10 Lacunarity - the bridging mobility

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10.1 Summary

The structure of our societies is changing. Home and residence are given a new meaning in a time of spiritual and physical nomadism and strong migration. The family image is evolving into an intensified single household. Cities reach their limits and therefore place new challenges on transport systems.

As a result of these changes the human being has to become more mobile. The name "automobile" cannot be used any more. Both parts of the word are no longer justified. It is not "auto", not independently and automatically, it must be controlled. And it is in its mobility - "mobile" - restricted, reduced.

A new type of vehicle is coming, that is neither a bike nor a car. On average 1,2 people travel with a car. New vehicles should be designed for maximal two persons.

There is a lot of future in "individual mobility". As our society and the necessary infrastructure has fewer and fewer pedestrians, a new way of "walking" is expected. An "electric walking". A supported and accelerated walking.

10.2 History of mobility

Aristotels travelling
http://www.stepmap.de/landkarte/aristoteles-leben-1395420

We feel that the world has never been as mobile as it is today. It is true that today we are moving faster than in ancient times and in the Middle Ages, but society was also mobile in the past. "Not our century, but the Middle age deserves the title" mobile ". It was a basic feature of the Middle Ages: kings, merchants, beggars and crooks, the soldiers of the armies followed by the mercenaries and the prostitutes, the students and many professors. They all had long years of wandering before they could settle permanently, if at all. "[1]

Even the scholars of antiquity had to be mobile.

Aristotle was born in Chalcidice[2], north of present-day Greece. In

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[1] FRIED, Johannes: „Mobilität im Mittelalter: Gelehrte auf Wanderschaft", Frankfurt 2014
http://www.muk.uni-frankfurt.de/49106961/004?
[2] Stageira

order to improve his career prospects as a philosopher, he moved to Athens. Here was the center of the scholars,but he ended his life in the east of the country, on the island of Euboea[3].

Hundreds of kilometers were traversed. Although at a lower speed, than would would be undertaken today, the distances themselves were not less.

In the Middle Ages it were the pilgrimage routes and today they are the tourist routes on which the masses move. Like tourists, the people moved in the ancient world. In the last fifteen years of his life, the poet Aischylos[4] spent several periods in Sicily.

Nevertheless, humanity has never been as mobile as it is

today. With the growing prosperity and the abolition of borders in Europe, "freedom" came as a new symbol. Freedom moves a society. The severe barbed wire boundaries must be overcome.

Pilgrims
https://upload.wikimedia.org/wikipedia/commons/1/17/Supplicating_Pilgrim_at_Masjid_Al_Haram._Mecca%2C_Saudi_Arabia.jpg

many

Our economy has been labor-intensive and therefore needs more mobility. Mobility of goods, information and products and their managers.
In addition, increasingly liberalized markets turn the world market into a "global village".

10.3 <u>Cesare Marchetti</u>

Changes happen cyclically. This was the finding of the researcher Cesare Marchetti[5] who also gave formulas on how to calculate these cycles. In addition to long-term cycles, there are also changes in medium-term periods.
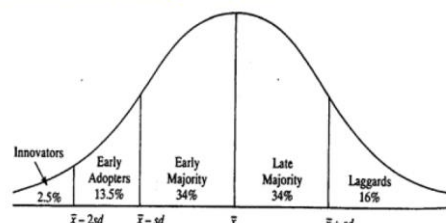
In the economy world ups and downs are common. The intensity of growth is sometimes slower and is accelerated again by new events. Stagnation and depression are followed by an upward trend. These cycles were often discussed. It is only after researches by Cesare Marchetti that they are known

Cesare Marchetti
http://www.iahe.org/boardofdirectors.asp?did=14

to follow a certain scheme. Old technologies are replaced by new ones. This substitution is a result of social behavior and new economic structures. They follow certain rules.

Marchetti began his research on counting fishes in the Adriatic Sea. He found that it is possible to calculate the fishing results of the fishermen. Many predators reduce the number of bait fish. The predators have too little to eat and their population goes reduces. This allows the bait fish to multiply again and the cycle starts again. This

Changes are in cycles
Products come and go in cycles

Innovators 2.5% | Early Adopters 13.5% | Early Majority 34% | Late Majority 34% | Laggards 16%

$\bar{x} - 2sd$ $\bar{x} - sd$ $\bar{x}$ $\bar{x} + sd$

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[3] HARTMANN, Martin: „Das aktuelle Genie"
www.zeit.de/2013/48/sachbuch-aristoteles-hgellmut-flashar
[4] 525-456 v.Chr.

[5] Cesare Marchetti (born 1927 in Lucca) is an Italian physicist and system analyst. He worked in the field of energy engineering and related system theory. He gave his name to the „Marchetti constant" and the „Marchetti curve".

knowledge is expressed graphically in an "S-curve". It is also used in business.
The cycle includes the following steps:

- Genesis / Origination (= low spread, low growth)
- Growth (= high growth, fast distribution)
- Saturation
- Replacement

This formula is now used worldwide in a wide range of areas:
- Development of the automotive industry in a particular country
- Increase of global air traffic and transport volumes
- Worldwide tankers
- Demand for primary energy from certain countries
- Technological substitution
- Replacement of horses by vehicles, etc.

Although we often feel that many things are developing faster, the innovation cycle remains constant. The innovation phase is repeated every 55 years.

The discussed cycles are only medium and long term. A change beyond this would be a change in the biosphere towards the neo-sphere.

Development of earth-bound people to knowledge-based individuals.
In the development towards the knowledge society, mental and moral aspects have more significance for our behavior. A change that can not be valued at the present time. Our life is too short to calculate the future impact.
The distance between the innovation waves is 7 years. These innovation waves can also be demonstrated in transport policy.
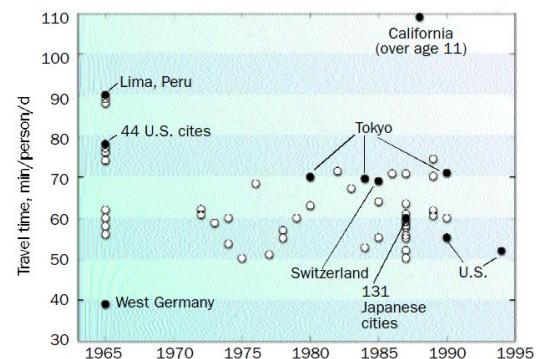
Cesare Marchetti also calculated the size of cities and came to the conclusion that this is dependent on the factor time. People want to reach their destination within an hour within a city. In the Middle Ages, when people walked, this was a distance of 3 kilometers. Today, with transport systems such as car, subway or other public facilities, this can be 80 kilometers. To this extent the cities have grown. At the beginning of the 20th century the main changes were in the areas of transport and communication. The new emerging infrastructures changed people's lives. The function of houses and streets has been redefined. The development of cities that have reached their limits go from the horizontal expansion with high-rise buildings to the vertical. Overcoming short distances has increased.

10.4 <u>Residence</u>

Residence and home have a new dimension. Increasing mobility needs a new definition for one's own place of residence and the term "home".
The reference to the place of birth is decreasing. Place of birth and place of dying are different in many cases. The art of life is changing. Two trends stand out:

- Migration
- Social change through more single households, fewer children, older people and larger living areas.

The co writer of this paper – Peter Kotauczek – is a good example: He has
- 4 residences and
- min 5 identities (entrepreneur, artist, researcher, husband, overaged child),

which are changing and overlapping in space and time.
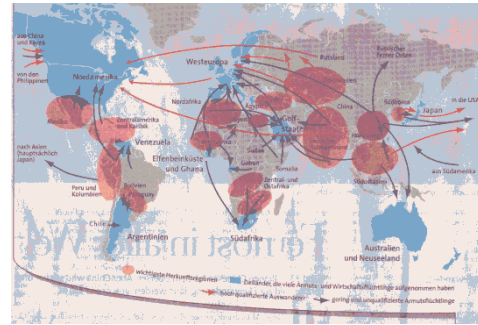
10.5 <u>Singles</u>

Families are smaller today. In recent years, single households have doubled.

Single households in Austria
1986 780,000
2016 1.430.000

40 per cent of the 4 million households in the country were single households. This made an increase of households from 2.8 to 3.9 million. On average, only 2.22 people live in one household. The largest group of single-person households are the "under 25-year-old", followed by "over 65-year-old" and „45 to 54-year-olds".

10.6 <u>Migration</u>

In addition to this reduction in population density, there is worldwide migration. People have always been mobile and have left their homeland to settle in a new country. Between 1800 and 1914, 50 million people left Europe and began a new life in America. In the 20th century the movement towards North America and Europe to Latin America was established. In 1984, the United States recorded half a million immigrants. Cities like New York, Los Angeles and San Francisco have 25% foreigners.
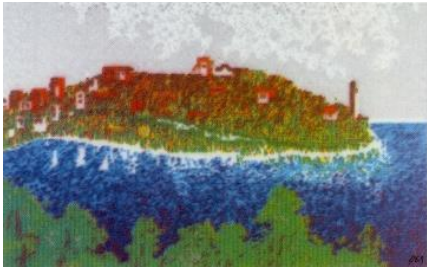

In Europe, this situation is new today. France has 3 million "black people". The number of inhabitants in Austria grew by 1 million because of the political change in Eastern Europe. Wars also trigger migrations. In 2000, 21 million people left their home countries because of war. In Europe 7.5 million migrated because of the war in Yugoslavia. In 2015 the United Nations registered nearly 250 million migrants. The United States have the most migrants with 47 million followed by Germany and Russia with 12 million each.
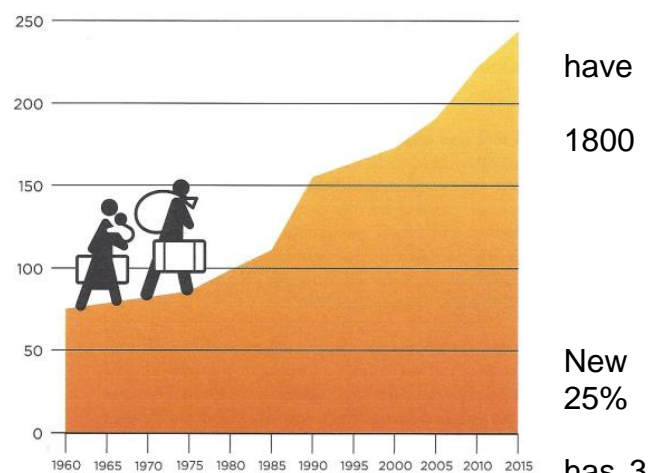
All public figures and statistics do not include short term migrants, split migrants and occasional migrants. Maybe this figure would be higher than all the existing statistics. There is no differenciation between poor and rich people. Rich migratants are called managers, tourists and globetrotters.

There are real and virtual migrants. "Within their networks, migrants function as mediators or mediators of other world views, new technical or technological, economic or cultural knowledge and competences, thus providing migrant workers and those who receive benefits through the transfer of money and knowledge in their home countries. More to empower, more influence and decision-making competences."[6] Virtual migrants are created on virtual internet sites, such as the "BEKO Island"[7] in Second Life. The nice thing about BEKO Island 2.0 is that there are ONLY migrants. This is the ideal multicultural island. No one cares what the other does or does not do. Ideal to study the details of the split migrantism. Migrants with the same diverse identities, behaviors, possessions or traditions are present on this island. We can learn a lot from the observable phenomena of the real migrants, as they are currently flying uncontrolled in Europe.

We are all more or less beloved / tolerated migrants on this earth / in this state / in this community, because our being here is always limited in time. The study of temporal patterns of migration appears to us as a worthwhile scientific goal[8]. BEKO Island 2.0 is the ideal laboratory. Split migration, short-term migration, migration gaps, social migration or parallel migration are new, currently observable phenomena in the real world, which have not yet been investigated at all. We are concerned with exploring these phenomena abstractly and experimentally.

These virtual countries also create their virtual currency like bit-coins.
The BEKO Iceland is just one example. Worldwide, more and more are being created. A project in Norway is called Liberstad. „Liberstad, aims to create a private, tax-free city for libertarians who respect the non-aggression principle and private property rights. Holding a presale now, the project's organizers accept bitcoin for land and plan to make it the city's primary currency. Bitcoin.com talked to John Holmesland, the general manager of the company that operates Liberstad, to learn more about how the project is progressing."[9]

The virtual world allows one individual to have multiple identities and thus have different migrational patterns in parallel. In colloquial languageone it says "he / she leaves a double". Sientistc call this "split migration". The modern computer technology (Clouding) and the blockchain algorithms allow to live different interrelated identities that occupy different physical and abstract spaces.

[6] Oltmer, Jochen: „Globale Migration, Geschichte und Gegenwart", Munich 2012
[7] https://www.facebook.com/Mikrostaat/
[8] Institute of Human Informatics
[9] HELMS, Kevin: „Libertarian City Liberstad in Norway is Moving Forward Using Bitcoin as Primary Currency",
https://news.bitcoin.com/the-libertarian-city-liberstad-in-norway-is-moving-forward-using-bitcoin-as-primary-currency/

10.7 <u>Worknomades</u>

Nomads confuse the order of settlers. Nomads have moved around the world.
In the German language, "nomads" are those people who, as cattle breeders, move from one pasture to another. In English, hunter-gatherers are also included.
All forms were pushed to the margins of society by industrialization and greatly reduced.
The knowledge society re-cultivated it on an intellectual level. Today, nomads are moving

Worknomades
http://www.spiegel.de/fotostrecke/arbeitsnom
aden-die-teuersten-staedte-der-welt-
fotostrecke-138597-5.html

around in the virtual world or working - for example, trade representatives - in their "catchment area". The area assigned to them by the employer. Similar to the nomads who guarded their herds of cattle and accompanied them through the feeding grounds. They were only allowed to do so in the areas assigned to them, otherwise there was war with the neighboring tribes. Looking at today's policy, similar conditions arise again. Wars are shifted to trading levels, for example when the new American President rejects international trade activities and protects only his own country.

People have always been mobile, have always traveled from one place to another. Stopping in one place is not typical for humans. There is no time in the history of mankind in which people have not moved. They have always sought new places. Not only physically but also mentally. Travel in the world of ideas.
One third of the people of the modern era were always on the road. Being settled was a privilege and only temporary. The sedentary is more recent and was defined only with the advent of transport technologies like the railway in the 19th century.
In the Middle Ages the leading class of society was mobile. They were the privileged ones.
Just as today's pope traveled much, the medieval popes were very mobile. They rode themselves on their journeys.
Professional qualifications are now growing faster and people have to relocate their jobs. The more rapid change of the place of life is therefore not just based on physical mobility, but also on mental level.

In 2014 only 8 per cent of Austrians were privileged not to follow their jobs:

Commute	per cent
Not	8
In the same city	30
In an other city	32
In an other regions	25
In an other country	5

An influence factor that people live outside a city and commute to work is the higher housing prices in the cities.

Internet supports intellectual nomadism. It allows people to live in many different countries, regions and "worlds".[10]

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[10] BRÄUNINGER, Michael: „Wien-Pendler. Der ÖAMTC testete drei Pendler-Strecken: Der Öffentliche Verkehr hat leichte Vorteile", in auto touring 05/2016, page 33

This spiritual nomadism is not only virtual but real. Communication is with real people in real continents. Communication is possible in real time. It does not replace the physical journey but is mentally real.

10.8 Immobility

The traffic of the 21st Century suffers from the disease, "immobility". On average an Austrian motorists stays 78 minutes in a traffic jam. This is called "Floating Parking". The individuality of driving got lost.

The average speed in the western cities is 16 to 24 kilometers per hour. In the German city of Cologne, the average speed is only 20 kilometers per hour, but in many other European cities already 10. The transport speed of a car has reached the speed of a bicycle or a pedestrian.

10.8.1 „Headrests View Generation"

The psychology of the motorist has no regard for facts and rational cost calculations. A change can be expected from the first generation of drivers who grew up "with the view of the headrest." So those children who were strapped in a car seat while driving could see only the back of the front seat. They have a different approach to driving. They have not experienced the passing of the car windows freedom of the countryside. For them it was a transport from A to B without any adventures on the way. For them, the "drive" has become irrelevant. For them, the transport function in urban areas with their cost-benefit ratio is not of interest.

For younger people the local mobility is stagnating. They do not like to have an own car. In the period 1997 to 2007, the use of a car by young people decreased. In Vienna, the age group 20 to 29 years of age drove ten kilometers less by car every day and used more public transportion. This generation is MULTIMODAL. They always use the cheapest possibility of transport and change between public transport and private transport. In doing so, they also increasingly rely on sharing systems.

10.9 Individual Mobility

If every point should be reached from any point, then it is to a large extent only individually possible. The "individual mobility" has a big future.   As our society and the infrastructure has fewer pedestrians, a new way of "walking" expected. „Electrical Walking". A supported and accelerated walking. Like an electric toothbrush accelerates tooth brushing and increased the quality, an electronic pedestrian is a new way of transportation, which is adapted to the new environmental conditions.

10.10 Networked Mobility

Any form of transport praises its options. The bus of the dense network in the city; the train, the high speed; car sharing the loss of their investment; eBikes the vigor saving driving; etc

Each transport system has its advantages and disadvantages, which looked at as a whole could bring benefits to the consumer. Networked Mobility allows the traveler to use all forms of transportation, from bicycles to taxi and to the aircraft.

A colleague came with his "eScooter" to a seminar. From there he went to the nearest available car sharing car. This car took him to the city boundary, where his own car was waiting for the cross-country trip.

A network must coordinate the different forms of transportation. If the local bus departs 2 minutes before the arriving train, he has missed his functionality.
Flexibility could give back individuality.

10.11   Lacunarity

Each complex traffic system has gaps. This also applies to systems of passenger traffic. The gaps are created wherever the person boards or leaves a vehicle or changes transport system. If a trip begins, the person must reach – from their own position A - the position B where the vehicle stands. At each change of system the means of transfer must be done: from the taxi to the train or the train to an aircraft. This transfer must be done by own funds. Usually he is relying on the natural resources of his body, not only of themselves but also to transport some luggage. This phenomenon of gaps is called by Mandelbrot "Lacunarity". "A fractal is called lacunar if it has large gaps, that is, if the gaps include large intervals."[11] Lacunarity of a mixed traffic system is a measure of the loss of convenience of the traveler.

The most popular case is currently the own parked car right outside the front door. The car can be parked everywhere on a reserved parking space in front of each goal (work, shopping, entertainment destination). This ideal has led to the known problems of space requirements and various displacement phenomena. Since this ideal is associated with very high expenditure on infrastructure and already concerns physical limitations, some lacunarity in the transport system is inevitable and growing.

In the minds of road users "Lacunarity Liberty" is enshrined as a desired destination. Nobody wants to go far to his pickup spot, no one wants to travel long distances between transport systems on foot. Even those people who want to enjoy walking the pickup spot in front of the house and are the exit point immediately have arrived. Each lacunarity in the system is therefore perceived as a deficiency.

Complex networked traffic systems inevitably generate lacunarities. This regularity can be observed everywhere where technically different systems meet each other. Typical examples are large railway stations, airports or ports. When such bodies come together various transport systems are in the toughest competitive interface. The planner must therefore always make priority sequences, which in turn act to increase lacunarity.

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[11] MANDELBROT, Benoit B.: "Die fraktale Geometrie der Natur", Basel 1987, Pag
Electronic Version:
http://books.google.at/books?id=bkVNilU3SvwC&pg=PA326&lpg=PA326&dq=lakunarit%C3%A4t&source=bl&ots=KByOu1i4qO&sig=gK2J_rBhBTqrsaBDAmmqcjeL2Ng&hl=de&sa=X&ei=KCAOUbbCEMbTtQaZ5oHIAg&ved=0CC8Q6AEwAA#v=onepage&q=lakunarit%C3%A4t&f=false

Nowhere should anyone have to cover such large distances in large modern airports or shopping malls.
If one has the misfortune to have to use a less privileged transportation system for arrival, you can very quickly accumulate a few kilometers for transfer. Anyone who has ever experienced an overnight flight connection in London Heathrow knows what should be expressed here.

Float Walker
http://www.schweber.at/

The larger the cities, and the more people that live in a confined space, the more oppressive are the problems of lacunarity. The road users have not only an objective time and effort but also a significant problem of frustration. Overcoming the constraint of time and distance gaps to fit and conform to the system is perceived more and more as a restriction of freedom and theft of life. It leads to stress and unpleasant feelings. Although the experts know these relationships, they cannot stop, with current concepts, the growing lacunarity. The trend is also influenced by non legal actions. Many „roads" are used against the law. Citizens are more and more doing unlegal things, f.e. double citizenship – which is not allowed.

10.12   Electrical Walking

The automobile is increasingly being driven out of the city by politics. Paid parking, reduction of parking spaces and low transport speed are damaging the use of the traditional

"automobile". Extreme political parties also pursue the goal of forbidding private mobility in the city. People have always been mobile and will remain so. They need new alternatives. Our society must forget the the name "Automobile". Both parts of this word have lost their authority. It is not "auto", not self-contained and not automatic. In its mobility - "mobile" – it is reduced.

A new type of vehicle will come, which is neither a bicycle nor an automobile.
On average, a car is currently traveling with 1.2 passengers. This means, that we need vehicles with one, but a maximum of two person capacities.
According to experts, the transition to a new generation takes about 30 years. All the alternatives offered today are pioneers and transitional solutions to a new vehicle type.

10.13   The Float Walker

If the gap closure could be transformed into a positive movement experience, a great deal would be gained. Moreover, if the current preference of gap minimization is reduced, more flexibility and freedom of choice would be achieved. At present, every user of traffic systems

tries to keep the number and size of the connection gaps as small as possible. It takes a lot of time and effort to change the system.
The designers of shopping centers have recognized this and are striving for locations where as many traffic systems form a node. The gap becomes an experience. Now you can not build a shopping center at each node. In addition, every possibility of shopping again entails an individual transport problem. The transport operator becomes a small freight carrier. He becomes the transport vehicle of his own. Watching the crowded people who are postponing the crowds during the peak season. Passangers do not enjoy this. This is particularly true for those more old fellow

citizens who are already struggling with walking. An ever-growing population in the cities. A suitable infrastructure can not be provided at every possible gap. The transport user must bring this infrastructure component by himself. Like his smartphone. "Bring your own device" is a keyword in the networked communication system.

In peripheral locations, where traffic systems are already widespread, interface handling is often much more dramatic. What is needed is an "adhesive" that fills the gaps.
This "glue" could be an electrically operated device, a small electric vehicle. Easily transportable and like an umbrella to take away, in order to be used more quickly - electrical walking - in case of need.

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