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CARNIVAL¹

Summary

How is a new research laboratory being created? Using the story of the establishment of Central laboratory of Optical Storage of Information at Bulgarian Academy of Sciences in the spring of 1974, the paper briefly outlines the political legitimization of the necessity to invest in the new laboratory and the bargaining about its organizational shape. This process is defined as specific public regime of planning as opposed to the acting in the close community of fellow researchers. Then the paper focuses on the taxonomy of the entities the laboratory is made of and the local process of setting up the lab and the constitution of its "style of life". The key "building entities" the lab was made of are described, using the vocabulary both of action-network theory and Marx's theory of action. At the end the concept of "heterogeneous couples" is introduced, describing the micro-level of social organization between humans and non-humans in the lab.

Once upon a time (instead of introduction)

In a late autumn morning of 1974, a group of people, bewildered, were waiting in front of the office of Todor Zhivkov - First Secretary of the Bulgarian Communist Party and President of the country. Among them were several functionaries of the upper Communist Party apparatus, ministers and civil servants in high positions, professors from the Bulgarian Academy of Sciences. Including a research associate, 33 years old, who had just surrendered at the entrance checkpoint a briefcase full of research equipment and files with drawings and formulae. Most of those present, embarrassed by the solid walls, the long corridors, and the repeated check-ups on the way to the office, are in vain trying to guess why they should have been summoned to the office of the First Communist Party Secretary.

Methodius, a physicist and chief player in this story, remembers: "When we came in and those present were introduced, I realized that everything had been prepared in advance - the functionary of the Communist party Central Committee in charge of the new technologies, the Minister of Electronics, representatives of the Ministry of Finance, of the State Planning

¹ This paper presents part of the results of my ethnographic study of Central Laboratory of Optical Storage and Processing of Information (CLOSPI), carried out between during the period of 1993 - 1997. Complete results are presented in my book "Making a Hologram: a Book About the Scientists, About the Light, and About their World", published in Bulgarian by "Prof. Marin Drinov" Bulgarian Academic Publishers. I would like to thank the staff and fellows of IAS-STS, Graz for the excellent conditions and highly stimulating research environment, as well as for the possibility to present my findings at IAS-STS seminar and the important comments they made during the discussion.

Committee, the President of the Bulgarian Academy of Sciences were there. Zhivkov explained the object of the meeting and gave me the floor. I reported our findings and their possible applications. Then I took out the laser (a small helium-neon laser), brought privately by a colleague of mine from a specialization in France, and the plates pattern from the briefcase, and reproduced the holograms on the spot. Out of each of them, with an area of less than one square millimetre, an entire page of text appeared on the screen. It was 1974 - most of those present saw a laser in action for the first time! Then, out of the other plate I showed them the red-and-black three-dimensional image of Vassil Levsky, the Bulgarian national hero... When the demonstrations were over, Zhivkov said: "That was it, you heard it. I also hear of it for the first time. Now, what are we going to do?" Almost no one wanted to say what was to be done. Zhivkov even got a little angry, pounded on the table and exclaimed: "This man, these people must be given an opportunity to work!" He directly started dictating: the Council of Ministers was to issue a directive for the establishment of a laboratory, the required funds were to be allocated, vacancies... Then a few found the courage to object that it was premature, that it was better to wait a while... Rather harshly, the First Secretary replied that they were short-sighted and could not see the prospects and the strategic importance of this area of research."

Thus, six months later, in the spring of 1975 the Central Laboratory for Optical Storage and Processing of Information (CLOSPI) was established with the official aim of "conducting fundamental & applied research in the area". It was clear to everyone, however, though it was not mentioned expressly, that the strategic task was the "great computer memory" - the holographic storage that was to make a real revolution in computer industry.

How did such a meeting become possible? How did the strongest figure in the state, the all-powerful "absolute monarch" of Bulgaria for more than 30 years suddenly turn out to be interested in the achievements of the young scientists, who had been chucked out of everywhere so far and had taken shelter in a small one-room laboratory at the Solid State Physics Institute? The reverse question - why did for the two scientists become so vital to enter the fortress at the center of Sofia and to be "blessed" by the Zhivkov?

There are two key elements, which closely bound the Bulgarian communist leader with the scientists. First, it is *their imagination* and *their dreams for different worlds*. It does not

matter that the worlds these persons dreamed are quite different - the totalitarian utopia for Bulgaria as a 'Technical nation, Communist nation' (Zhivkov) and the modest 'utopia' for a new, fascinating optical computer memory, produced in Bulgaria and conquered the world computer market (Methodius and Cyril²). What mattered was they both believed in their 'utopia' and invested all available resources to make their dreams real.

The second, they became allies and mutually interdependent because of the *complimentary resources they control*. On the one hand, Zhivkov disposed the enormous resources of the totalitarian party-state. On the other hand, Methodius and Cyril in early 1970-s were the only people in Bulgaria (and among the few people in the world), which had managed to 'enter some crystals' and to record and reproduce from minor spots real, three-dimensional images. They became the 'spoke-persons' of the light beams, promising to 'time' the incredible power of these beams if captured in the designed optical computer. The Communist leader was convinced, that one of the shortest ways to the planned 'developed socialist society' passed through the holographic computer memory project. On their side the two physicists realised, that the totalitarian utopia for a 'Technical nation, Communist nation' was the most reliable source of funding.

It were these minute holograms which in the autumn of 1994 enchanted the small audience at T. Zhivkov's office and put their incredible power into action - more than \$1 million were allocated, the Council of Ministers met and issued ordinances, laboratories and personnel were moved, overseas representative offices made the utmost efforts to break through the Western embargo and to equip the laboratory ...

² Cyril - Cyril was the closest collaborator to Methodius since late 1960s. He graduated in physics of the semi-conductors in the prestigious High Institute of Electrical Engineering at St. Petersburg, Russia. We can catch a great deal of satisfaction in his recollections of those years. ("Then the Russians were moving with the times and had very good contacts with the Americans. I even attended some of the lectures of Claude Shannon, one of the founders of cybernetics, in St. Petersburg in 1965!") Cyril returned to Bulgaria with favorable recommendations and got a job in the laboratory at the Technical University in Sofia, where Methodius became his first boss. Cyril's first encounter with holography was there, when Methodius find out his expertise in the Fourier-transformations. The Fourier-analysis is a fundamental mathematical apparatus in diffraction optics and holography which few Bulgarian physicists at the time have mastered. ("At the university in St. Petersburg I had studied Fourier-transformations for five years, in Russia training in this field was really very solid," remembered Cyril). So Cyril too became fascinated by the diffraction optics. Apart from being exceptionally interesting, holography was very much up-to-date and incredibly promising. When Methodius moved to Institute of electronics, he invited him to join the newly formed group of optical memory, and Cyril did not hesitate to accept. Later then moved to the small laboratory a Solid States Physics Institutes, where they made the first micro-holograms in Bulgaria.

1. Making a laboratory - nothing is taken for granted

This section provides details about the behavior of the key actors presented in the introduction in setting up organizational framework of research and delimitation of the necessary financial, technical and human resources. This process is closely bound with the overall rules of science policy in early 1970s Bulgaria, but it reveals the importance of the ability of the agents involved to “follow the course of events”, subverting the rules and arriving at specific arrangements, still keeping their strategic aims. That is why the second part of the section discusses the problem of the *language of description* and *starting point* in the analysis, briefly mirroring actor-network theory and Marxist theory of action.

At the end of the introduction we posed the question "*How did the meeting in Central Committee that led to the establishment of CLOSPI become possible?*" and found the answer in the *complimentary resources the Bulgarian Communist Party leaders and two researchers disposed* - the first controlled what traditionally is called "social and economic resources" (money, goods, infrastructure, institutions, displacement of people), while the other controlled "natural objects" and "thinks" (light beams, chemical substances, crystals, electrical signals). Hence what followed - *the creation of the laboratory* - was considered as combination of the two in order *to change the world*. It was the combination of *expertise* (i.e. the physicists' ability to work with natural objects) with the *resources of the state* (economic, organizational, technical) which if successful will bring about different society - richer, technologically advanced, "one step ahead towards communism" to put in the language of the epoch. My research question was to analyze this "combination" as immediate practical task of those involved.

Why the situation of setting up a new research lab is so interesting? - Because it provides a rare possibility to reconstructs *the interplay between different regimes of social action* – the macro-level of *public action (state institutions)* and micro level of close community of fellow researchers. What are the *modes of legitimate behaviour* at these levels? What are the forms of coordination of action? What is the role of inherited rules and forms of organisation in shaping action? What is the role of technical artefacts and nature's entities in this process?

How these different regimes operate and adjust each other with the advancement of the project? - These are some of the questions the analysis of the research data could answer.

Let us focus first to the *level of public action or level of strategic planning*, i.e. setting up the organizational framework of research and delimitation of the financial, technical and human resources to be provided. Before describing the events in details, I would like to cite Loran Thévenot's account on *planned action*: "...[it] is a type of behaviour, which rests on the deliberate intention (and which differs from the so-called 'instinctive' of habitual actions), but in addition to that it took the consolidated form of plan. This means that we have an extension of the human action's format with its habitual language and semantics – in addition to that, the planned action tend to privilege *verbal communication* as key element of coordination. It presupposes an *externalisation of intentions* and *design of explicit tools of coordination*... The planned action presupposes also another form of externalisation in the *form of investments*. This includes the objects transformed in functional tools able to extent the plan in the outer space, but also specific "cognitive artefacts", which also provides external support of the human activities." (Thévenot 2001, p.104)

Coming back to the data we have found that "... After my first meeting with Todor Zhivkov I was asked to present estimates of the resources we would need to boost research on the designing of a holographic computer memory" (from the interview with Methodius). After the first meeting with Todor Zhivkov there had been two more, and well as *weeks and months of work with the institutions that were directly involved* - Ministry of Finance, Academy of Sciences, Ministry of the Interior, State Committee for Scientific and Technical Progress. This means *a lot of writing, talking, calculating in order to prove and legitimate the desired combination*. What is important is that in these *institutionalized talks you must use conventions and standards*. The objects and human bodies are classified, measurable - the necessary equipment amounts to ... \$, the office space should be no less than ... m², they

should meet these and these requirements³, there are needs of these and these categories personnel each with determinate salary.

But it is not only that: "...at the time Methodius was walking on air and even planned the setting up of a **whole institute**. Fortunately Prof. M. Borisov advanced instead the formula of a "**central laboratory**" (from the interview with Cyril). Vis-à-vis conditions in Bulgaria in the mid-70s, the laboratory was to be a close-set research unit with a simple internal organization and a staff of 30 to 60 people - quite a different from the "institute" which means sometimes up to 200 and more researchers, with its own scientific council (at least 15 member having habilitation or professorship).

Second choice - the lab will be affiliated to the Academy of Sciences and not to the Ministry of electronics (where the most of R&D in the area was concentrated). This meant that *the laboratory was going to have a privileged status in the scientific community*: 1) *Higher salaries* than the colleagues in the industrial institute (at the time a research associate at BAS was paid BGL 135 monthly, whereas his colleague in a departmental institute got a salary of BGL 115); 2) More opportunities for *mission trips abroad* (very attractive for then closed Bulgarian society); 3) *Tolerant academic atmosphere*, with no strict task to be executed according to plan; 4) However, relatively limited funds compared with industrial R&D units.

Making plans is also not in the empty space and on hearing of the breakthrough, adversaries from the other institutes started attacking the project at its very outset, *made accusations*, with no success though. The top leader of the country had said his say and it was to carry weight for a long time ahead.

It is at this point to note the ability of the agents involved to subvert and modify the existing rules and to arrive at specific arrangements, that better correspond to their strategic aims. When Methodius accepted the above arrangement *he managed to secure initial funding, which few academic institutes at the time could hope to get* – BGL 600 000 in socialist

³ Specifically, holographic researches are vibration sensitive and require solid isolation from the environment. They require also very low dust loading level, protection of the eyes against laser radiation, etc. Therefore, the decree of the Council of Ministers provided for investments in new premises, which had to be built by the construction organization of BAS. However, this did not happen the way it had been planned. The designers were late with the project and years went by...

currency, BGL 490 000 in Western currency and BGL 380 000 for construction works (under the decree of the Council of Ministers) - in all, more than over USD 1 million.⁴

2. *The limits of the regime of planning*

The analysis of the specific *regime of planning* prevents us from taking for granted some aspect of the laboratory life, which typically escape the attention of the sociologists. Having no this analysis, we could find empirically the difference between “institute” and “central lab” in the ethnography of Bulgarian sciences in 1970s, but we never will consider it as specific design tool, that configure long term research activities. This distinction is not “natural”, it is “constructed” too, just the same way the local laboratory life is constructed. But at the same time we hardly could understand what is particularly at stake in the concrete project if we stick at this level – *it is not the planning itself, but the process of holographic research as “specific form of life”, as specific pragmatic regime* which substantially differs from the planning, and which defines *the space of negotiation* in the planning and sets *the limits of compromise*. So the concrete research lab as a locus of this form of life is born in the *“trial of strength” between these two regimes – science policy planning on the one hand, and pragmatic regime of concrete scientific research - on the other*. That is why we need similarly elaborated, but *compatible*, tools to analysis the second regime.

So *what does it mean in particular to establish an institute or a research laboratory?* Does it differs in principle from the efforts in establishing any other modern institution – be it medical clinics, military base, religious institution, etc.?... Vibration insulation was rather peculiar requirement, but a military base might be even more peculiar. In the winter of 1975, the setting up of this institution had been delegated to Methodius and a few of his followers as an immediate practical task. However, as things were at the time, they had fragmentary information on the matter and had to rely on their limited experience. Furthermore, they knew that the resources, though a generous sum of money as regards existing circumstances in Bulgaria, would run out someday.

⁴ This strange – for the Western reader – distribution of the same currency reflect the peculiarities of administrative economy. It resembles very much the different type of currency in the family of USA farmers, described by Vivian Zelizer (in Michel Callon (ed.) 1998, *The Laws of the Market*, Blackwell, 1998; see also J. Kornaj 1990, *The Socialist System: Political Economy of Communism*, the chapter on the bank system.)

Let us take the now classical STS definition of laboratory as “*heterogeneous community of humans and nonhumans*” (Latour, 1994; Knorr, 1994). To create a laboratory, we commonly need these two types of actors - humans and nonhumans who must enter into special relations. What concerns humans, the language of Marx theory stipulates that we need “*shaped people*”, e.g. different types of ‘scientists’: 1) solid-state-physicists-specialized-in-optics-and-quantum-physics; 2) chemists-specialized-in-photo-chemistry-and-storage-media; 3) electronics-engineers-specialized-in-input-and-output-devices. On the other hand, the “nonhumans” comprise the natural bodies that are the subject of scientific research (light beams, crystals, chemicals substances, etc.) together with their “tamed”, already socialized cousins – *the hybrids*, e.g. the infrastructure / material conditions of work like buildings, equipment, communication devices, plus software, texts of any kind.

Sociologically speaking, we can say only with very strong deviation from reality that Methodius, Todor Zhivkov and the other involved “have created a laboratory”. As a matter of fact, it would be more correct to say that right from the beginning they got into a *whirlpool* in which they were shaping the things which were in turn shaping them (to express this people use words such as “he develops and matures professionally”, “he grow up as manager’ etc.; Alfred Schutz would say “they grew old together”). Along with that, *many things occurred incidentally*, just like that, and by doing so, they displaced preliminary drafted plans.⁵ But for all plans and effort, other things failed to take place. Therefore, although the socialist regime of planning provided some clues, it was extremely difficult to find a point of support and take a stand in this vortex in order to be able to understand and describe the dynamic nature of the process of creating a lab with all its constantly changing interpretations, defining and re-defining of roles, responsibilities, etc.

Still *actor-network theory* (ANT) appeared to be one of the most successful tools of analyzing such processes. Using the methodological apparatus of semiotics, ANT helps us know when we should simply follow the actors together with their definitions and translations (Law, 1995; Callon, 1982; Latour, 1987) and when we have to introduce our own – of the researchers - point of view, our sociological schemes and patterns. At his time Marx

⁵ For example the Methodius "big strike" at the International Industrial Fair in Bulgarian city of Plovdiv that took place the same autumn of 1974, where CLOSPI bought precious pieces of up-to date Western research equipment, imported in unique exemplars for the exhibition only!

used to say that ‘the *tools of labor* provide the anatomy of social development’ meaning that they provide researchers with clues how peoples in the past had been acting in given situations and that researchers should use these tools to reconstruct the extinct ‘social’ species, the way paleontologists do it. However, the case we deal with is different because we study species that are not extinct, but are yet alive – they speak, work, write, argue.... *We could put the ANT notion of "hybrids" under the Marx notion of tools*, however, the notion of ‘nonhumans’ makes troubles for Marxist wording – here they appear less “actors” than humans are, but at the same time they are more hardy, have a larger “momentum”, undertake the consequences of the impacts, preserve them and transfer them into new situations even when everything is over and the people who created them are no longer to be.

3. *Searching for points of support. The vampires*

We ended last previous section defining new laboratory as specific *heterogeneous community* where humans and non-humans interact in a “whirlpool way”. Now we are investigating the concrete human and non-human actors the laboratory was made of, stressing the relationships (both between human and between human and non-human actors), which have been established prior to the set up of the lab. Among them we found the crucial role of specific types of entities, *which are neither human, nor nonhuman, still less the hybrid, and which we metaphorically name ‘vampires’*.

There are things outside the whirlpool, which, as we will see, are very *stable*. In our case one of these things is *the principle of holography*, as invented by Denis Gabor. The same way our ancient predecessor of the Neolithic Age has invented the wheel Denis Gabor gave humanity in 1947 a tool to effect the transformation of a three-dimensional image into two-dimensional and its reverse reconstruction. This happens when we record on a plane the complete *wave properties* of the light coming from a given object. However, it is done in a different way as in photography where only the *beam properties* (the intensity) of the light are recorded. Notwithstanding all vicissitudes that marked the life of CLOSPI and its founders before and after 1974 and to this date, *the principle of Gabor* was the core feature, *the totem* of the tribe of solid-state-physicists + photo-chemists + electronic-engineers who inhabited the southern wing of 109 Building, the “Academician Georgy Bonchev” Street.

Stop! I said “inhabiting” and right off I related *the principle of Gabor* to a certain place. But we can’t find it there - it had dwelt in the small laboratory of the Faculty of Physics at Sofia University and even in all other laboratories where Methodius had worked before, way back to his students years - to the book of French optical scientists Mareshal & Franson on diffraction optics, and to the heated argument they had with his old friend and colleague, Pavel Kulev, at the small self-made attic ‘laboratory’. I have also found the principle of Gabor or “living according to the Gabor principle” in the CLOSPI fellow labs all over - in the Applied Optics Group at Erlangen University, and at the Optical Physics Department in Osnabrück University both in Germany; in the *Thomson CSF* Research Lab at Orsay near Paris, France; in off-lying Novosibirsk – with Professor Tverdokhlebov group at Siberian Branch of Russian Academy of Sciences; in the “cellar” of Prof. Serov in Moscow. It might be found “in live” at several other places in USA and the Far East.

At the same time, however, the *principle of Gabor* cannot be completely tied with all these places, because it will remain “in live” even when they have long disappeared like the holographic laboratories of *Siemens* and *Philips*, which were closed down in the late 1970s. *The principle of Gabor will exist as long as there are people who can read the books in which it is described and as long as they can work with the devices in which it is embodied.* However, it will be lost if these “shaped people” disappear, even if the holograms, these marvelous images on glass or plastic foils are preserved. Then our successors will look at them in the way we look at some of the miracles of the past.

I guess we have come to the core of the subject. *The principle of Gabor*, this simple and at the same time sophisticated principle, this “wonderful and enchanting discovery”, as Prof. Marie Mie from Curie University in Paris put it once, is *one of the centaurs which modern sociology in vain tries to harness*, with no success, though. They are close to what Laurant Thévenot calls *investments of forms* - as “...operations that shape the people and things”, “that shape the world by forging likeness and contribute to homogenization, across contexts, in the treatment of people and things” (Thévenot 2001:58). However, he is not clear enough about the ontological status of these “conventional entities”. Being interested in the “[human] agents’ capacities to move from particularized situations to general forms” and the “human capacity to establish relationships with the future... refusing the immediate satisfaction in the name of increased stability of expectations [caught by the notion of *investment*]” (ibid.),

Thévenot insists on the *plurality* of the investments of forms, stressing the second term – the *form*, and claiming that “the differences between knowledge operations, establishment of rules and use of material investments is less important than their qualities of durability and modalities of their extension”. (Thévenot 1985: 55) The *investments of forms* could be such diverse things as tools, frameworks, calculating rules, formulae, measures, written instructions, tariffs, forms of education, methods of selection, etc. That is why I rather prefer the notion of *third things*, coined by Georgian philosopher Merab Mamardashvili – it points to the entities that are neither humans, nor nonhumans, and like "hybrids" they creep into both realities to coordinate, adjust and piece them together. The *third things* set the human dimension of being, they are formative to human subjectivity, simply because they last longer than humans and are quasi-objective. At the same time, however, they cannot exist without humans, without someone burning away for them and devoting himself to them, giving them his flesh, time and life.

Writing this text in the dead of the night I feel almost religiously elevated and that is why, I would also call these centaurs or “third things” *vampires*. True, *the principle of Gabor is a vampire* like the tamed fire, the wheel and so on. If I should refer to Latour’s *The Pasteurization of France*, I would say that the vampire is not the microbes, which Louis Pasteur tamed in the vaccine, but *the act of their taming itself*. Latour hints to this saying that actually, Pasteur tamed a new species of microscopic animals the way the farmers have bred cows - *it is just the taming which is a specific human dimension of the being*, discovered by our predecessors tens of millennia ago.

Still, in 1974 Methodius together with Cyril, of course, Tzetzta Mateeva, Ivan Tsakov, Pavel Kulev and a few more people have become one of the specific forms the principle of Gabor’s existence – as a micro-hologram-fit-for-information-storage. No, it is not a slip of the tongue - in a sense, the micro-holograms and the young physicist who demonstrated them at the meeting with Todor Zhivkov *are one and the same thing*. Similarly, the Indians of the Bororo, tribe described by Claude Lévi-Strauss, will have it that they are *red parrots*, and this certainty of theirs leaves the Europeans speechless. Furthermore, they do not claim descent from the parrots, nor resemblance to them, nor that the parrots are their gods. It is their profound conviction that they and the parrots *are one and the same thing*. It is *the principle of Gabor* that directly makes *Methodius and the microholograms one and the same thing*.

Refusing to follow the lead of Methodius, Ivan Tsakov had parted ways with him already few years before that. He went to the Dubna nuclear research center in USSR where he made holograms of tracks of elementary particles. Later he set up his own laboratory at Sofia University, in the small but successful Institute of laser technology. However, Cyril and Tsetsa Mateeva drew up in line after Methodius. Other scientists joined the ranks too - the chemists from electronic industry who had created their super-micro-grain photo materials (for photo-lithography of chips); physicists Teodor and Lyudmila who, though involved with polarization holography, managed to come to terms with Methodius. Sick and tired of the decisions of their bosses⁶ in the course of decades, their friends from Central Institute of Information Technology and specialists in input-output electronic devices, also joined the enterprise: “We continued mastering the outdated IBM technologies, although we knew that with each new device we were lagging another 10 years behind. Under socialism, however, it was a matter of prestige to go and buy some trash from USA instead of paying enough your colleagues from across the boulevard”, one of them would say to me in an interview, I had in 1993. What is more, the proposal of Methodius appealed to these engineers of electronics - “We must learn how to control the laser beam!”, he said. To control, if only beams, is the cherished dream of every engineer!

In this section we analyzed the peculiar ontological status of *principle of Gabor* and its foundational role in the establishment of CLOSPI. It is this principle, ‘*third thing*’ or ‘*vampire*’, who defines the identity of the lab as belonging to *peculiar from of life – holographic research*. It simultaneously makes the new lab member of specific species (world network of holographic research) and makes it different from the local environment. Having found now some stable ground, the next section deepens into the local world of the emerging laboratory, to discover strange micro-communities of human and nonhumans, which we called *couples*.

4. *Heterogeneous couples*

I think we have again put on pace. Which way did all these people in the last two paragraphs come from? And why did I start from them and not from the laser of Pavel Kulev, for

⁶ Which their considered cheated and bought up by IBM because of the decision to copy IBM devices rather than develop their own...

instance? - Pavel Kulev, a good old friend and fellow student of Methodius, who was always forgiving but never forgetful. When CLOSPI was in a process of setting up, Pavel was in Paris in the group of Prof. Franson at the Institute of Optics in Orsay near Paris. Originally, he had gone to France for 3 months to do postgraduate studies, but his good command of French and excellent knowledge of diffraction optics made Prof. Franson keep him for two years. Pavel ventured into a new field - speckle-holography, published articles in top journals in the field. One day he was summoned to the Bulgarian Embassy in Paris where he was told: "A team headed by Methodius is now setting up CLOSPI in Sofia. You are a good professional, so, you must help them". "What exactly is this laboratory going to be?" - Pavel asked. "A holographic memory will be designed". "Whose idea was it?" - his next question was. "Of Methodius", they answered. "I don't join in the fulfillment of promises Methodius has given - I have already suffered for that", he answered, "The idea is good and I'll give some help, but I don't think I can join CLOSPI!"* So Pavel, like Ivan Tzakov, took his own way. However, though each struck out a *different* line of his own, both were guided by *the principle of Gabor*.

So, why not start with the nonhumans, with the laser of Pavel, with the storage media of Anton Katsev? You see, humans show up the minute we start speaking about nonhumans - laser of Kulev, storage media of Anton. It was the super-micro-grained media of Anton Katsev that made possible the recording of micro-holograms, the show at the Zhivkov office and the setting up of the laboratory. This storage media were the deed of Katsev, of his team of young, bright and cheerful girls chemists all of whom had graduated the university with a difference of one or two years. It was one of these talented chemists who had sent few years ago two of her well-trained assistants to help Methodius and Cyril carry out their experiments in the small university laboratory. Also, she supplied super fine-grained plates for nothing, of course, as friends would do.

* In 1986 Methodius resigned his post at NICRE (National Institute of Cinematography & Radio Equipment) to work at the laboratory of Technical University in Sofia (leaving Pavel to complete the contract with the State Committee for Scientific and Technical Progress (SCSTP): "The contract we had signed the previous year, provided for designing a device to study the quality of optical systems using the Furrier-analysis. The device received great acknowledgement. It was something unique, still, SCSTP demanded norms, drawings and lots of supplementary staff as though there was going to be a large-scale serial production. We had hard time with SCSTP and just then Methodius deserted - he got out of the mess with the contract and joined TU." (From the interview with the author)

But why did Methodius need the help of chemists? There are no chemists in the holographic laboratories in Erlangen, nor in Orsay, nor in Novosibirsk. Why would he need chemists when super fine-grained silver plates could be any time ordered at AGFA or Kodak? And besides, it was already common knowledge that the photorefractive crystals were more reliable than the silver plates. With them recording was reversible and could be time and again recorded and deleted thus making unnecessary procedures like developing, drying, bleaching, etc.. Methodius must have been aware of this, although Cyril used to say that he was not keen on reading the literature. But where could he possibly take the crystals from? Just like the laser of Pavel and the plates of Anton, they too were walking after “the man who was grazing them”, e.g., taming them? Simply, *there was not such a man in Bulgaria at that time*. One could find such people in the Soviet Union, in St. Petersburg and that is why in 1976, less than two years since the establishment of CLOSPI, Methodius visited St. Petersburg. On his way back he took few of the precious crystals and gave them to Margarita, a newcomer who had already got through the selection but was still by herself - *she had not got engaged to a non-human yet*. After returning from St. Petersburg, Methodius gave her those small yellowish crystal cubes⁷ - “See what you can do with them!” That day on Margarita became “Margarita-with-the-photorefractive-crystals” for the decades ahead...

What did we find out? Indeed, the laboratory is created both by humans and nonhumans, which are interrelated in a certain way. However, to set up a large organization, called laboratory, institute, institution, etc., prior to that *humans and nonhumans must couple*, must pair someplace - coupling is a good English word for this process. And later, when the institution, the laboratory is already an established fact, it must provide for new copulations on a local level.

What I wrote about Margarita, applies in absolutely the same measure to Methodius - not only did he follow the *principle of Gabor*, but already in 1965 he has “coupled” with the another currious entity – so called *D-optimum plans*.⁸ And again, had it not been for the D-

⁷ In the "universal" local language of holographic tribe they have the ugly names of 'Barium Titanate', 'Lithium Niobate', etc.

⁸ The D-plans are methods of probabilistic calculation on the basis of a minimum number of experimentally obtained parameters. They were discovered in the USA in the early 50s and were used in the design of nuclear and missile weapons. In Moscow at the end of the 50s, the mathematicians of the group of Kolmogorov arrived at the D-plans by their own means. Thereby, America's supremacy was excelled. Several years later these methods were gradually declassified. At the time when Methodius got familiar with them, they were seldom

plans, which in 1972-1973 made possible optimization of Anton Katsev's storage media with the shortest possible delay, there would not have been any micro-holograms, nor the show with Todor Zhivkov, nor CLOSPI.

Well, *some sort of system is slowly taking shape in the apparent chaos of the vortex, called "creation of a laboratory" - neither large structures nor networks but small "couplings", small "pairings" or "couples" of shaped people and nonhumans of a definite type.* It is in these pairings, as compact as the monads of Leibnitz, where the agents develop and tame *each other*. Let me list only some of the stable heterogeneous couples, which I found during my study:

- *Pavel Kulev* was thoroughly qualified in the *new generation of lasers* available in Paris (which, though light-duty, run for years and even for tens of years unlike the "deplorably bad Russian lasers of first generation which operate 30 hours only and break down");
- *Anton Katsev* and his ladies chemists were thoroughly qualified in the *super fine-grained halide plates*;
- *Methodius* was thoroughly qualified in the *D-plans*...

Later, when the laboratory was already created, such couples were formed among the newcomers - *Margarita* with the *photorefractive crystals*, *Simeon* and the *fading light-waves*, *Peter* venture into *new types of D-plans*, *Marga* got involved with *bi-chromate gelatin*, *Plamen* set about making *reflective gratings*, *Stephan* designed and then long time worked with his digital *RAM-camera*...

The key precondition for appearance of new *heterogeneous couple* is the existence of an indispensable minimum of *opaqueness*, of *non-transparency* of the nonhumans. In other words, they should be known to some extent and at the same time not completely tamed, still keeping some of their secrets. These nonhumans already have names and have partly revealed themselves, not fully. *This is what makes sense in partnership in the couple - to get to know each other*, to see whether we are a good match, after which we either part or stay friends for good. However, unlike the couples of humans, the heterogeneous couples in

used and difficult to apply. But D-plans were an exceptionally efficient research tool – with their help one could specify the fields in which decisions could be expected after a couple of experiments only, etc. The D-plans *accelerate research process and decrease expenses*.

science are in a way altruistic - when changing together with my nonhuman, I seek to share it with the rest of the world and not have it for myself only. My aim is to come to an agreement with fellow-nonhuman, to make it my ally, as Latour said, but also an ally of the rest of the people like me. Along with this, I aim at getting people around me, familiar with the special features of this new ally, with its whims and demands. And we do not need to stick at Christian schemes – they might resemble ancient forms of coupling like in matrimony, to be modern, traditional, town, rural, free, of convenience and so on. Depending of the nonhuman you couple with. More important, however, is the principle and as long as we do not push it too far, it reduces mess to order although temporarily.

Let us stop here. When undue, generalization may evolve into sociology in the sense in which it is discussed in a popular TV show - we are going to speak a lot, we are going to make excellent diagrams about the things which pretend to explain but, as a matter of fact, say nothing worth mentioning.

Conclusion - the different roles the hybrids play.

The storage media, the crystals, polarization and the holographic memory itself are nonhumans of a peculiar type and it is really rewarding if you dedicate your life to them - simply because “they still keep many secrets from us”. However, along with them there are other nonhumans without which neither media, nor crystals nor memories would have been possible - lasers, cameras, oscilloscopes, photodiodes, the French vibration-proofing optical masses, numerous prisms, lenses, beam-splitters, deflectors, etc., which help direct and manipulate light. Unlike in the couples among humans⁹, *when the humans join up the nonhumans they need devices and tools - e.g., other nonhumans, which are well-known and “keep no secrets” and which will be their “interpreters”, mediators, informers, supervisors, torturers and so on.*

So, at least two types of nonhumans come forward - “savage” and “tamed”. Bruno Latour has two different names for them - “strictly nonhumans” (which the modern Europeans usually related to the Nature) and “hybrids”. For the latter, the distinction between nature and society, between humans and nonhumans, is not applicable - they are a blend of both, of

⁹ By the way, human-human micro communities hardly could survive without hybrids too. Now being temporary way from my family, how could I live without modern communications?

humans and nonhumans. They stand in the middle of the society-nature continuum. In another article Latour (Latour 1994b) advances yet another argument in support of this differentiation - the hybrids consolidate society by building in human relations their solidity, stability, silent authority and compulsion whereas the “savage” nonhumans rather destabilize it as they go their own way, just like that.

Does *the principle of Gabor* fit into this pattern? Is it an ordinary hybrid? - Hardly so. Specifically it is to be found in the hybrids and *at the same time*, in the humans. Thereby, we called it “vampire”. It is a kind of “*higher hybrid*”. The troubles in conceptualizing this peculiar category of hybrids stem from the impossibility they to be attached permanently to some material embodiment. At the same time, *their reduction to ordinary structures of signs and symbols, to some sort of “text”, deprives them of their essential characteristic* - they are not just a premise nor the result of the process of interaction in the hybrid micro-communities, but a *form* of its intercourse. To some extent, one could stipulate that the “vampire” type of hybrids correlates in what Marx used to call “*socially valid forms of thinking*” and Karl Mannheim defined as “*style*” of a social or aesthetical reasoning in given epoch. *The problem is that even though we can reduce the vampires to “ideas”, they are something more than that* - they are *the form of behavior* which is valid to an equal degree *for the humans, non-humans and for the tamed as hybrids nonhuman actors*. It is in this sense that they closely approach the Thévenot’s *investment of forms*.

Coming back to the *regime of planned action* analyzed in the first section and comparing it with our findings in the next sections when we analyzed the *local pragmatic regime of action* we arrived at rather complex, multi-layered vision of research activity. First it was the general public framework of research, defined by its own forms of reasoning (legitimization), forms communication, standards, forms of measurement, etc. Then we got the lab as local form of life (it core being 'vampires' as specific class of hybrids), which too appeared 'composed' and rather broad to catch in full details the concrete research work. So we arrived at micro-level of 'heterogeneous couple' where the intimate relationships between human and non-human agents took places. Although these layers mutually mediate and define each other, none of them fully predetermine the scientist activity and leave large space of maneuver.

Postscript*Actor-Network Theory and Marxist theory of action*

The comparison between the *actor-network theory* and *Marxism theory of action* exemplifies these difficulties in grasping heterogeneous relationships in social theory. If we look for an equivalent of the distinction between “nonhumans” and “hybrids” in Marx, the latter being a typical modernist approach, we will detect the important difference between *object* and *tool (means)*. Marx wrote that apart from the appropriation of ready means of living, “...the object, which the worker masters directly, is not the object of production but the means of production.” (Marx, 1979: 205) For him and later in ANT too, the means, especially the elaborated ones, were more important. “When the labor process reaches a certain stage in its development, it already needs elaborated means... The means of labor are a criterion for the development of manpower (e.g., the living human body - I.Tch.) and an indicator of the existing public relations” (Marx, 1978: 18).¹⁰

In the Marxist tradition, the dialectics between *living labor* and the *means of production* is manifested in the process of work. In this process the means of production shape the living capacity for work (historically concrete human being), e.g., the specific public relations under which it works. Marx himself expanded time and again the range of this assertion stating, for example, that hunger, when satisfied by a fork and knife, is entirely different from hunger satisfied by tooth and nail. The means, e.g. the artifacts, the hybrids, set the criterion for the specific human attitude to the object. Implicitly, we can detect “coupling” within the framework of Marxism, *but between the living capacity (human bodies) and the hybrids*. For Marxism as well as for Latour, the latter are a key to the anatomy of public formations and an indicator of public relations. However, the distinction between nonhumans and hybrids, introduced by ANT, makes the situation more complicated.

In the Marxist model, *the process of scientific research in the natural sciences is but a variety of the process of labor*. What ANT considers to be the “savage”, untamed nonhuman

¹⁰ And again for the sake of the tradition, we must give full credit to its originator, the one whom Marx considered his teacher: “Means are higher than the ultimate aims of external expedience; the plough is worthy of more respect than the immediate benefits which are attained through it and which serve as aims. The means remain whereas the immediate benefits are transient and are doomed to oblivion. Through his means man rules the external environment, although regarding his aims, he is rather dependent on it”. (Hegel, 1967: 242).

(or what Karin Knorr calls 'knowledge objects') in Marx theory is simply an *object*. This object is pre-given to the process of labor and although it is able to resist the human, the asymmetry that draws activity towards the human-subject and to a lesser degree to the socialized means, to objectified manpower - is all the same preserved. While with the model of the heterogeneous couples, we get into a situation, which Marxism considers feasible only in the sphere of human-nonhuman relations. *The idea of the “vampires” as a special category of hybrids, as a specific “law” for the behavior of both humans and nonhumans, acquires special importance in the situation in which we refuse to grant the human-human relations a status of privilege compared to the relations between humans and nonhumans.*

Otherwise, within the framework of Marxism there is no way for the “nonhuman” status to be established - if we should refer to Hegel, from its very start the activity sides with man and as we could see later in Marx’s analysis of the machine, the hybrids can be only *quasi-subjects* which have assumed the alienated essence of man and resist him as external compulsion. Bearing in mind this distinction, in her report at the conference on sociology of science in Bielefeld, Germany in October 1996, Karin Knorr stressed the unsatisfactory result of the traditional ways in which the material things or objects are perceived in social sciences. She underscored that the traditional modes of tools and commodities already do not suffice to describe the type of objects which sociology of science deals with: “The knowledge objects, she writes, contain an element of unfolding and mutating. We can come closer to understanding them, the author maintains, using Lakan’s concept of *wanting*, e.g. of *what is missing* - that which appears after the need has been satisfied and when a repetition of the act of satisfying itself is desired outside the purely utilitarian respect”. (Knorr 1996) For Lakan *wanting* is a concept that is called upon to express *an attitude to the Other man* and therefore, Knorr’s attempt to employ it in studying the relations between people and objects of science, is quite symptomatic.

So, modern cognitive sociology of science restores the original power, activity and might of the objects that are studied in the laboratory, grants them the status of real actors and by doing so, it opens up new vistas for social science - the outfield in which people establish relations with the other beings. The phenomenon of “coupling” that we described above is a specific form of these relations.

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