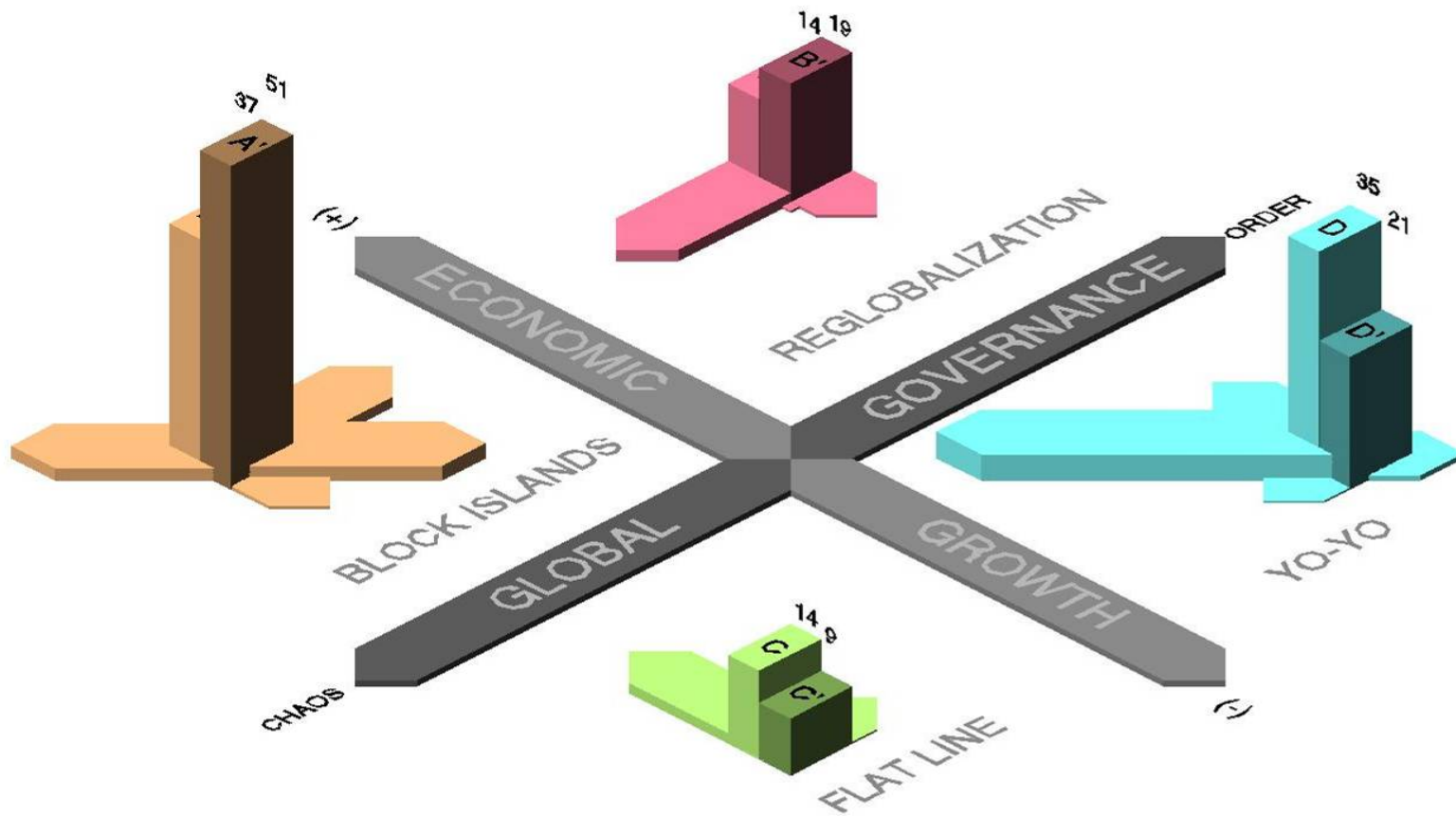
a view from Asia

Global Scenario Workshop
Asia Summary



a global view

Global Scenario Workshop
World Summary



what will we do in THIS world?

SURVIVE

or

THRIVE



**How will you be a
thrivalist in each?**

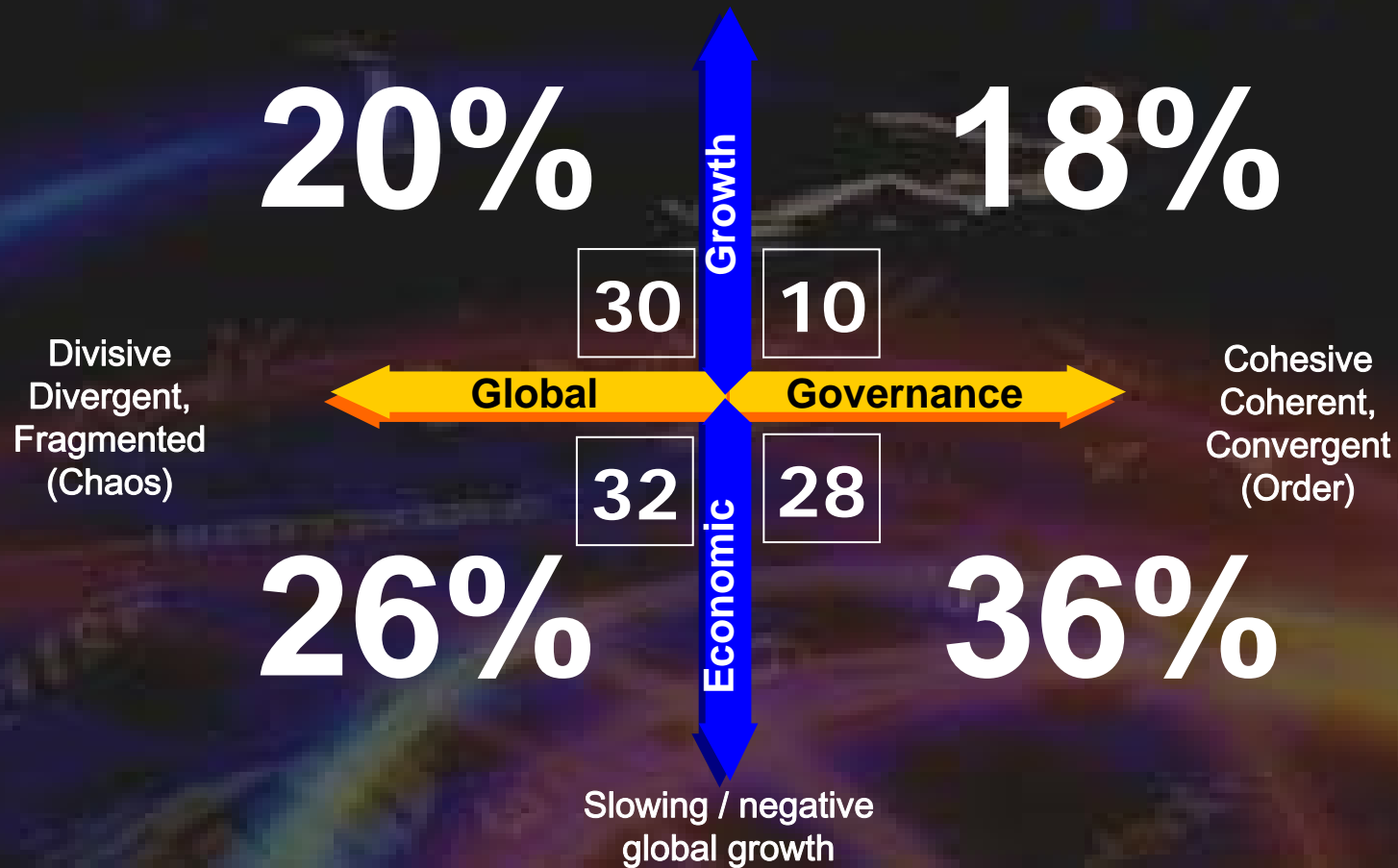


Coffee



global scenarios to 2025

Global growth returns



STEEP

Singapore

Lisbon

Frankfurt

Moscow

Denver

Johannesburg

Sydney

Bristol

Libertyville

Los Angeles

Hong Kong

are the **Drivers of Change**

Zurich

London

San Francisco

Melbourne

Berlin

Perth

Warsaw

San Jose

Edinburgh

Cardiff

Boston

Cape Town

Copenhagen

Cambridge

Durban

Chicago

New York

Seattle

Pretoria

Manchester

Santa Rosa

STEEP

What are the key external **driving forces** that will be important to **PORTUGAL** for the next 20 years?

STEEP Drivers

Social

Technological

Economic

Environmental

Political

What are the key external **driving forces** that will be important to **PORTUGAL** for the next 20 years?

disaggregate
prioritize
re-aggregate

STEEP Drivers

Social

Technological

Economic

Environmental

Political

take a scrap of
paper

[if you have one]

take a moment
and think of
drivers....

write down ten
drivers...

STEEP Drivers

**now move to your
flipchart.**

**together, list your
drivers for the
ONE letter...**

What are the key
external **driving
forces** that will be
important to
PORTUGAL for
the next 20 years?

STEEP Drivers
move clockwise....
add a few [MORE]
drivers....

What are the key external **driving forces** that will be important to **PORTUGAL** for the next 20 years?

disaggregate
prioritize
re-aggregate

STEEP Drivers

**now look at the
drivers in front of
you and underline
the **THREE MOST**
important for
PORTUGAL**

What are the key
external **driving**
forces that will be
important to
PORTUGAL for
the next 20 years?

disaggregate
prioritize
re-aggregate

STEEP Drivers

Now, choose the
most important
driving force for

LISBON.

Circle it.

STEEP Drivers

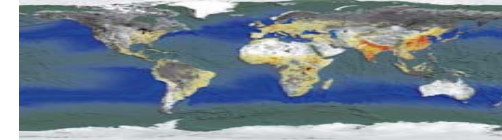
Each individual

VOTEs by
putting a DOT in
each STEP
category for the
MOST important
for LISBON.

Driving Forces

Harvard Club. New York, USA

2006.05.11



Social

- Demographic Change
- Education => global competition
- Resource depletion

- Race relations
- Immigration
- Security – national
- Urban sprawl
- Housing
- Minimum wage
- Agriculture
- Disease
- Natural disasters
- Religious differentiation
- Healthcare
- Social security

Technological

- Global Communications
- 'intelligent' building systems
- New forms of transportation
- New forms of energy
- Nanotech
- New health-techs

Economic

- Energy Costs
- Growth in China, India, Russia
- World Terrorism

- Oil Supply
- Relative innovation in other countries
- Demographics
- Strength of US\$ in global economy
- Deficits

Environmental

- New Energy Sources discovered that are self-sustaining and non-polluting
- Disease
- Water access

- Pollution
- Rising water levels
- Species Extinction
- Crop Failure leading to food shortages
- Larger swings in weather
- Increased natural disasters
- Land stewardship
- Shift to a RESORATION economy
- Insurance availability w/re environmental liability
- Developing 'Greenbelts'
- Shifting population patterns towards 'natural preserves'

Environmental

- Attitudes of younger generations
- Price of Oil
- Increasing population and their distribution
- Bio-Engineering

- Global Warming
- Health of fisheries
- Water wars
- Increasing emphasis + awareness of sustainability
- Disease
- Need for deeper understanding of what we are dealing with in the world
- Alternative energy sources
- Better utilization of facilities
- Health of soil and forests
- Connection between food and resource reqmts
- Ability to trade CO2

Political

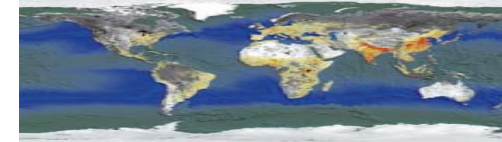
- Terrorism + homeland security + civil liberties
- Global Issues Impacts
- Energy Policy

- Demographics
- Religion
- Pandemics
- Health care
- Immigration
- Social security
- Tort return
- Tax
- Economic polarization
- Hillary
- Isolationism [or not]
- Allocation of funds
- Pension bailouts

Driving Forces

Harvard Club. New York, USA

2006.05.11



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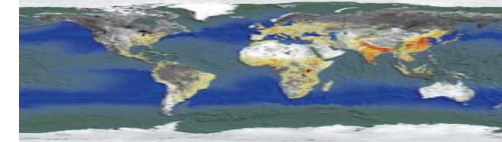
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Driving Forces

Harvard Club. New York, USA

2006.05.11



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Driving Forces

Sydney, AUS

08072004

Workshop with ** including
Clients in the Arup office.
Contact was Georgina Legoe



Social

- **Aging Population**
- **Expanding gap between 'haves' and 'have nots'**
- **Immigration/Multiculturalism**
 - Demography
 - Health/Stress/Depression
 - Consumerism vs environment
 - Beauty Demand
 - Religion
 - Work/Life Balance
 - Increasing need for new and repair of infrastructure
 - Gender
 - Household size
 - Obesity
 - Population Growth
 - Composition of families
 - Community fragmentation
 - Decline in education standards
- Demise of the 'glass ceiling'
- Hedonism
- Demand for home/life location
- Drugs
- Crime (perception of security)
- Regulation vs freedom
- Demand for entertainment (the opiate of the masses)
- Longevity
- Big Brother

Technological

- **Universal connectivity**
- **Power/Technology failures will have increasing impact on work patterns or technology will change to solve the problems**
- **Technological fixes to environmental problems**
 - More efficient manufacturing fabrication back to local industry
 - Greater recycling new industries
 - Better transport/technologies will impact on work leisure patterns
 - Medical revolution will affect demography of workforce
 - Biotechnology
 - Nanotechnology

Economic

- **Relationship to world economy + events**
- **Sustainable economic development**
- **Ageing population/children**
 - Attitude to resources
 - Consumer debts = unsustainable consumer optimism
- Efficient capital markets
- Declining middle class
- Attitudes to social welfare
- Interest rates, inflation
- Interstate trade agreements
- Tourism
- Terrorism + war

Environmental

- **Water availability and quality**
- **Climate Change**
 - Political will/public response
 - Population
 - Global agreements (eg Kyoto)
 - Consumption
- Greenhouse emissions
- Fossil fuel depletion
- Resource depletion
- Full costing of resources
- Waste management
- Company Director liability
- Scientific, technological + R&D understanding

Political

- **Short termism**
- **Lack of vision**
- **Retention of Power**
 - Political ineffectiveness
 - Single Issue Parties
 - Balance of Power
- Threat of terrorism
- Bi-Lateral Trade Agreements
- Immigration/Population
- Infrastructure as it affects politics

Bold indicates a clear majority of votes and everything above the line received a minimum of one vote

aging population	S	education
stem cell research	T	energy
current account deficit	Ec	oil prices
sprawl/population growth	En	global warming
state budget deficit	P	governance

San Francisco. 2005

Cape Town. 2005.09.30

aging population	S	wealth distribution
convergence	T	convergence
wealth distribution	Ec	debt
fuel/energy	En	fuel/energy
integration	P	polarization

Zurich. 2005.06.07

Seattle. 2005.05.18



S ocial
T echnological
Ec onomic
En vironmental
P olitical

Demographic Change
Convergence
Dong Tang
Energy
Visions?

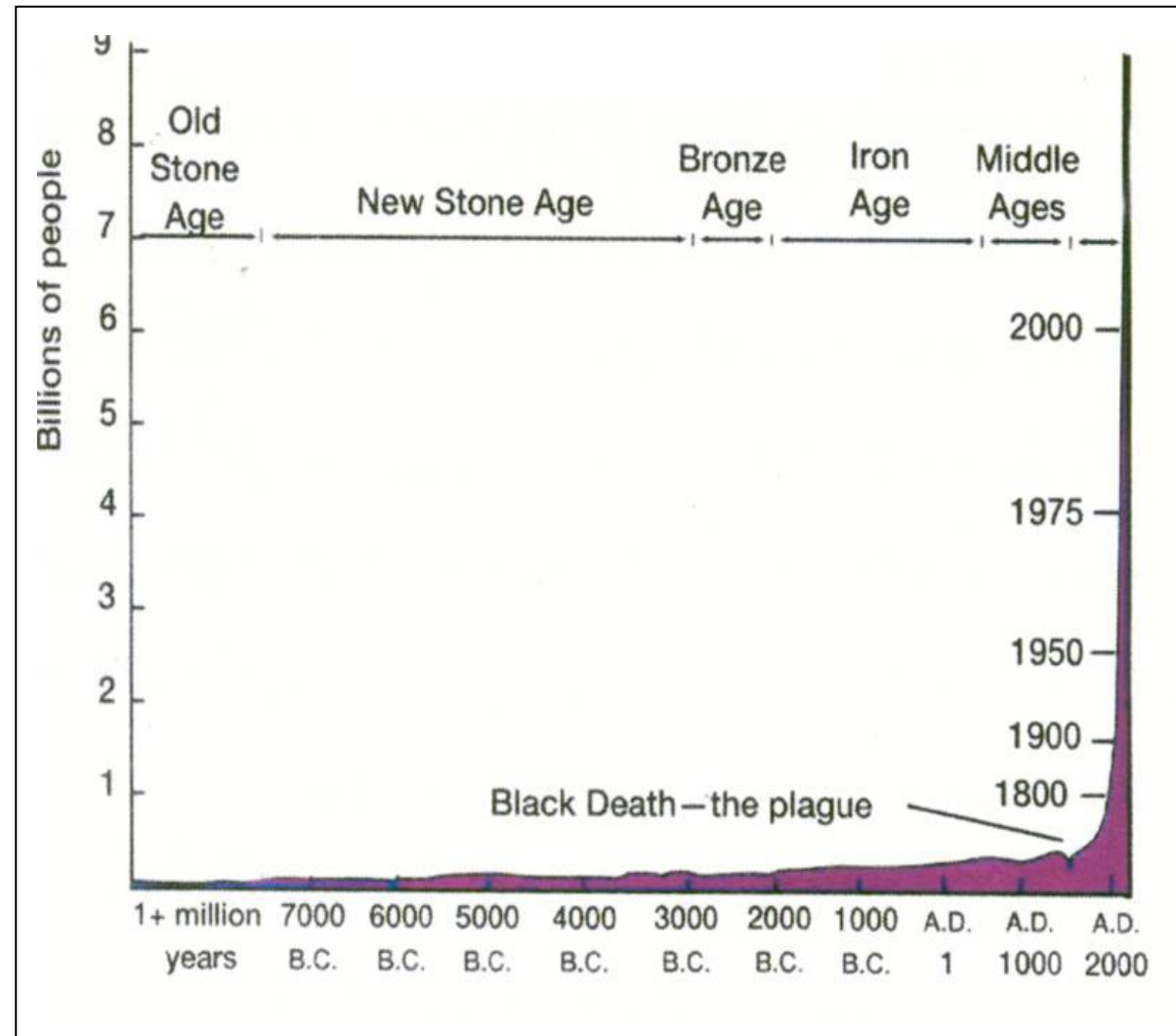
www.driversofchange.com

Demographic Change

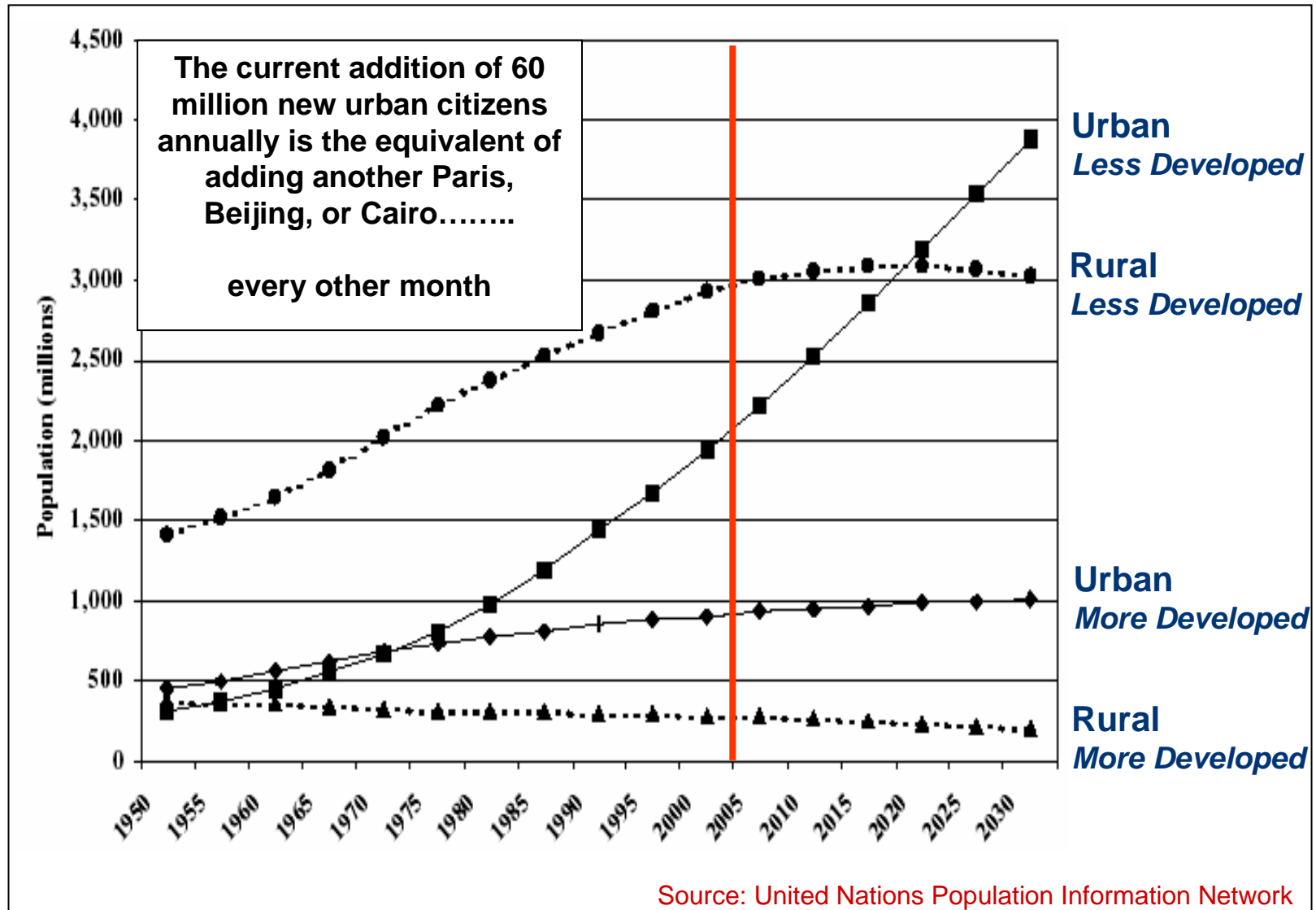
Demographic Change

Increasing

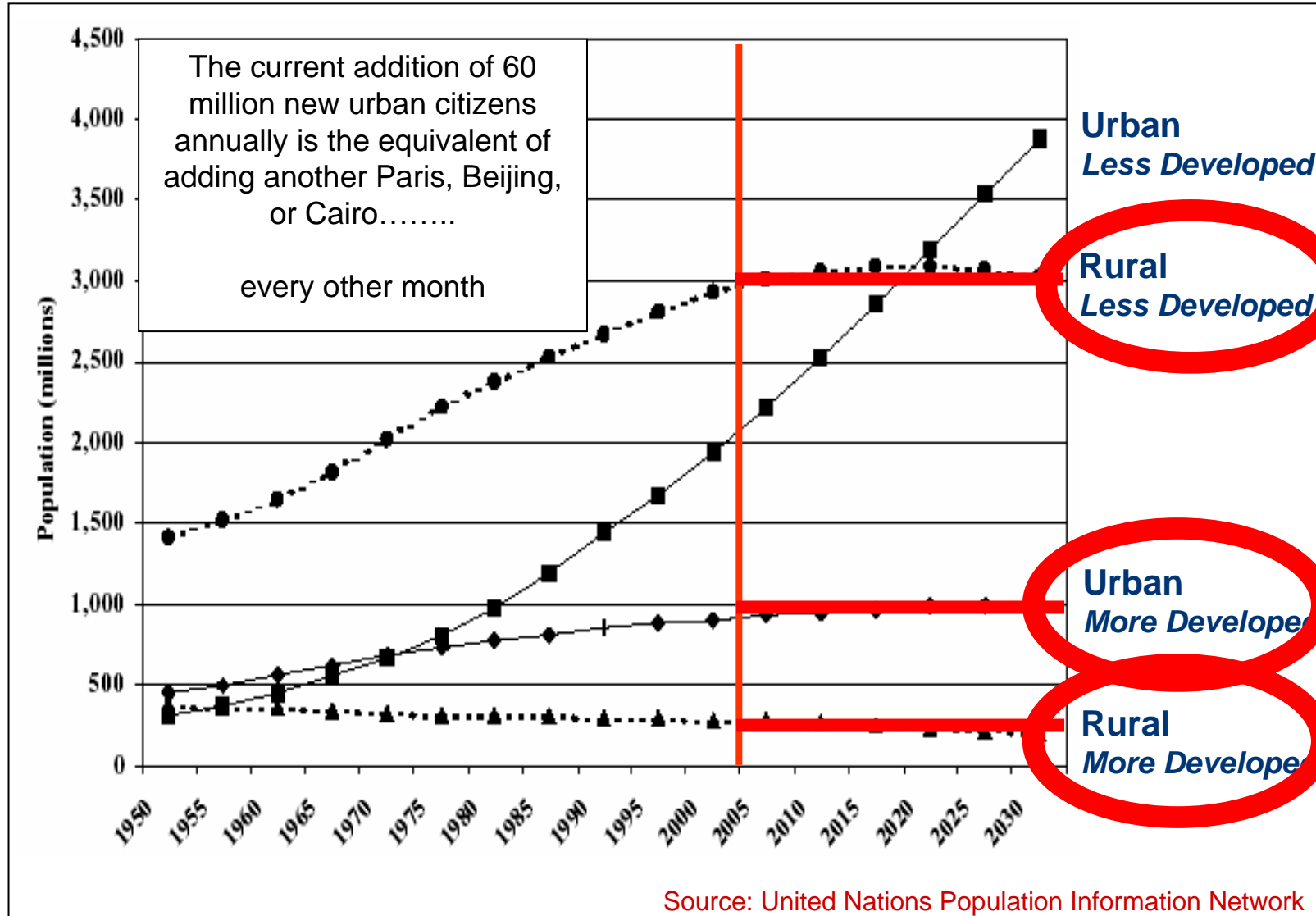
If we would observe a similar increase in population in bacteria, we would consider it an epidemic and do our best to eradicate it.



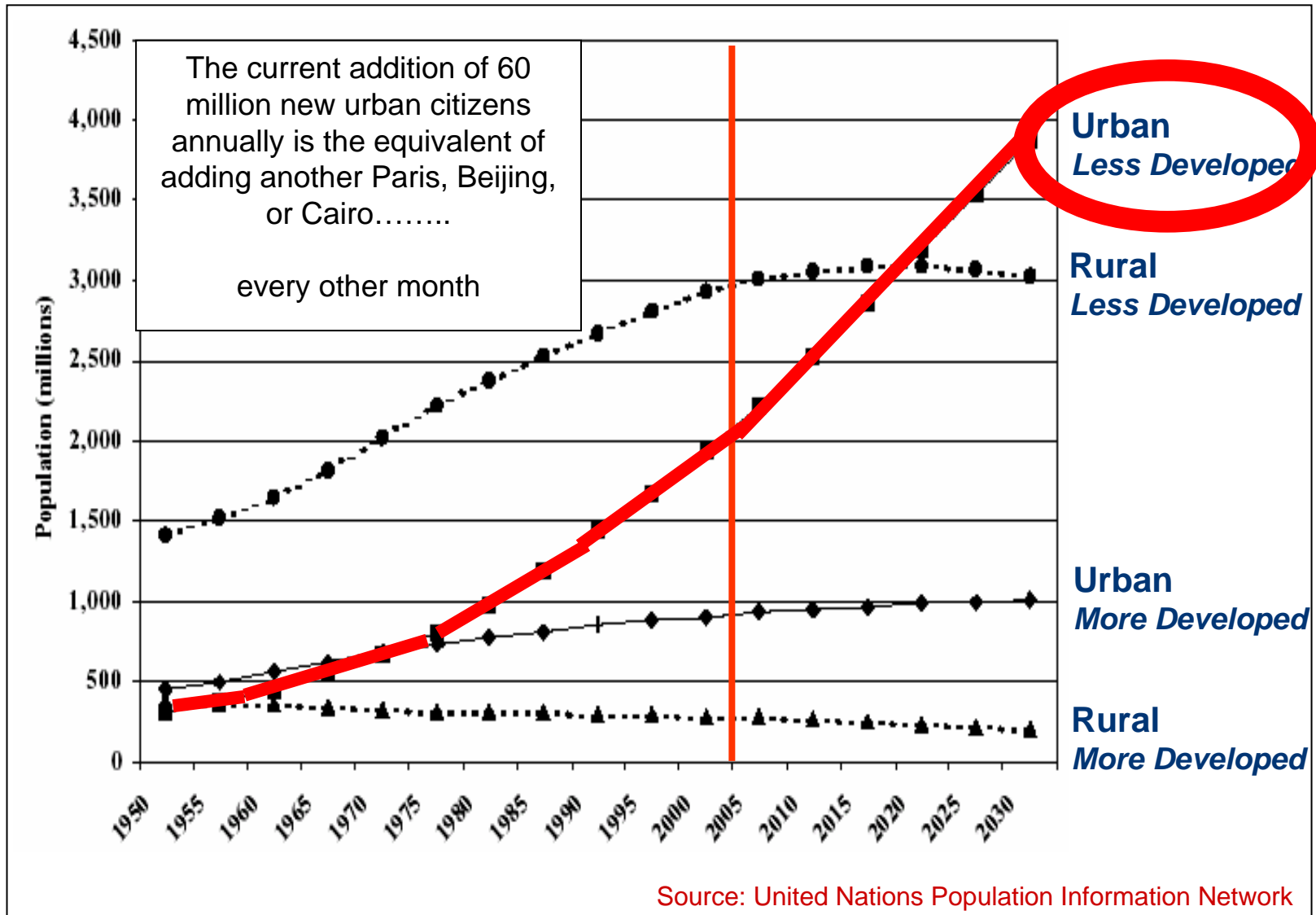
demographic change



demographic change



demographic change



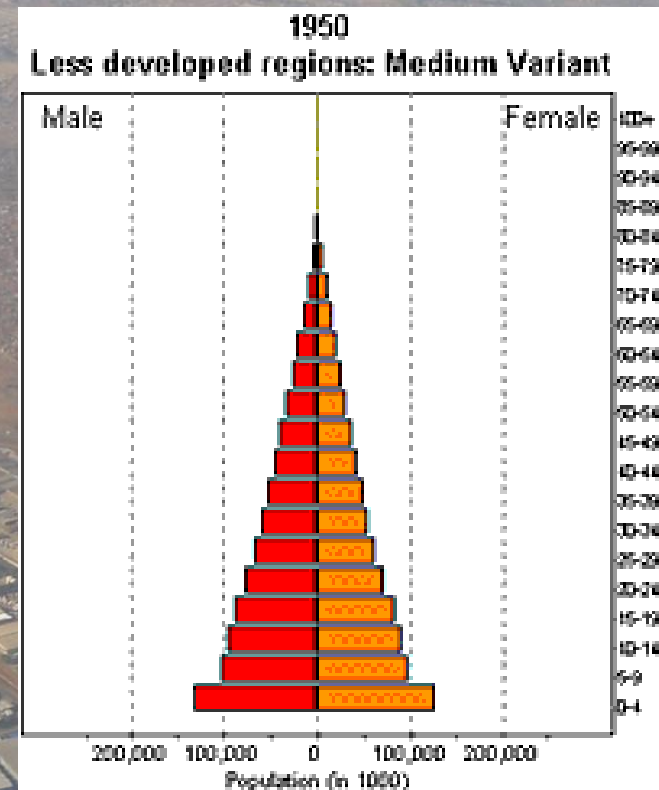
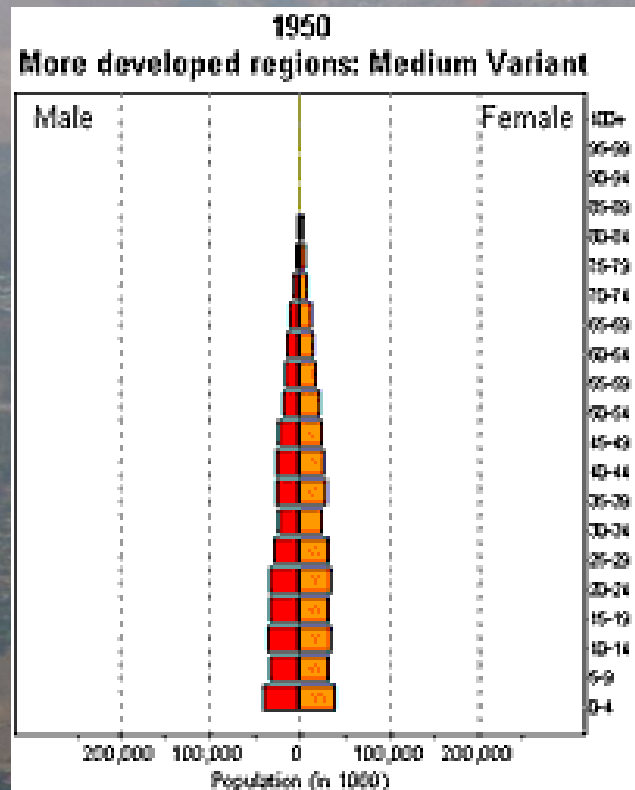
demographic change



the 'other' 98% that have not

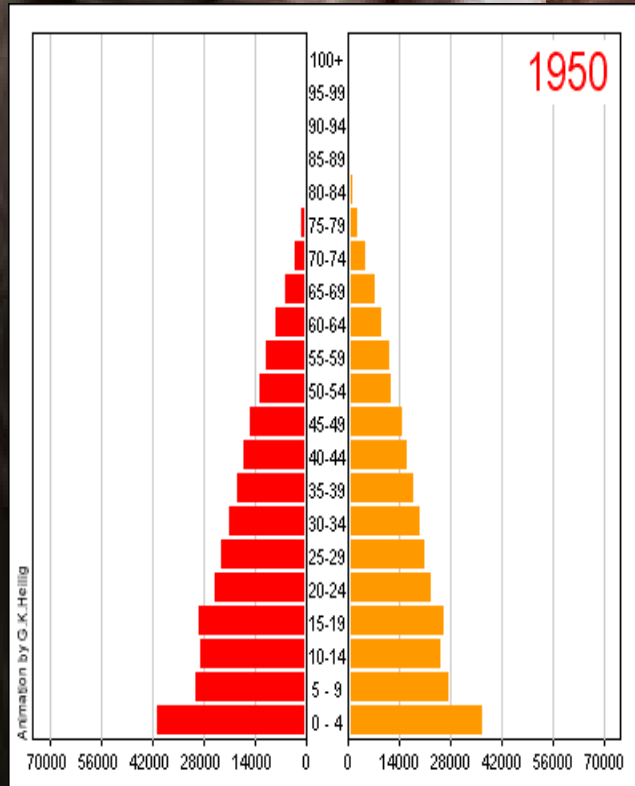
distribution

Where are we? Where will we live? How will we will live?



aging

The number of people aged 60 will triple by 2050. Who will work for you?



Single-person households

make up one-third of all households in Western Europe



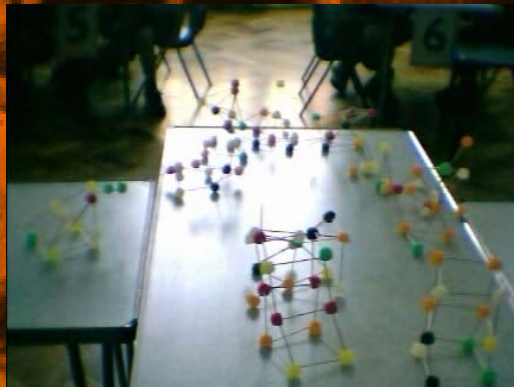
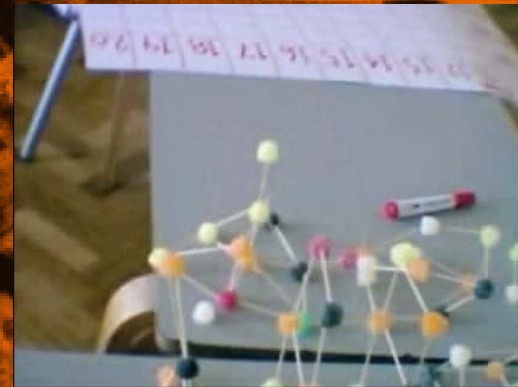
trans-generational exchange

How will it take place? space and place matter.



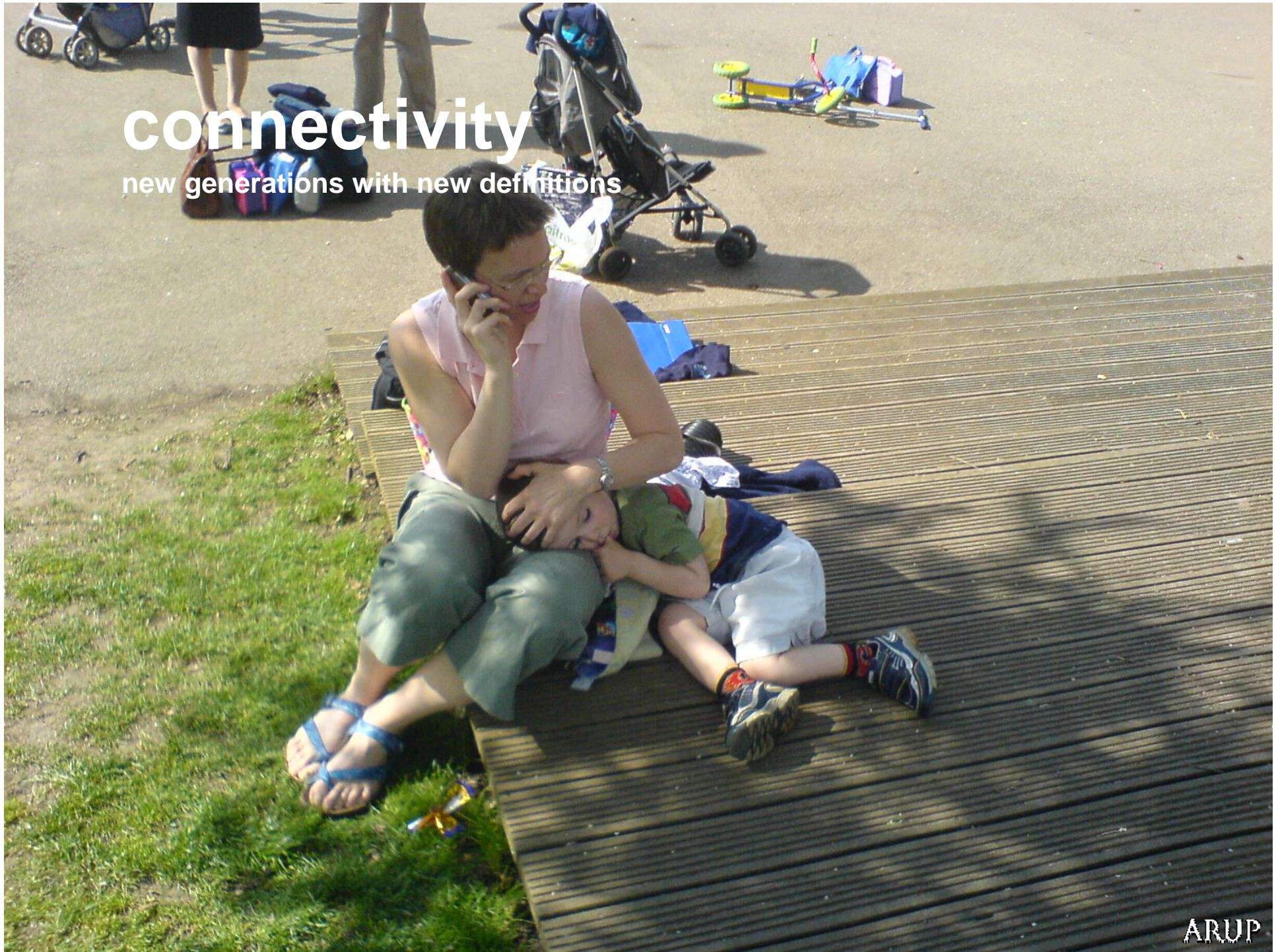
connectivity

new generations with new definitions



connectivity

new generations with new definitions



the citizen of the future

Who will they be? What will they need? What will they desire?

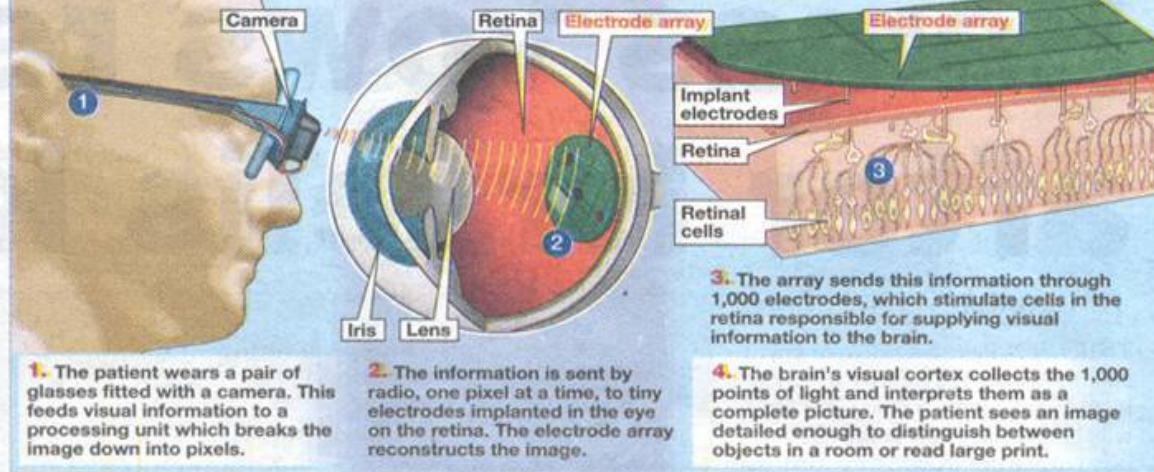
Convergence



bionics

inevitable. we expect it. are there limits to the merger?

HOW THE DEVICE WORKS



Bionic eye 'will cure blindness'

A NEW bionic eye could soon give sight to thousands of blind people.

Scientists are close to perfecting a light-sensitive silicon chip which

BY BEN GILLILAND

and do basic household chores.

They won't be able to do things like

processes the signals to create visual images.

Mike Daily, a researcher at the US government-funded Sandia National

biohospitality

take care of me. PLEASE! nobody else will.



information

What will happen when anonymity only exists in the dictionary?



intelligent infrastructure


What will happen when no one drives? we are all driven.



AUTOMATICALLY GUIDED BUS TRAIN
Chicago Transit Authority's Plan-All Guided Bus-Train by 1961

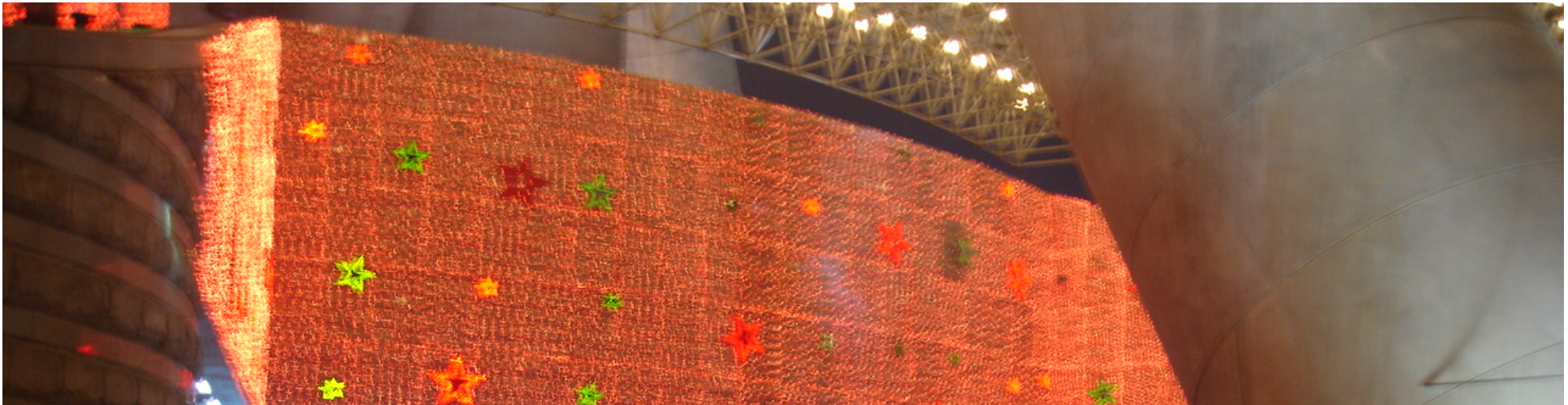


4



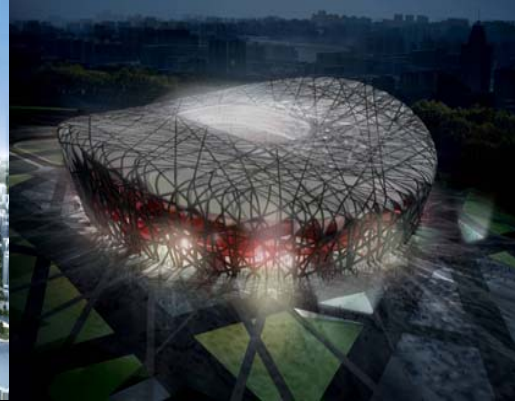
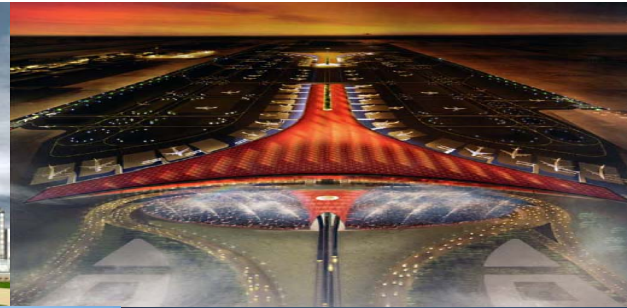
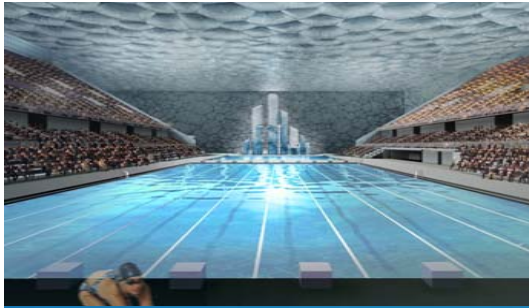
“The Urban population [in China] is to reach 1.12 billion by 2050 – this is a shift of more than **600 million** people from rural to urban.”

Guangming Daily



Unsustainable urbanization is a threat to long term security





Dongtan Eco City
东滩生态城市

FACTOR 10
ENGINEERING FOR
SUSTAINABLE
CITIES



Bridge/Tunnel link

16 M / 100M people in region

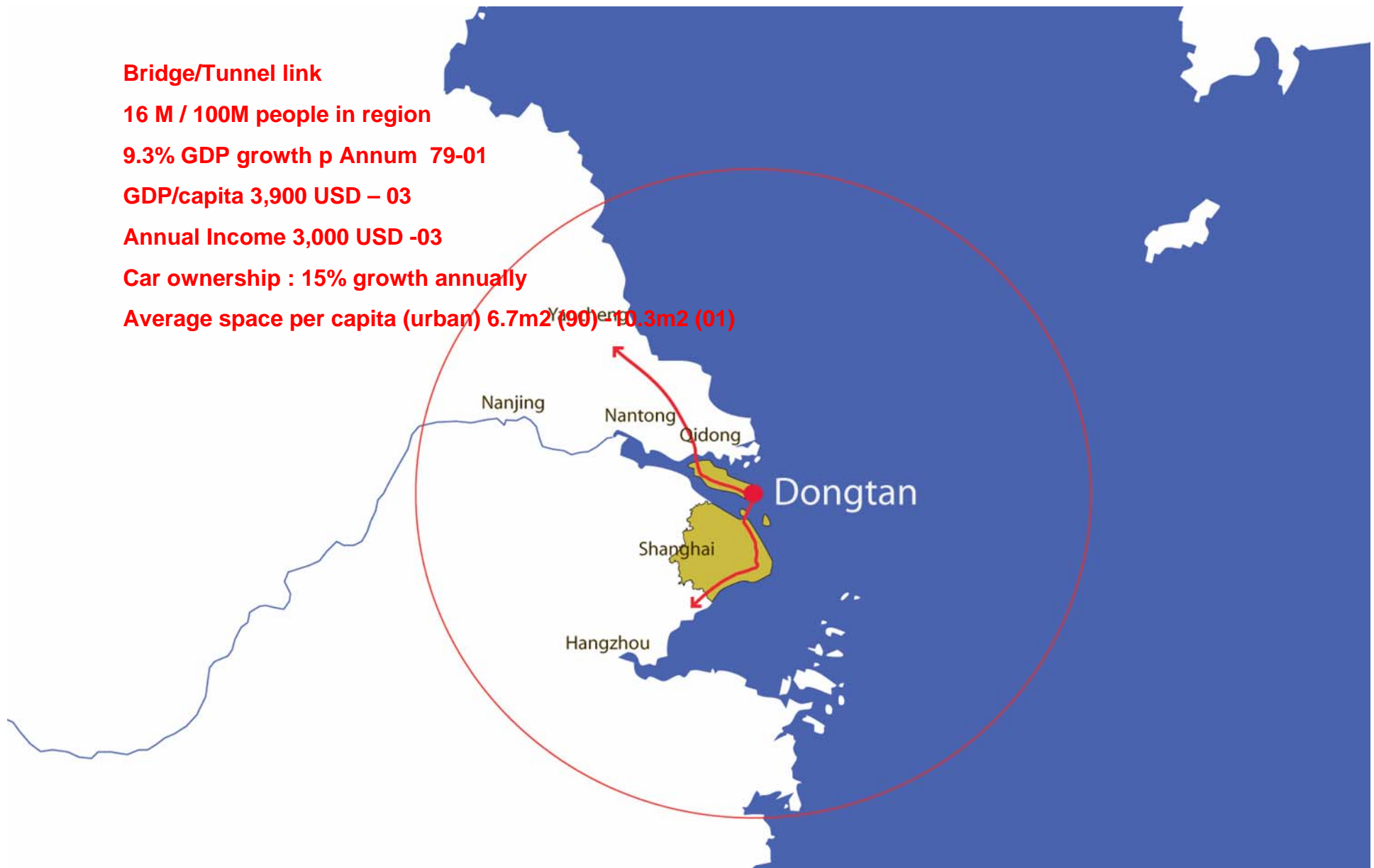
9.3% GDP growth p Annum 79-01

GDP/capita 3,900 USD – 03

Annual Income 3,000 USD -03

Car ownership : 15% growth annually

Average space per capita (urban) 6.7m² (90) - 10.3m² (01)

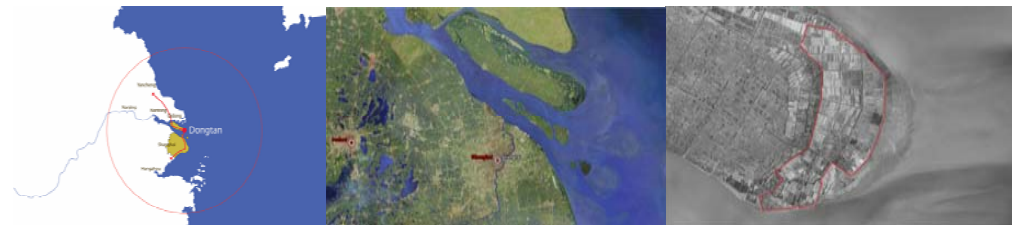




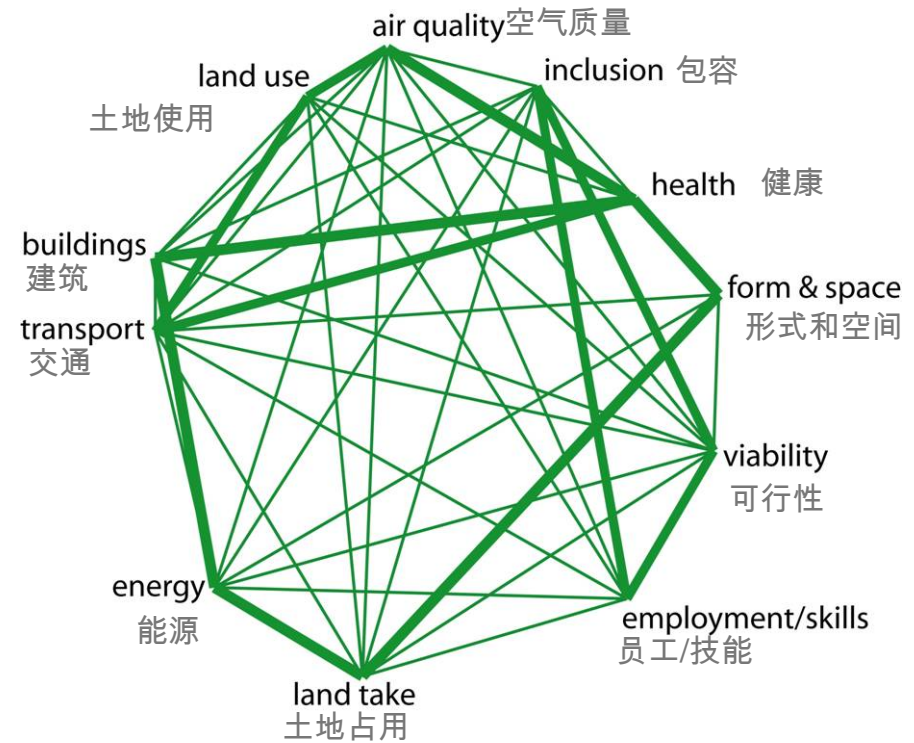
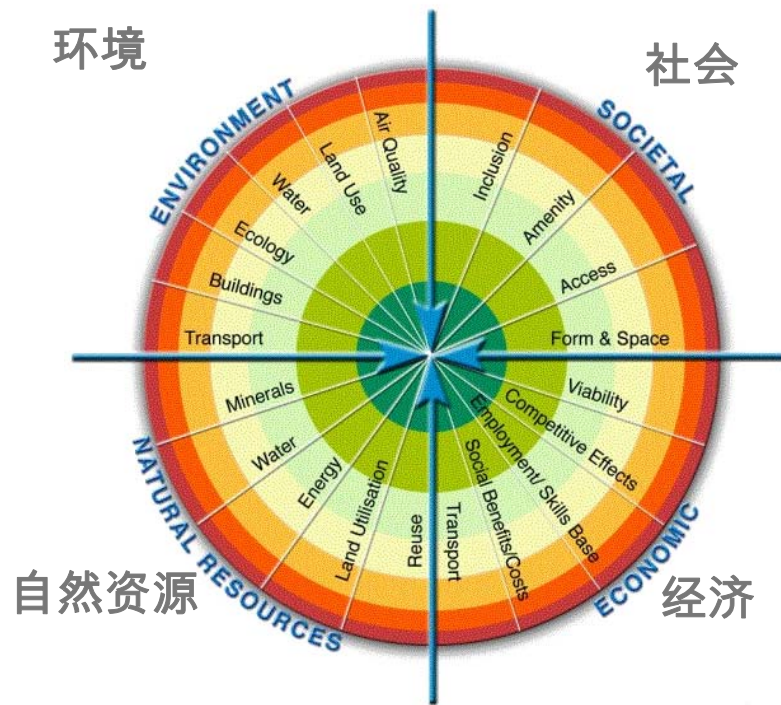




Dongtan is not intended to be a demonstrator of imported technology or ideas. It will represent the Chinese understanding of sustainability within the context of China's developing economy and unique natural and cultural environment



AN INTEGRATED APPROACH TO VALUE THROUGH BETTER DESIGN



目标 2 - 社会与经济优势

OBJECTIVE 2 – SOCIAL AND ECONOMIC BENEFIT

可持续的生态城市
Sustainable Eco-city

80,000 residents 8万居民
15,000 visitors daily 每天1万5千名游客

51,000个工作岗位
51,000 jobs

常规城市
Conventional
Approach City

50,000 residents 5万居民

19,000个工作岗位
19,000 jobs



目标 3 - 低生态足迹

OBJECTIVE 3- LOW ECOLOGICAL FOOTPRINT

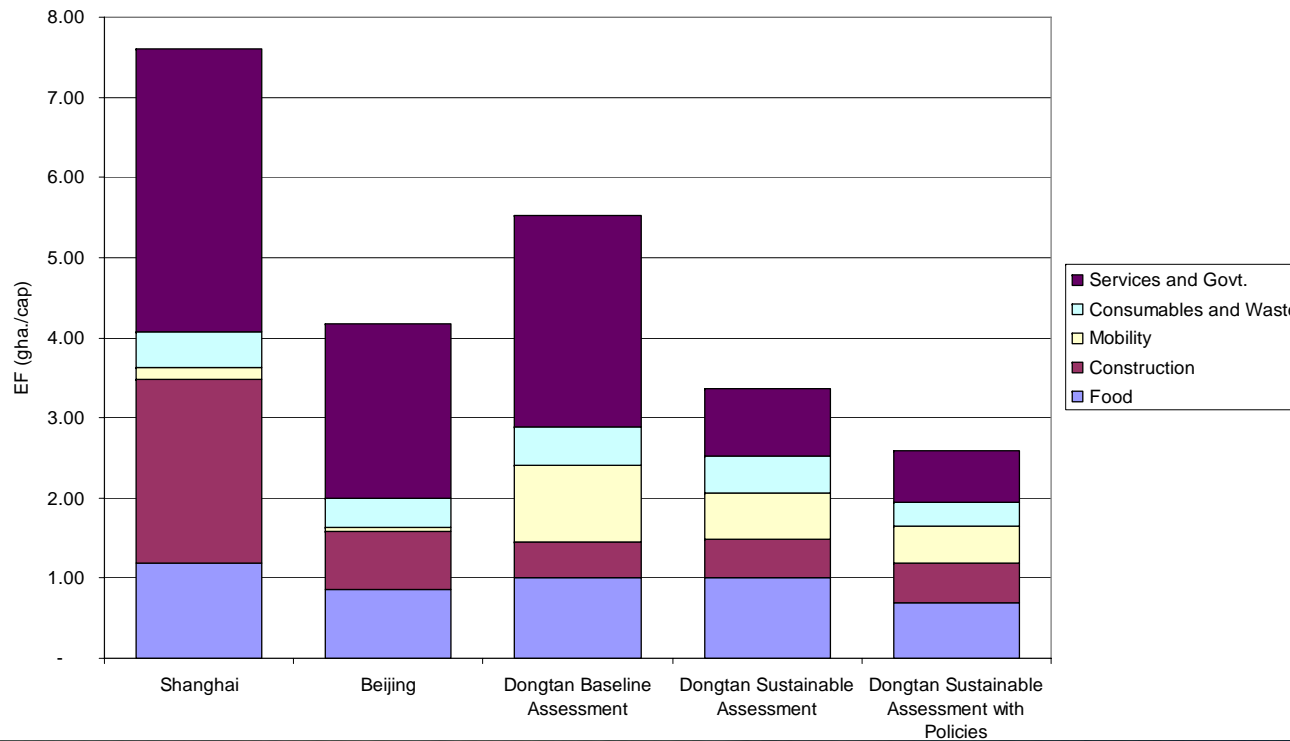
生态城市的足迹 2.6全球公顷/人

Eco-City Footprint 2.6 gh/person

常规模式的生态足迹 5.8全球公顷/人

Conventional Approach City Footprint 5.8 gh/person

Factor 10- Reduction in energy footprint



目标 6 - 能源产生、使用和减少排放

OBJECTIVE 6 – ENERGY PRODUCTION, USE AND EMISSION REDUCTION

可持续的生态城市
Sustainable Eco-city

能源需求 600兆瓦时/每年
Energy Demand 600 GWH/year
电能和热能不产生二氧化碳排放
No CO2 Emission from energy for power and heat

常规城市
Conventional Approach City

能源需求 1650兆瓦时/每年
Energy Demand 1650 GWH/year
每年产生350,000吨的二氧化碳排放
CO2 Emission of 350,000 tons per year
Factor 10- Reduction in carbon emissions



更好的城市,可持续发展的城市
BETTER CITY , SUSTAINABLE CITY

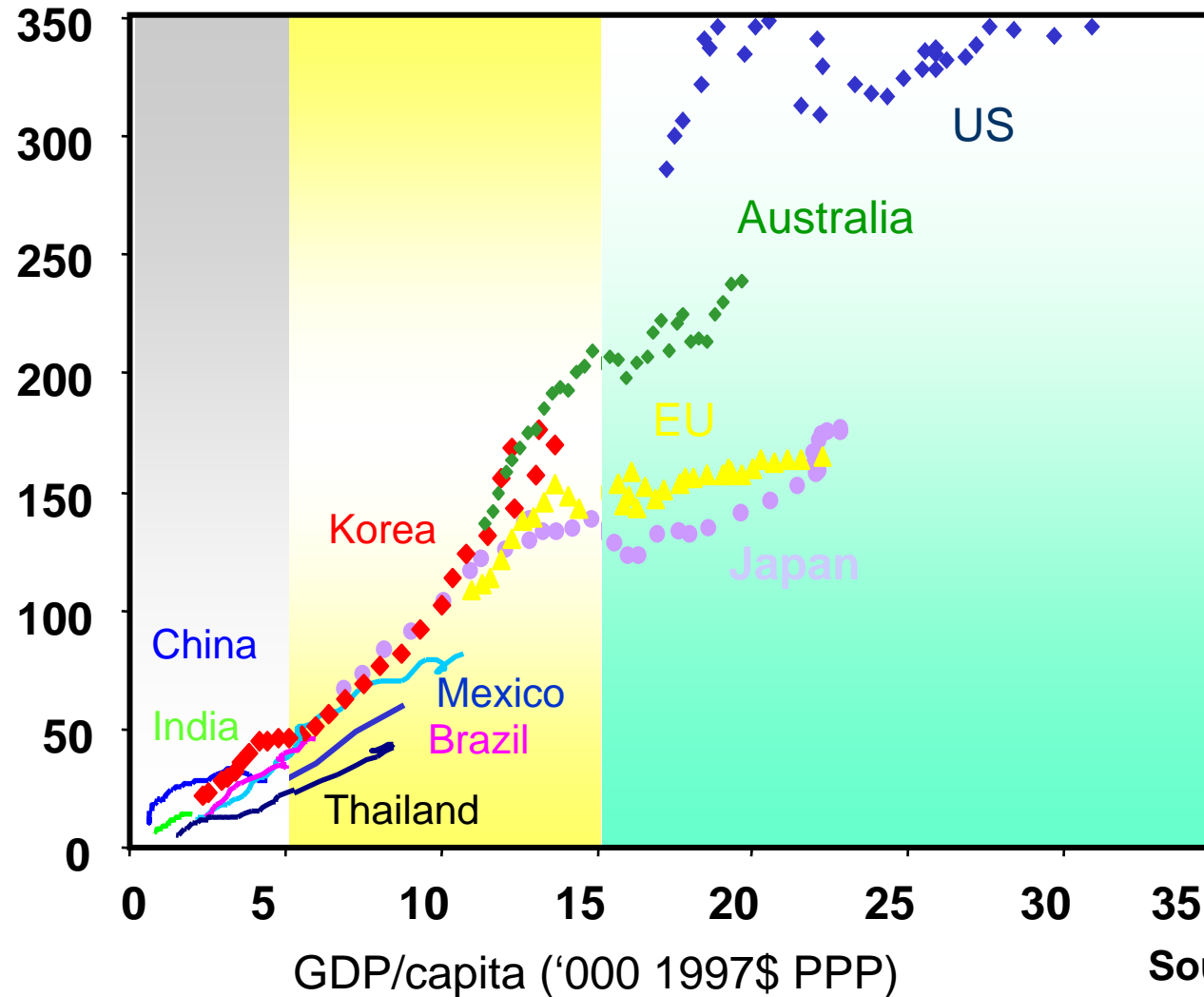




Resource Depletion : Energy

the energy / wealth ladder

GJ/capita



+\$25k/capita:
little extra energy
needed

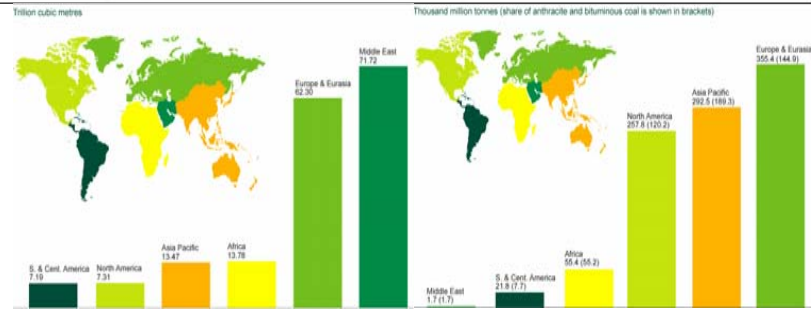
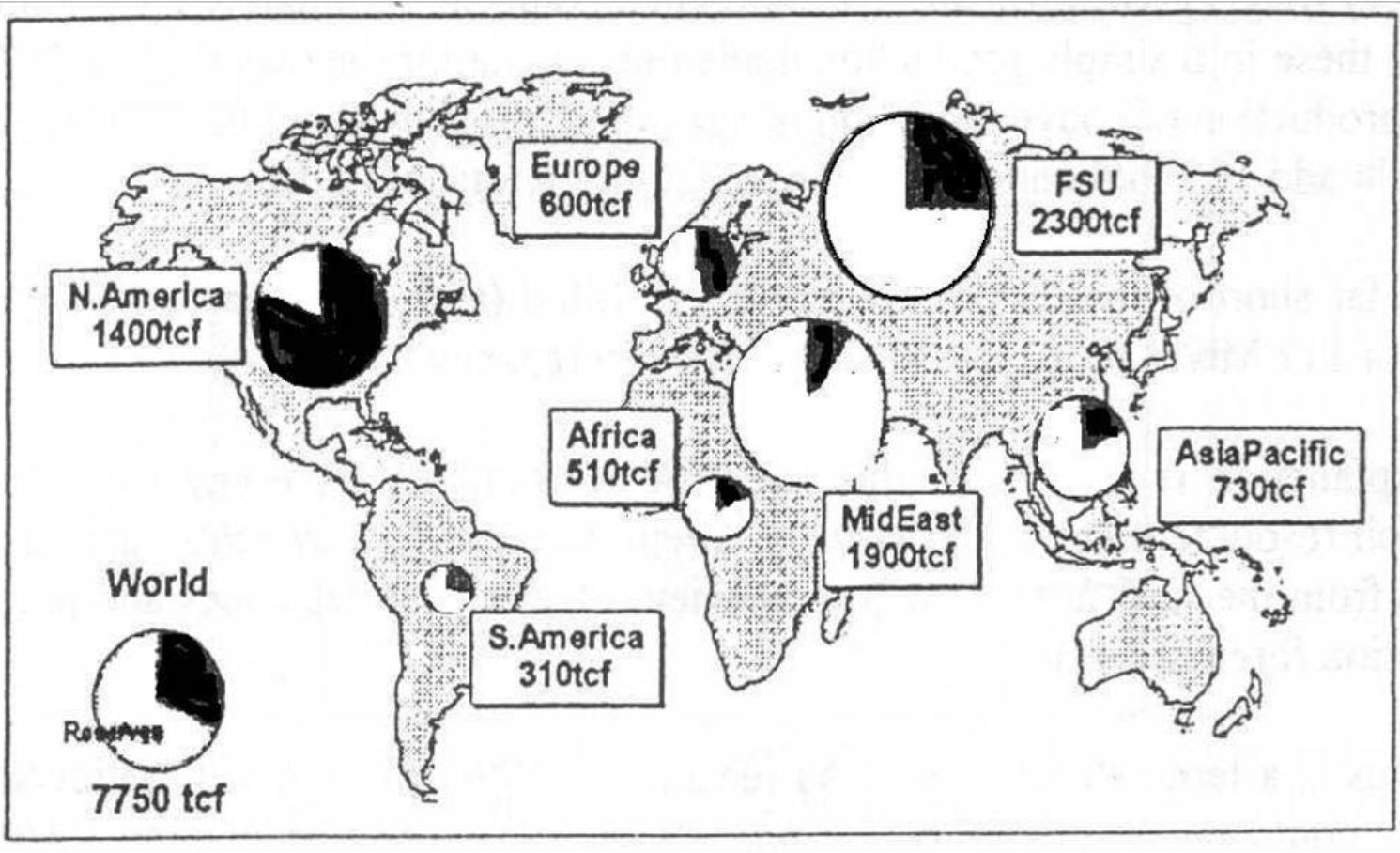
+\$15k/capita:
services start to
dominate growth

+\$10k/capita:
industrialisation
near complete

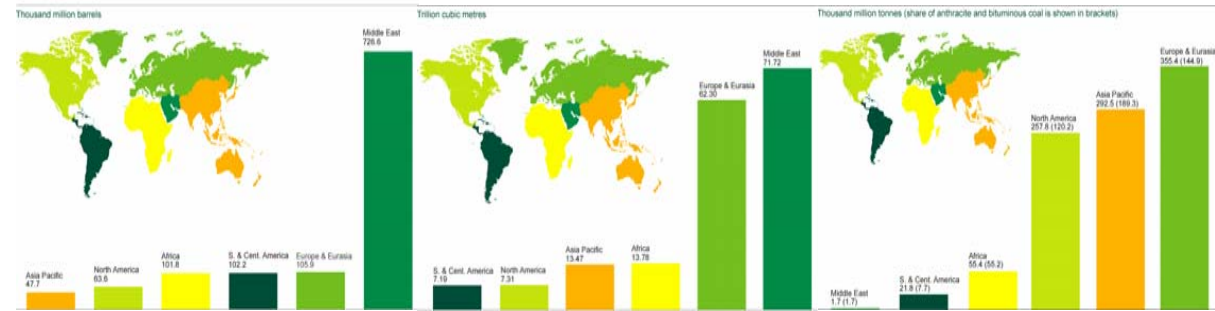
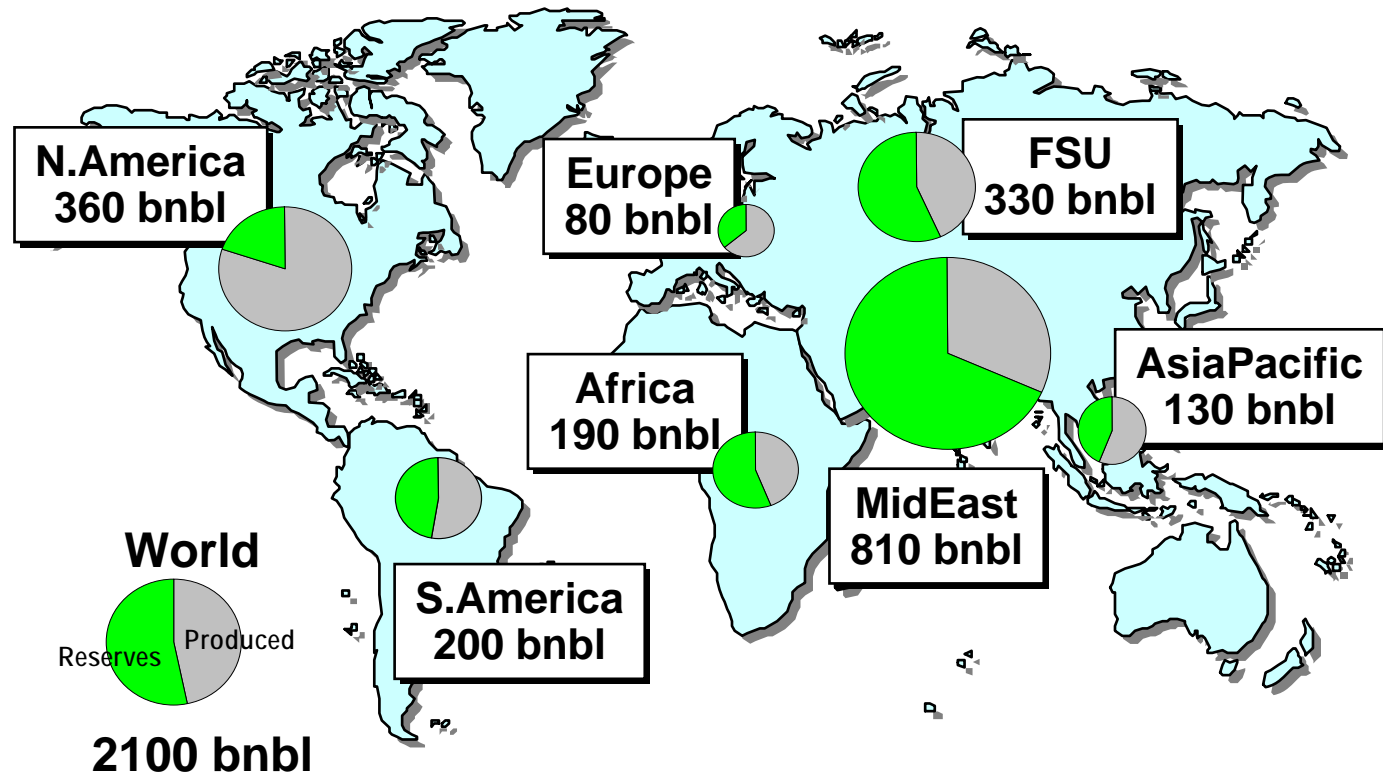
+\$5k/capita:
industrialisation
and mobility take
off

Source: IMF, BP

Proved gas reserves end 2003

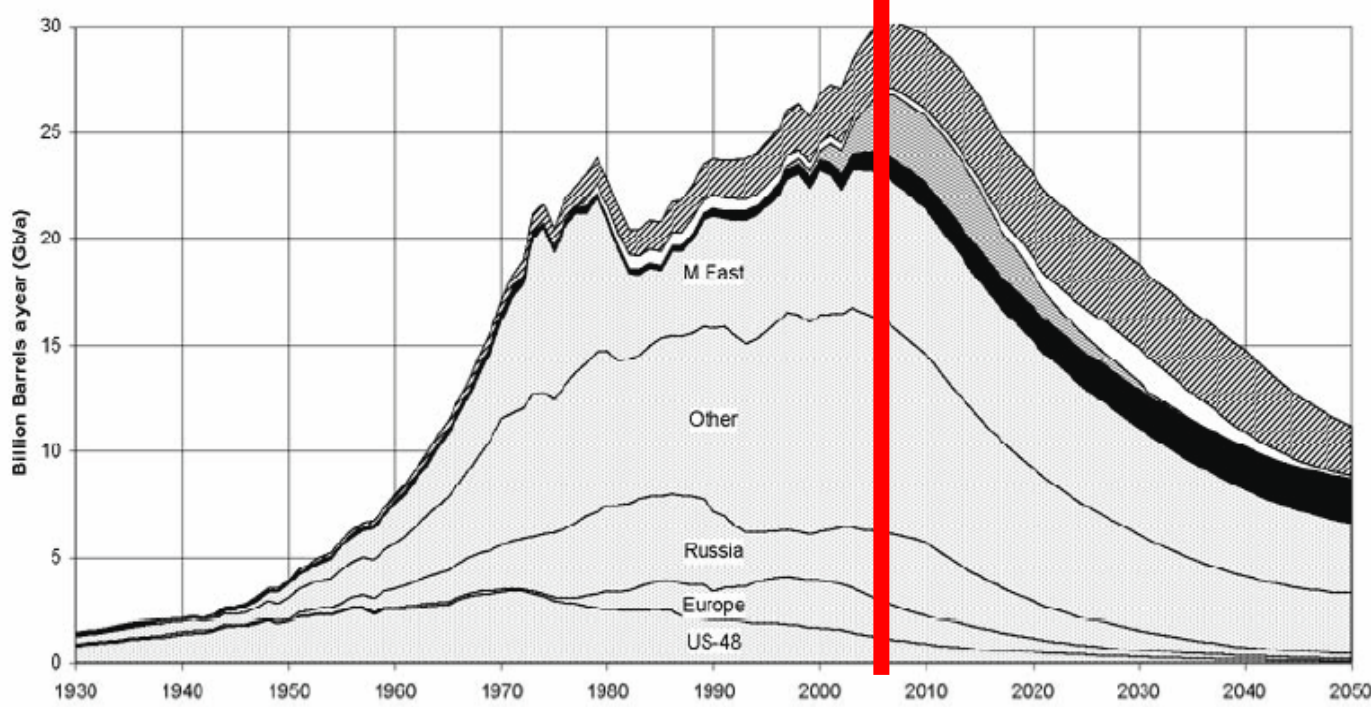


OIL reserves



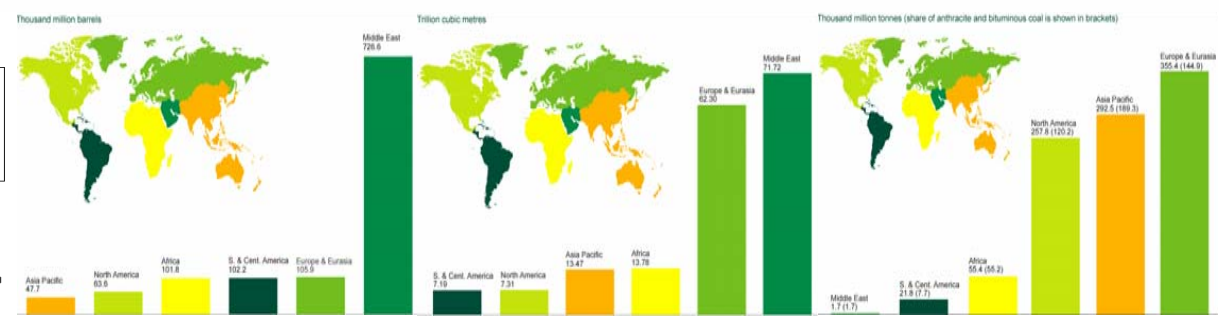
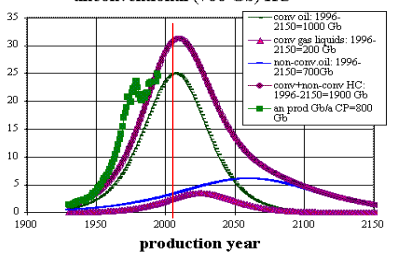
ENERGY reserves

OIL AND GAS LIQUIDS 2004 Scenario



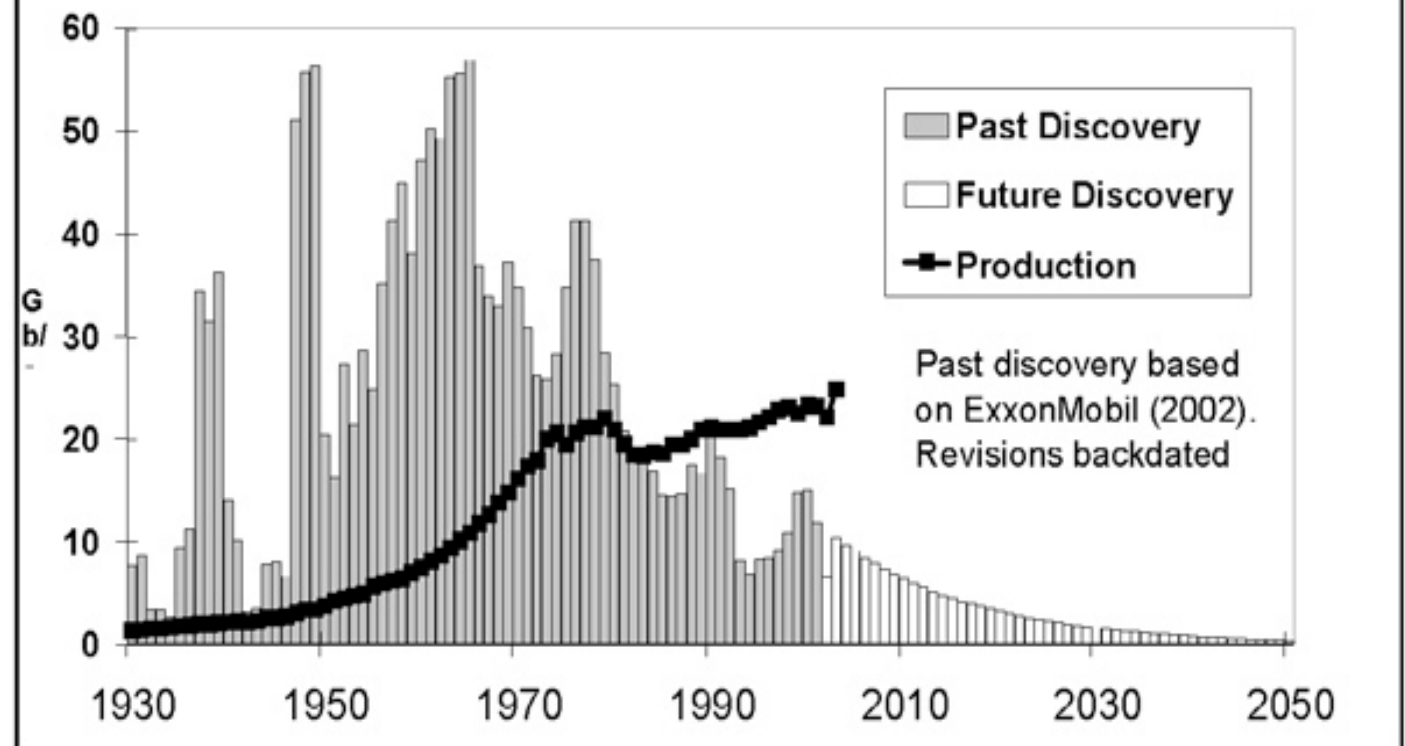
US-48
 Europe
 Russia
 Other
 M.East
 Heavy etc.
 Deepwater
 Polar
 NGL

scenario for a world's liquid production from conventional (200 Gb) and unconventional (700 Gb) HC

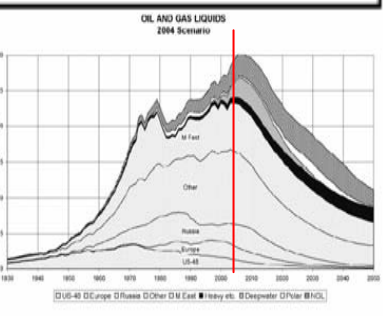
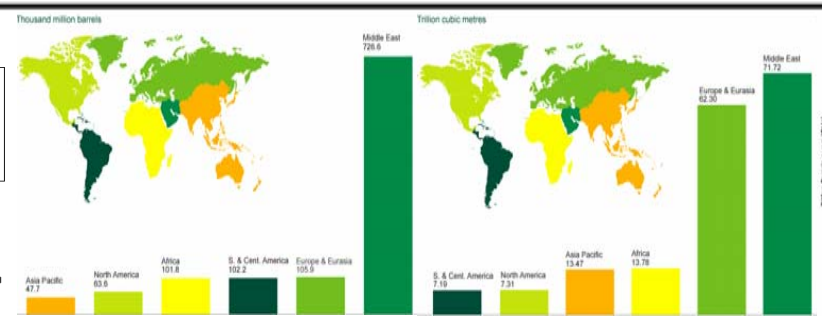
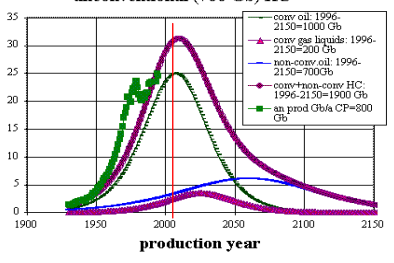


ENERGY reserves

THE GROWING GAP



scenario for a world's liquid production from conventional (200 Gb) and unconventional (700 Gb) HC







Director ARD

ARUP

32Group presents

SNOWDOME

The ultimate winter lifestyle
in sunny Dubai

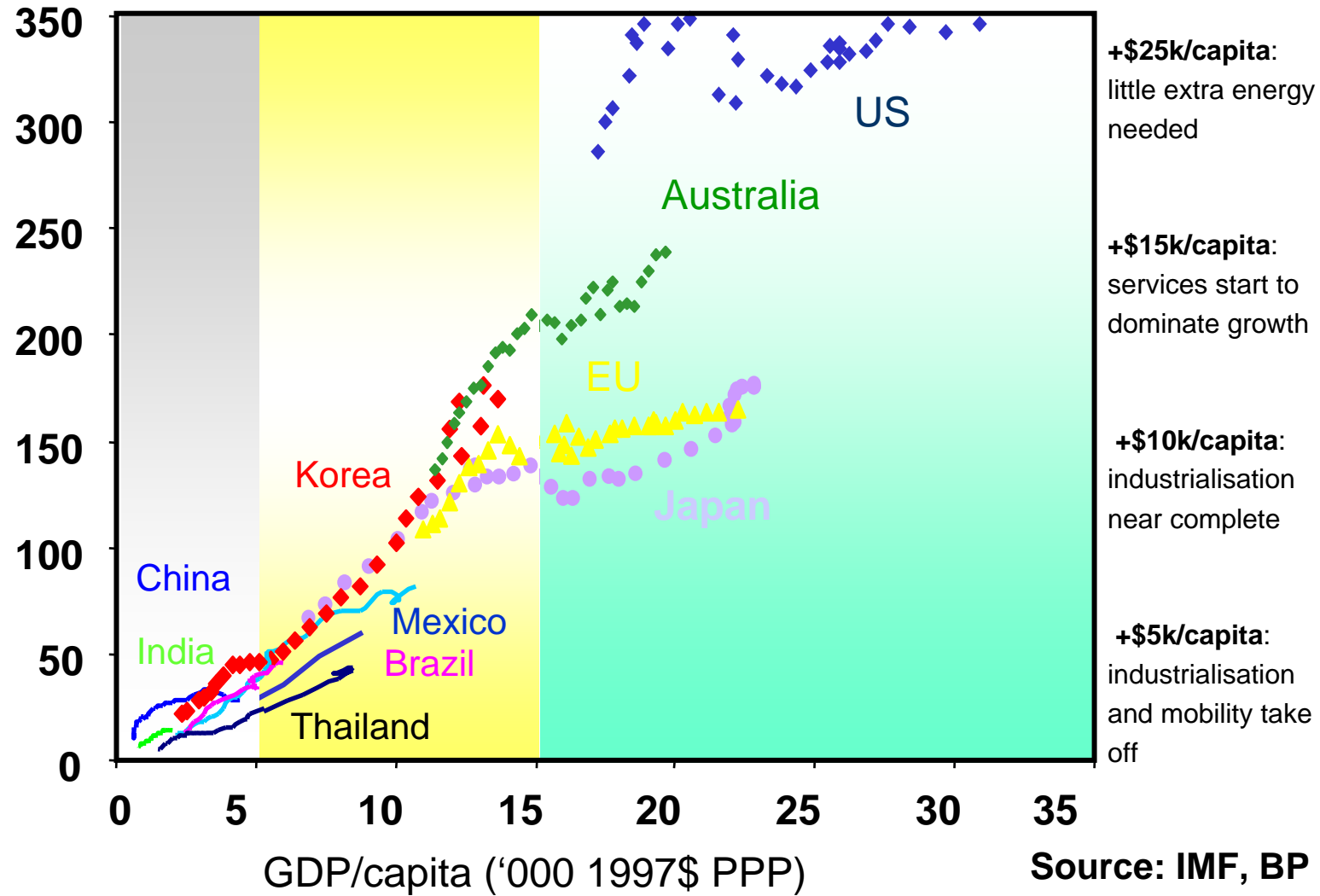
32Group

soaring dreams
grand visions

ARUP

the energy / wealth ladder

GJ/capita



the energy / wealth ladder

GJ/capita

350

300

250

200

150

100

50

0



+\$25k/capita:
little extra energy
needed

+\$15k/capita:
services start to
dominate growth

+\$10k/capita:
industrialisation
near complete

+\$5k/capita:
industrialisation
and mobility take
off

0

5

10

15

20

25

30

35

GDP/capita ('000 1997\$ PPP)

Source: IMF, BP

the energy / wealth ladder

GJ/capita

350

300

250

200

150

100

50

0



0

5

10

15

20

25

30

35

GDP/capita ('000 1997\$ PPP)

+\$25k/capita:
little extra energy
needed

+\$15k/capita:
services start to
dominate growth

+\$10k/capita:
industrialisation
near complete

+\$5k/capita:
industrialisation
and mobility take
off

Source: IMF, BP

An aerial photograph of a vast, arid desert landscape. A long, straight, dark asphalt road runs diagonally from the upper right towards the lower center of the frame. Several utility poles with cross-arms are spaced along the road. The surrounding terrain is a mix of light tan and yellowish sand, with some darker, possibly rocky or mineral-rich patches. The overall scene is desolate and emphasizes the isolation of the road in a remote area.

90% of all transportation depends on oil

LUNCH

Drivers of Change 2006

SIX working assumptions [pontos de partida]

a BUNCH of futures

four GLOBAL futures

your OPINION

five STEEP factors

my STEEP

more STEEP

IMPLICATIONS

[ACTIONS]

conclusion

Driving Forces – Portugal/Lisbon

Lisbon, Portugal 20061207

Social

- Quality of education
- Quality of health
- Decreasing population

Technological

- Renewable energy
- More research
- Sustainable technology

Economic

- Development of sustainable energies
- Better professional training
- Development of tourism based on sustainable technologies
- BETTER QUALITY OF URBAN ENVIRONMENT

Environmental

- Re-useable water
- Kyoto protocol getting real emission market
- Rational use of resources
- RATIOANL USE OF PRIVATE TRANSPORT

Political

- More regional power
- Strong European leadership
- Bad national territorial planning without participation of municipalities
- LACK OF RESPONSIBILITY, COMPROMISE, and COMMITMENT

Driving Forces – Portugal/Lisbon VOTE

Lisbon, Portugal 20061207

Social

- **QUALITY OF EDUCATION**
- **Decreasing population**

Technological

- **RENEWABLE ENERGY**
- **More and improved public transport and fewer pollutants**
- **More efficient buildings**
- **Rehabilitation of urban spaces**

Economic

- **BETTER QUALITY OF URBAN ENVIRONMENT**
- **Better Control of Taxes and Subsidies**

Environmental

- **RENEWABLE ENERGY**
- **Rational use of private transport**
- **Sustainable cities**

Political

- **LACK OF RESPONSIBILITY, COMPROMISE, and COMMITMENT**
- **Civil movements as political drivers**

STEEP Drivers

**Distribute to the
ISSUES.....WHAT
did you**

**VOTE
for?**

Discuss and list

STEEP Drivers

**Of those that are
in front of you
NOW..... What are
the two or three
most important?**

STEEP Drivers

**NOW...discuss
amongst you the
implications of the
top one or two.**

STEEP Drivers

NOW...discuss
amongst you the
implications of the
top one or two.

SO WHAT should
we do ?

WHAT could we
do?

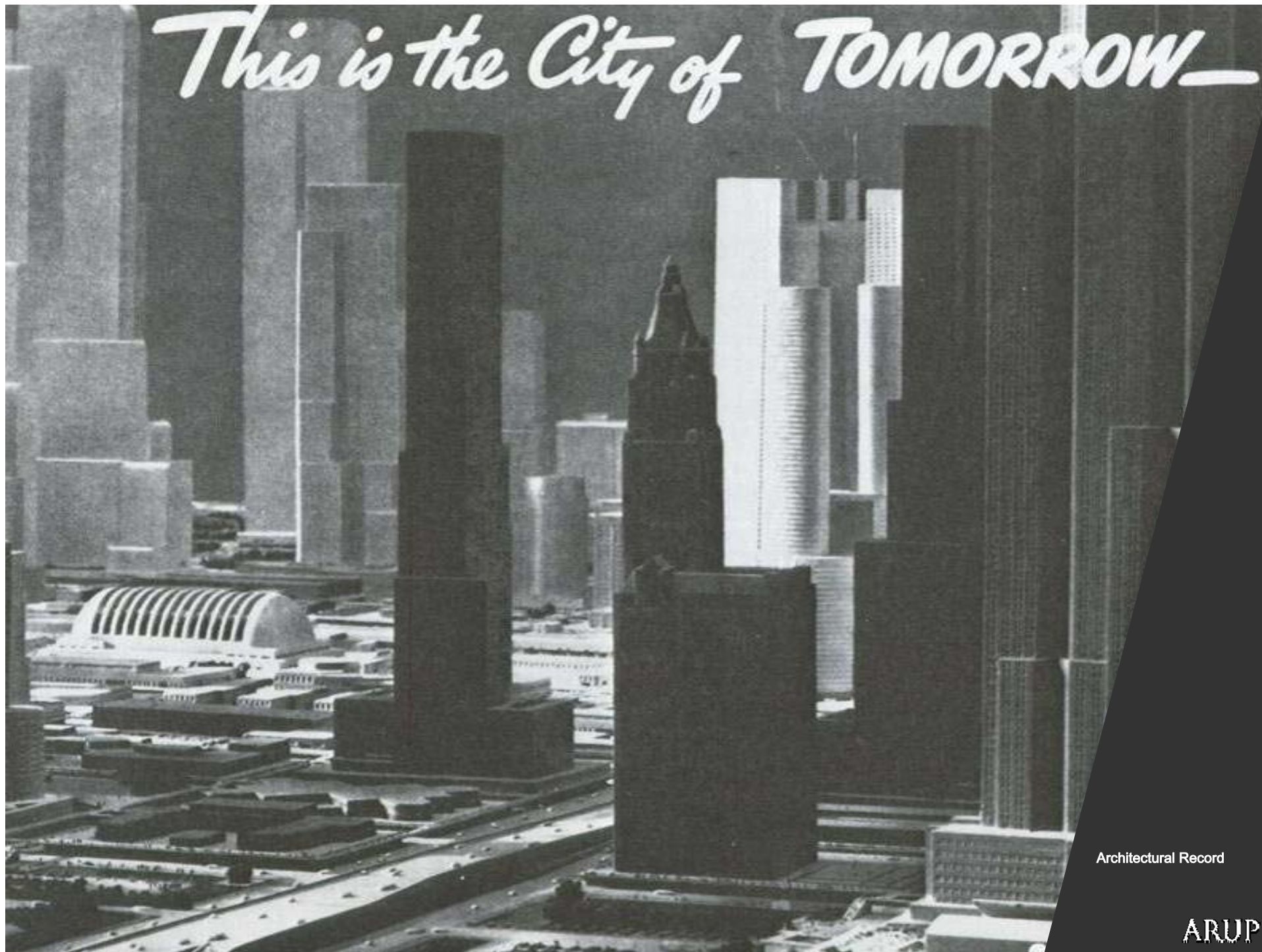
WHAT MUST we
do?



Future Vision



This is the City of TOMORROW



Architectural Record

ARUP

This is the City of TOMORROW



...it is already here and it is all around us.



paradoxical dichotomies

our context



museum cities

DisneyPlus? New Realities?



everything inconvenient will change



everything inconvenient will change

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Popular Mechanics



TECHNOLOGY • SCIENCE • AUTOMOTIVE • HOME • OUTDOORS

• WHAT WENT WRONG

TEXAS OIL REFINERY EXPLOSION

• ROAD TEST FACEOFF

MUSTANG VS. CORVETTE

• PM SNEAK PEEK

NAVY'S NEWEST ATTACK SUB

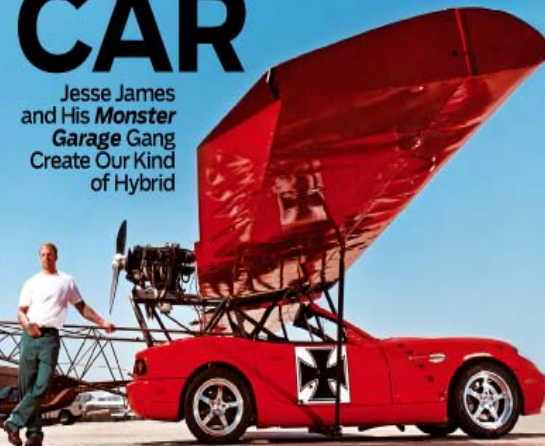


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EXPLORING THE FRONT

TEXAS OIL REFINERY EXPLOSION

EXPLORING THE PAST

THE SPANG CORVETTE

EXPLORING THE FUTURE

NAVY'S NEWEST ATTACK SUB

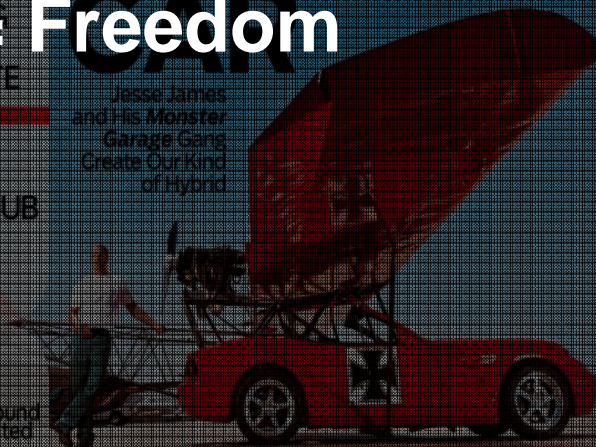


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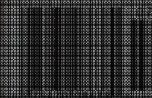
HOW TO BUILD A FLYING CAR

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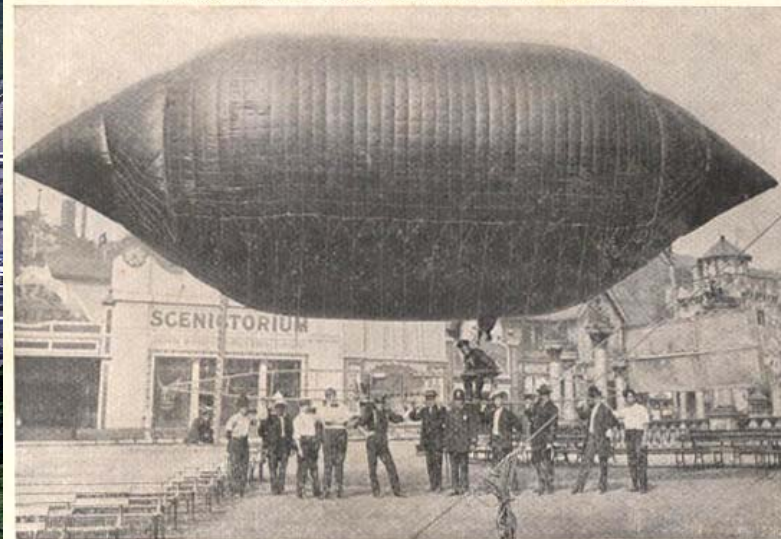
Popular Science 193

An aerial photograph of a multi-lane highway filled with cars, viewed from a high angle. The highway curves through a valley with green hills on either side. In the background, a semi-transparent city skyline with several tall buildings is visible against a hazy sky. A dark, semi-transparent banner with a grid pattern is overlaid across the middle of the image, containing the text "Personal Mobility = Freedom".

Personal Mobility = Freedom

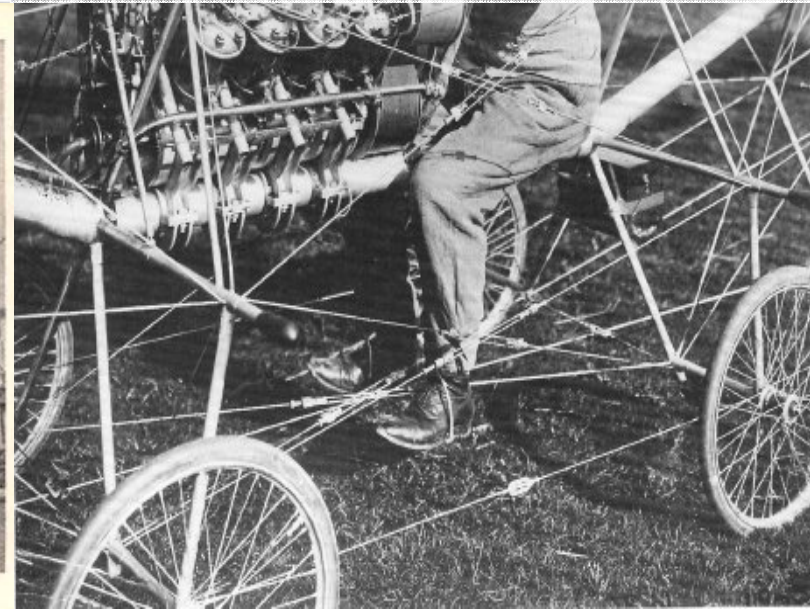


Beachey-Knabenshue Airship ~ Syracuse State Fair ~ Sept. 1906



LINCOLN BEACHEY AND HIS AIR-SHIP

"I confess that in 1901, I said to my brother Orville that man would not fly for fifty years . . . Ever since, I have distrusted myself and avoided all predictions."
-- Wilbur Wright, 1908



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See Page 45

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HOME WORKSHOP PLANS AND HINTS • 350 PICTURES

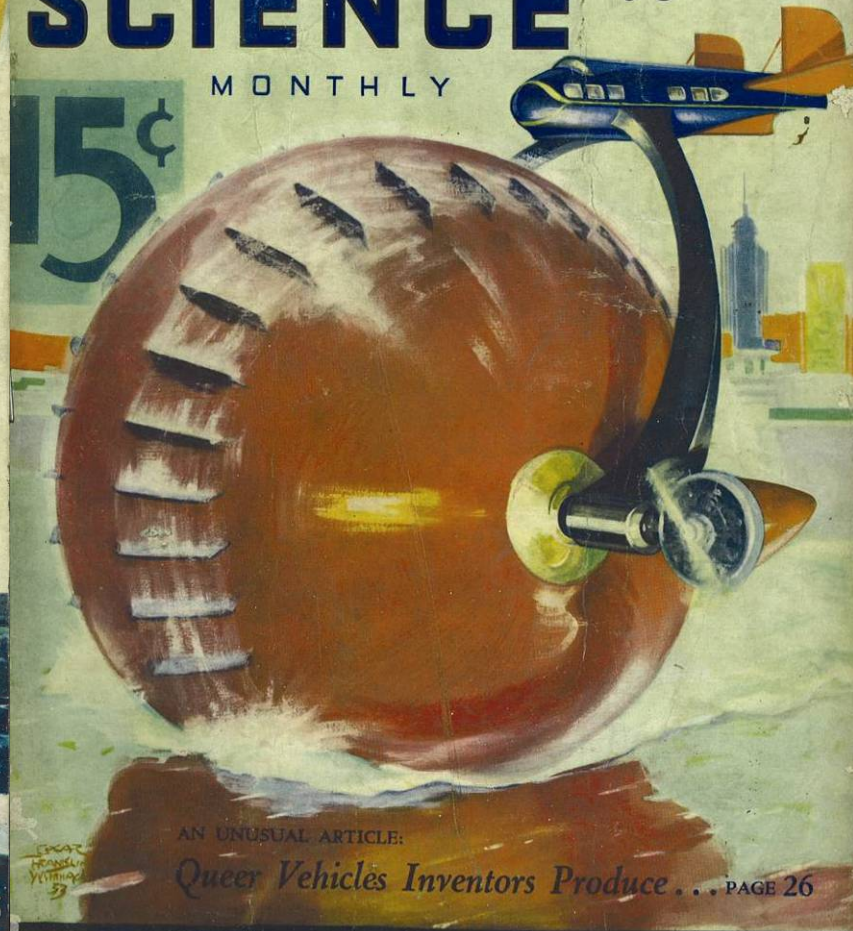
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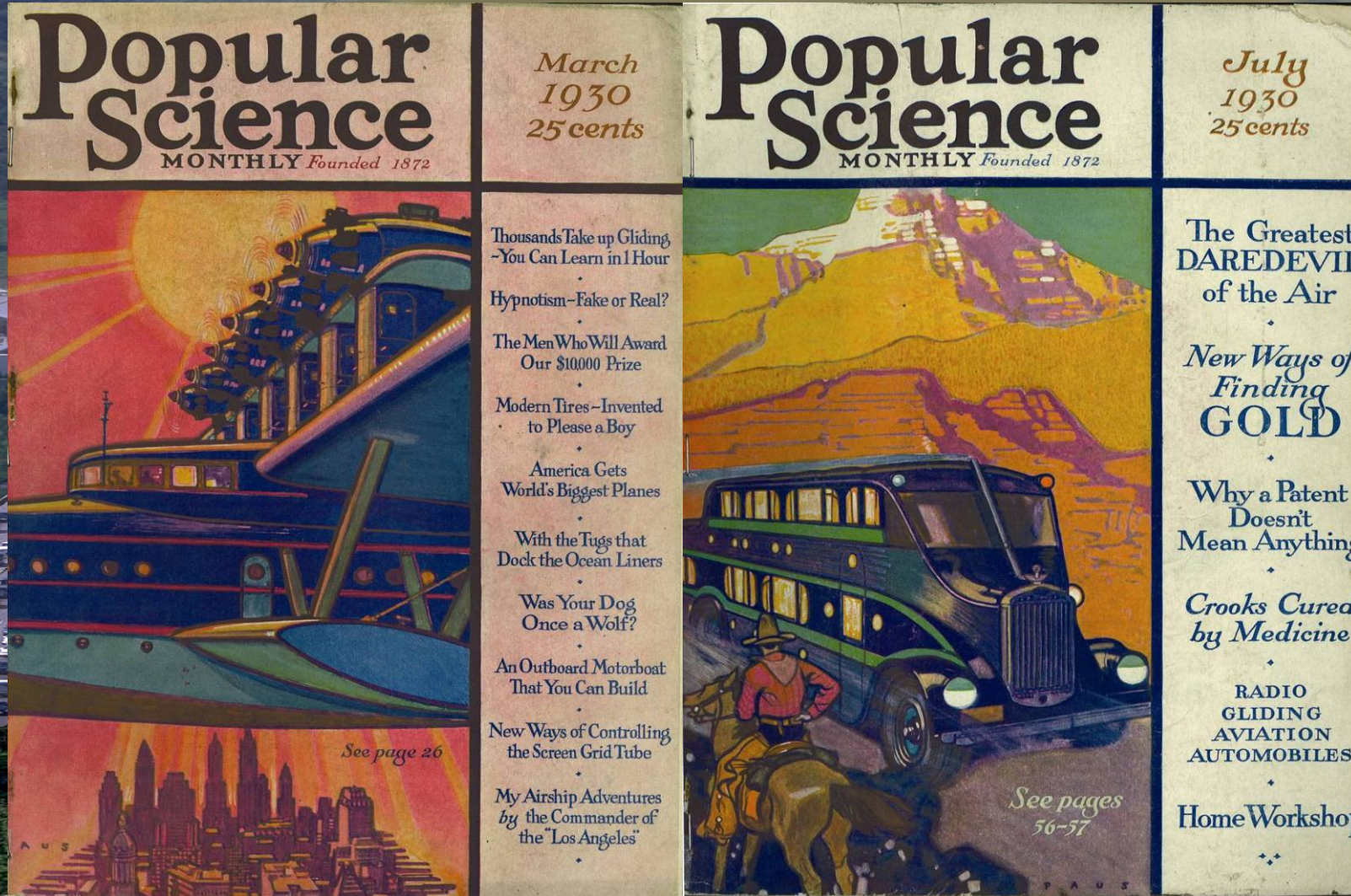
Queer Vehicles Inventors Produce . . . PAGE 26

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the age of endless resources...



the age of endless resources... is OVER



An aerial night view of a city skyline, likely Chicago, with numerous skyscrapers illuminated. The image has a dark, textured background with a grid pattern overlay. The text is centered in white.

**change is constant.....
context is variable.**

An aerial night view of a city skyline, likely New York City, featuring numerous illuminated skyscrapers. The lights from the buildings create a dense pattern of yellow and white, with some blue and red accents. A prominent 'RATERS' sign is visible at the top of one of the taller buildings.

growth

are there limits to growth?

waste?

No, only misallocated resources



total systems design





ARUP



Worth1000.com



the Future
is over sold
and under
imagined

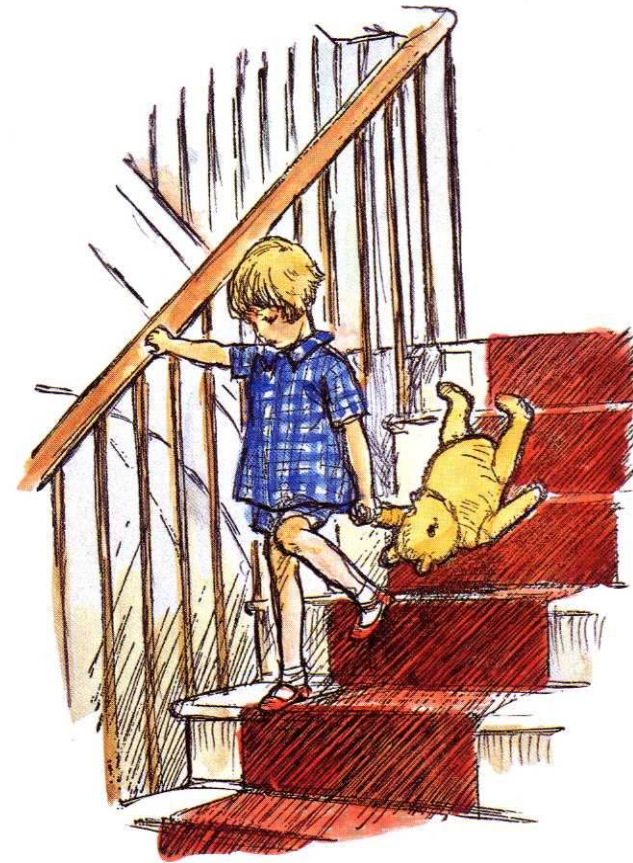
ARUP

[y]our future?

Here is Edward Bear, coming downstairs
now,

*bump,
bump,
bump,*

on the back of his head,
behind Christopher Robin. It is, as far as he
knows, the only way of coming downstairs,
but sometimes he feels that there really
is another way, if only he could stop
bumping for a moment and think of it.



Drivers of Change 2006



2006.12.07
Lisboa, Portugal EU

Dr Chris Luebke
Director for Global Foresight + Innovation
foresight@arup.com

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end