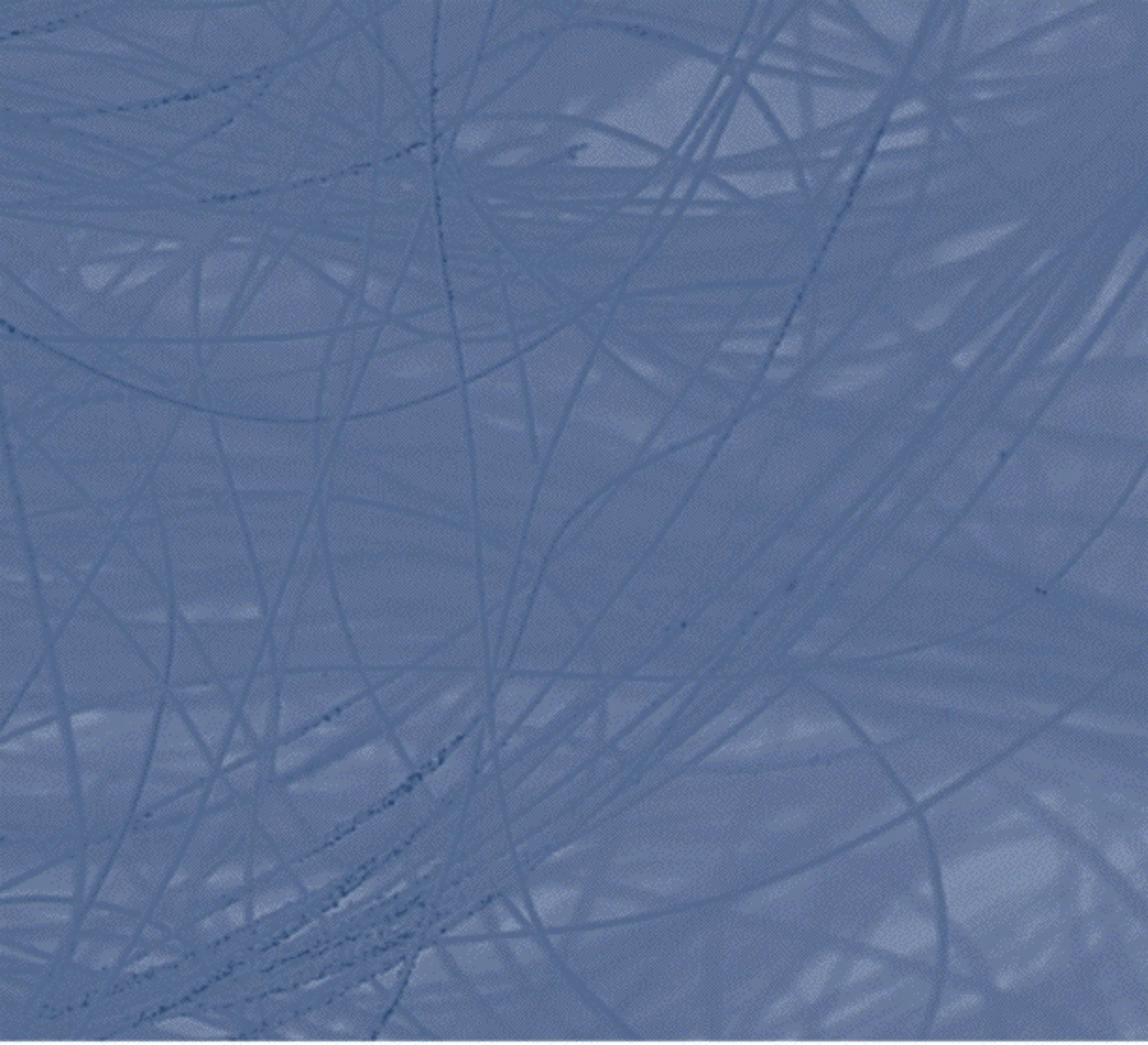

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Reverse Engineering and Other Respectful Enough Accounts: Creating New Spaces of Possibilities for Technological Innovation under Conditions of Global Inequality

Ivan da Costa Marques

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Introduction

The notion of intellectual property is strongly connected with standard epistemological assumptions, especially the existence of natural stable borders and instant discoveries. Natural stable borders allow for the conceived existence of pure, i.e. completely defined or unproblematic objects or things. Discovery allows for the detachment of a relative instant of time as the definite moment of recognition or creation of a thing (a stable form). The epistemological assumptions of stable borders and discovery intertwine with the "primacy of the origin." And primacy of the origin is thus mobilized to legitimate granting intellectual property rights to those who "first" recognize or invent a thing.

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In more general cultural and moral terms, the primacy of the origin is tantamount to the precedence, priority, predominance, preference, prerogative, privilege, right-of-way, seniority, supremacy of the original over the copy, of the model over the imitated. Through intellectual property rights, the primacy of the origin is more or less surreptitiously evoked and translated to guarantee the primacy of the North over the South, of the center over the periphery, of the first over the third world, of the colonizer over the colonized. Rather than using the words "colonizer" and "colonized" with their varying historically specific meanings, I associate them to an asymmetry that can be found in each macro or micro-instance of the process of construction of the so-called modern global world. In general terms, this asymmetry allows for the (always provisional) identification of those who are or feel more prone to set the pace of that construction as opposed to those who are perceived as more willing or compelled to follow its rhythm, those who are taken to be active as opposed to those are taken to be passive, those who are taken to be dominant as opposed to those who taken to be dominated. I will focus on the dichotomy colonizer-colonized and try to make it problematic amid technological politics, professions, education, computers, business competition, personal alliances, finance, law, ethics, Brazil and the United States. In the way I try to perform it here, depending on how it is situated, the tension colonizer-colonized may be identified with and visualized as many contemporary divides such as the North-South, the European-non European, the white-colored divide, or even the gender divide.

By means of institutionalized intellectual property, agents do not have to recreate the primacy of the colonizer over the colonized in its entirety by deliberate action in an immediately visible process. But that does not mean that institutionalized intellectual property is unproblematic to the colonizers. On the one hand, during the last decades, the colonizers of the world have been making considerable investments to expand and obdurate intellectual property rights. Previous overflows or externalities are now framed and encompassed into the realm of intellectual property laws. 'When it is created, it is copyrighted!' has become a catchphrase.

On the other hand, one might say that during the second half of the 20th century, strong philosophical movements, especially in French philosophy in the work of Foucault, Deleuze, Guatarri, and Derrida, among others, have put forward powerful tools of deconstruction of the primacy of the origin. Also, in the last decades, STS (science, technology, and society) scholars working in the colonizers' world, such as Geoffrey Bowker, Michel Callon, Donna Haraway, Sheila Jasanoff, Bruno Latour, John Law, Donald MacKenzie, Emily Martin, Annemarie Mol, Susan Leigh Star, Marilyn Strathern, Sharon Traweek, and Helen Veran, among several others, have been adapting and using these tools to show just how problematic borders and origins can be in the world of scientific and technological artifacts.

The tension between the processes of construction and deconstruction of origins as indicated above, leads us to the following question: in the context of the increasing investments in framing intellectual property, how far can postcolonial deconstruction of the colonizers' truths be relied upon to fight relations of effective dominance? And how far can it be relied upon to help create new spaces of possibility for technological innovation under the conditions of global inequality?

Unitron, a Sao Paulo-based company, developed a clone of the Macintosh micro-computer and in November 1985 submitted a project to manufacture it in Brazil. The case thus created, Unitron´s case, addresses directly the spaces of possibility of technological creation or innovation under conditions of global inequality, spaces increasingly regulated by intellectual property rights. Starting with this exemplary case, I will address issues such as: what counts as "original" or "natural"? how did Brazilian computer engineers in the 1970s shunned or reframed notions of "original" and "natural" to build an alternative ontological political framing?

The Unitron case

During the 1970s Brazil institutionalized a special policy for the minicomputer industry. Later on, during the 1980s, the Brazilian dictatorship carried on many of the previously adopted requirements for the minicomputer industry to the microcomputer industry regulation. I have gone into the operational details stressing the differences between the 1970s and the 1980s of this policy elsewhere.[1] Here it is sufficient to keep in mind that segments of the computer domestic market were supposedly reserved for manufacturers who had development labs in Brazil and had in fact locally designed their computer models. Prospective computer manufacturers were required to present their local development projects, schedules, and budgets to the Brazilian government, and have them approved before they started operations. In the 1980s, the Brazilian government agency in charge of the computer industry policy was named S.E.I. (*Secretaria Especial de Informática*) and CONIN (*Conselho Nacional de Informática*) was the name of a special court that was set for appeals against S.E.I.'s decisions.

As many of us know, the Macintosh computer, the most important and successful alternative to the IBM PC model/ concept, was developed by Apple Computer Company. In contrast to IBM, Apple tried to enforce and maintain strict control over the property rights of the technology and functional characteristics of its product. In the 1980s, Apple had a history of taking aggressive legal measures to prevent the copying of its computers. There are two ways to produce clones: namely, simply copying or, alternatively, reverse-engineering the original model. Through reverse-engineering, it is possible to duplicate the functionality of a computer system without exactly copying it. In the United States a company called Language Arts reverse-engineered the functional characteristics of the software of the Apple II computer and

[1] Marques, Ivan da Costa., 2002. 'A New Look At An Old Devil: the computer market reserve in Brazil' in Széll, György and Cella, Gian Primo (org). *The Injustice at Work. An International View of the World of Labour and Society*. Frankfurt, Germany: Peter Lang International, pp. 486-506. Also Marques, Ivan da Costa, 2000. "A New Look At An Old Devil: the computer market reserve in Brazil" in the *Proceedings of Third Triple Helix International Conference*, Rio de Janeiro.

figured out how to make a different set of programs do the same thing. Although Apple tried to fight the Language Arts programs, its attempt was not successful, as the programs were not direct copies and, therefore, did not violate Apple's copyrights. Language Arts then supplied the programs for the Franklin computer and the Laser 128 computer. This strategy of duplicating program functionality without copying the actual software was also used by Compaq, Phoenix, and other companies to create IBM-compatible machines that could sell legitimately without violating IBM's copyrights. In May 1988, Frederic E. Davis, editor in chief of the specialized journal MacUser, wrote: "The question is, can any company duplicate the functionality of the Mac's ... programs without violating Apple's copyright? I think the answer is yes."[2]

In 1987 S.E.I. had commissioned two universities to make independent reports on Unitron's project to manufacture a Brazilian Macintosh computer.[3] Both reports concluded that Unitron had conducted a reverse-engineering process and did not actually copy Apple circuits or programs. According to those reports, and also to a third one made by S.E.I.'s staff, Unitron's technical personnel had a sophisticated knowledge of the product and its internal logic, as well as detailed development documentation.[4] Those reports also indicated that Unitron had subcontracted parts of the development work. A state-owned laboratory, C.T.I. (*Centro de Desenvolvimento para Informática*), was hired to introduce test vectors in the circuits. For parts of the development and implementation of some circuits, Unitron hired National Semiconductors in Santa Clara, California.

The first version of the product, labeled MAC 512, was nicknamed "Mac of the periphery," in an allusion to its origin in a peripheral country. Unitron utilized an external case that was an exact copy of Apple's case. This gave Apple the opportunity

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[2] Davis, Frederic E. "Send in the Clones" in *MacUser*, May 1988, pp. 13-5.
[3] Reports were made by Universidade Federal do Rio de Janeiro (dated 5/14/87) and Universidade Federal do Rio Grande do Sul (dated 5/19/87).
[4] SEI report on process F-41025/88-1 dated July 28, 1988, p. 3.

to easily publicize Unitron in Washington D.C. as a pirate enterprise. In 1987 Apple had placed two apparently identical machines, one original made by Apple and one clone made by Unitron, side by side in a lobby in Capitol Hill, and dressed the latter with the pirate flag.[5]

As of November 1987, according to the S.E.I. report, "Apple had not filed any patent relative to the Macintosh in Brazil, and would not be able to do so in virtue of the time elapsed since the launching of the Macintosh in the market". The report concluded that "within technical bounds the project [to manufacture the clone of the Macintosh] complies with current legislation and we recommend its approval".[6] After recommending approval of Unitron's request to manufacture a clone of the Macintosh, the same report points out, as a closing remark on page 7, that Unitron's design would violate Apple's rights in those countries in which Apple had filed patents, although it did not violate Apple's rights in Brazil. Furthermore, according to a separate S.E.I. report of November 1987 the software part of the project should be approved as an indigenous development ("category A").[7]

According to all evidences, Apple had not protected its rights in Brazil and Unitron had not broken any Brazilian law with its clone of the Macintosh. The Brazilian government was compelled to approve Unitron's project. But this fact was unacceptable for Apple and the U.S. government, who in retaliation threatened to impose commercial barriers to exports from Brazilian firms to the U.S. By the end of 1987, among the disputes and controversies about the Brazilian computer industry policy, something had to give in. The "software law" in Brazil appeared as

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[5] *VEJA*, Micro vetado - CONIN proibe a venda de computador Unitron, Sao Paulo: December 28, 1988, p. 42 (VEJA is a sort of local equivalent to the TIME magazine in Brazil. It claims to sell over one million copies of its weekly edition all over the country with a high concentration of subscribers in the richer southern states).

[6] *SEI* report of process F-026398/85 approved on November 20th, 1987, p. 5.

[7] *SEI* report referent to process 07824/87-4 (Registro do Sistema Operacional do Microcomputador Mac512), dated November 11, 1987.

the weakest link on the network and gave in. The network, and along with it the legal framing of Unitron's project, was modified.

On December 18th, 1987, under heavy political and commercial pressure from the United States, a new law regulating the software sector was passed.[8] An addendum to the report on the software part of Unitron's project was drawn up on January 22, 1988.[9] According to this addendum, approval of Unitron's project should be dependent on the presentation of further information by Unitron, and possibly further developments should be required.

From this point on, Unitron faced difficulties: on January 27, 1988, Unitron formally required S.E.I. to approve its project, asserting that all requested information had been presented. On March 15, 1988 Unitron took legal action against S.E.I. claiming the right to have its project immediately approved. On March 21, 1988, S.E.I. denied Unitron's project based on "Unitron having started commercialization of the product prior to final approval".

We may pause the story here, first to suggest that, at least in some cases, once the limits of a frame of reference have been technically circumscribed and fixed, the difficulties in duplicating the functioning of products are relatively small, even for those classified as technology intensive products such as the Macintosh. Inside a laboratory, it is possible to clone a given computer at relatively low costs by duplicating its functional characteristics within a well-defined framing.

Second, matters are fluid and borders are not stable. Precise limits, permanence, and obduracy are always provisional. Here the fluidity of the intellectual property

[8] Law no. 7646, known as "software law". Brazil had no specific law for the software industry. In passing this law Brazil made concessions to American demands.
[9] Addendum to technical report of November 11, 1987, dated January 22, 1988, relative to process 07824/87-4.

law, which partially organizes economic framing, is illustrated. The Brazilian government was on the verge of approving Unitron´s 512 by saying that Apple had not deposited Macintosh patents in Brazil. But this was unacceptable to Apple and the U.S. government, who threatened to impose commercial sanctions. Something had to give in. Brazil's "software law" appeared to be the weakest link and was modified. Unitron's model 512 legal status changed. Governmental powers and the legal order are linked and not independent as theoretical constructions of the modern nation states claim – which explains the oscillations of the legal order as it moved from one form of stability to another form of stability that included the interests bundled in governments.

But, returning to Unitron's story, in spite of and maybe contrary to what S.E.I. expected, the new legal order, that is, the new framing provided by the new "Software Law", did not push the costs of cloning the Macintosh computers sufficiently high to make Unitron give up its initiative. Unitron had revaluated the situation and decided not to stop. They decided instead to abandon the 512 model and, I say, to add a law office to its laboratory in the strict sense. In this extended laboratory, Unitron had started to study/ clone the Mac 1024, Apple's next model. On March 29, 1988, Unitron filed a new project to manufacture a clone of Macintosh's new model, designated Unitron 1024. As of August 1988, Unitron had changed both the external case and the internal characteristics in the new model of its computer. After further interactions with governmental institutions, universities, and National Semiconductors, Unitron explicitly claimed to have completed the design of a clone of the Macintosh using reverse-engineering techniques. In a few months the new extended laboratory had remade the accounts, watching the new framing attentively, deciding carefully what should be done on the basis of costs of developing and reverse engineering, so that, borrowing Geoffrey Bowker's words in his precious study about the patents of Schlumberger, Unitron's

> "account [became] *respectful* enough to go to trial with, and that was all that was needed."[10]

Nevertheless, on August 1, 1988, S.E.I. denied approval to Unitron on grounds of "technical deficiencies".[11] On August 10, 1988, Unitron appealed to CONIN (*Conselho Nacional de Informática*) to have S.E.I.'s decision reviewed. The costs of cloning had undoubtedly gone up for Unitron, who had to pay for new rounds of interaction with government, universities and other contractors. But the extended laboratory allowed Unitron to appear confident before a court of appeal, claiming that its model 1024 could be "legitimately approved in Brazil or in any other country, since it is the result of an inestimable work of reverse engineering of the original American machine."[12] In a few months Unitron had remade its cloned machine, avoiding characterization of violations of the new juridical statute, and claimed before CONIN, against S.E.I., its right to manufacture a legal clone of the Macintosh computer.

Representation on CONIN was heavily balanced towards government interests, since it was composed of eight delegates of the federal government ministers and eight independent representatives of civil society.[13] On December 19, 1988, CONIN turned down Unitron's project in a vote 8 to 7. All seven independent representatives who were present voted for approval of Unitron's project.[14] All ministers voted against approval with the exception of the Minister of Aeronautics, who abstained.[15] Geraldo

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[10] Bowker, Geoffrey, 1994. *Science on the Run — Information Management and Industrial Geophysics at Schlumberger, 1920-1940.* Cambridge, Mass.: MIT Press. P. 124. Emphasis on the original.
[11] Source: Appeal to CONIN on part of Unitron for reevaluation of SEI's decision to revoke the project of manufacturing a clone of the Macintosh in Brazil, dated August 10, 1988, p. 11.
[12] Ibid, p. 1.
[13] In case of a tied vote, the Minister of Science and Technology, president of CONIN, would have the final word.
[14] The representative of the Union of Data Processing Industry Employees, A.P.P.D. (Associação dos Profissionais de Processamento de Dados), missed the meeting.
[15] *Jornal do Commercio,* December 20, 1988.

Azevedo Antunes, the main Unitron shareholder, declared he would fight CONIN's decision in the courts[16], but he never did. Unitron closed.

Based on Unitron's story, can we still maintain that the difficulties for the initial cloning of foreign technologies (in Sao Paulo, Brazil) are relatively small? Is it relatively easy to copy or reverse engineer without a violation of rights? If so, why is success elusive? I will first make an argument suggesting that the reverse engineering of a high-tech product in a given legal frame is relatively easy, even though Unitron lost its appeal by 8 to 7 votes.

1) A nuanced if bitter discussion proceeded from August to December 1988, when CONIN came to a verdict about Unitron's claim to clone the Macintosh computer. In 1988, the computer industry policy was already under domestic criticism for alleged obsolete, high priced products, and for not having developed Brazilian firms that would be able to export like Korean companies. Unitron's project, disentangled from its juridical appeals, might plausibly turn into a golden opportunity for export. However, important private companies in the Brazilian PC market feared eventual competition from Unitron, the lone company on the Macintosh market. Taking a "practical" approach, they did not want to witness a (possible) striking success for Unitron. Then, in private, these companies did not hesitate to accuse Unitron of "immoral behavior." Influenced by these larger companies, and certainly eager to compromise with American demands, high ranking government officials of S.E.I. argued that Unitron's problem was a "moral and not [a] legal" question, and therefore the executive branch should act to avoid further international embarrassment. In other words, larger Brazilian private capital investors did not find a way to stand up in public against Unitron but worked from inside the business/government network, exerting influence and making it easy for United States pressure to become effective.

[16] *Jornal do Brasil,* December 20, 1988: CONIN decide que Unitron näo pode fabricar micro.

2) Mathias Machline was the owner of several firms, including SID, a computer manufacturing company that was among the five largest in the country. One of S.E.I. reports in 1987 mentions that Richard Herson was a consultant working for Apple.[17] In December 1988, Geraldo Azevedo Antunes, the founder of Unitron, said to newspapers that Mr. Herson had selected Mathias Machline as the prospective Apple's partner in Brazil, noticing that Mr. Herson had been nominated vice-president of Mathias Machline's holding company.[18] We may conclude that Mr. Machline was the kind of man who would have something special to lose if a third group (Unitron, for instance) made a successful entry into the microcomputer market with a clone of the Macintosh. It so happened that Mr. Machline was also a notorious friend of the president of Brazil, José Sarney. On the eve of the CONIN meeting, the Minister of Science and Technology, who headed CONIN, said that the "Unitron 1024 is substantially different from the Macintosh ... all will depend on instructions to be received from Mr. Sarney."[19] In all likelihood Mr. Sarney did instruct the votes of the ministers, who voted all consistently against Unitron, with the exception of the Minister of Aeronautics who abstained.

3) The independent representatives in CONIN thought that Unitron's claims should be settled at the courts of the judiciary power and not decided in CONIN, a court of appeal of the executive branch of government. An important person among these representatives, Claudio Mammana, the president of ABICOMP (Brazilian Computer Industry Association), shared this view. He had had the opportunity to express ABICOMP's official opinion in a meeting with the E.I.A. (American Electronics Industry Association) in the United States. On this occasion, Apple's representative admitted that his company had not filed patents for the Macintosh in Brazil[20]. On the day after CONIN's decision, Claudio Mammana declared that "although the question

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[17] SEI's report on process F-026398/85, dated Nov 20, 1987, p.6.
[18] *Jornal do Commercio*, December 20,1988 and *O Estado de São Paulo*, December 20, 1988.
[19] *O GLOBO*, December 19, 1988, p. 15: Conin decide hoje se libera Unitron.
[20] Interview with Claudio Mammana, President of ABICOMP during 1987-8. Brasília: September, 3rd, 1996.

of United States pressure had not been addressed directly by the government at the [CONIN] meeting, the correlation between Section 301 of [the U.S.] Trade Act and the Unitron issue is too close to be overlooked."[21] But ABICOMP's president was not a businessman. As a professor of the University of Sao Paulo, he was a qualified employee who was respected for his intellectual skills, but his views were considered "theoretical" among representatives of the local capitals associated in ABICOMP.

First I claim that "it is relatively easy and inexpensive to copy or reverse engineer without violation of rights", because Unitron's case provides evidence that *a small firm with very limited staff in a peripheral country was able to produce a respectful enough account of its deed to go to trial with, and that is all that is needed*, for the composition of CONIN was unbalanced. Courts are located in a wider set of relations. And here we can summon Geoffrey Bowker's memorable study on Schlumberger patents to say that:

> "[in the battles fought in the courtrooms,] competing histories were at stake, and were being defended within a fairly strict framework. Most notably, there was an explicit agreement that this cloistered, rule-driven activity can decide an historical truth. Many of the actors concerned recognized explicitly, outside the courtroom, that the debate was really decided elsewhere; and yet there was a vested interest on the part of actors inside the courtroom in protesting that the show was all."[22]

On December 19th 1988, 8 delegates were government representatives, and in all likelihood the president of the Brazil instructed them to vote against Unitron. Since one minister abstained, the president of CONIN had to use his prerogative. The independent "representatives of civil society" who were present, a total of 7 in all, voted for Unitron. Had A.P.P.D.'s delegate not missed the meeting, it is likely the verdict would be different. All of the above strongly suggests that the legal case was respectable.

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[21] *O GLOBO*, December 20, 1988, p. 24: CONIN veta fabricação do Unitron
[22] Bowker, Geoffrey, 1994. *Science on the Run — Information Management and Industrial Geophysics at Schlumberger, 1920-1940*. Cambridge, Massachusetts: MIT Press, p. 113.

But if "it is easy to copy or reverse engineer without violation of rights" then why was success elusive? Unitron's case suggests that the answer exceeds the technical – and indeed the legal framing. The independent representatives in the court thought that the dispute should be settled in "the fully independent courts [of the judiciary]" instead of CONIN, which was under a too strong influence of the executive. And, though it is difficult to show this, it is possible that Apple did not feel confident that the Brazilian – or even non-Brazilian – courts would find in its favor, since after all it had not deposited its patents in Brazil. At any rate, Apple never sued Unitron, but hired lobbyists instead. Supposedly lobbyists know better how to cope with flows that escape framings. As I have just noted, Apple and Unitron never faced each other in court. But recognition of "fully independent courts" is an effect of the naturalization of the assumption of existence of completely defined stable (pure, unproblematic) boundaries of objects (and subjects).

Inside the courtroom only the veracity/ respectability of history matters, and the work to juxtapose the elements to carry ahead the construction of the object is a background. Outside the courtroom, however, historical account is

> "irrelevant background noise to the *real* focus of company activity. Strategies for imposing patents outside of the courtroom involve all kinds of different uses for them (and sometimes workarounds for being able to do without them)."[23]

Which is what I suggest happened with Unitron. To summarise: in a few months Unitron was able to make the cloning of Apple's products legal. It was able to re-organise the relevant heterogeneous elements to separate unacceptable "copying" from acceptable "reverse engineering". But this was not enough. Its laboratory (extended by a law office) still worked within a framing, and every framing has externalities which imply that a dispute may be decided elsewhere. Scientific framing overflowed into legal framing. But then the legal framing overflowed into a

[23] Bowker, *op. cit.*

political and an economic framing in such forms as “conflict with the USA”, “competitors in the PC market”, “friends of the president”, “moral but not legal questions”. Which finally allowed Apple to bar Unitron – but from *outside* the courtroom.

The study of Unitron’s case suggests new spaces and translations for negotiations of technoscientific objects and (perhaps possibilities of less violent?) transformations of relations of dominance of the kind of colonizer-colonized in certain regions. Changes in spaces are related to the expansion of laboratories and law offices to include each other into new spaces (factory-laboratories attached to law-office-courtrooms) of fact and machine construction in the colonized world; new translations involve the proposal that the colonized might see artifacts constructed in the extended modern laboratories of the colonizers as natural objects, and *ab initio* to research into them by integrating them into an unknown Nature-Society whole. In this unknown, Nature and Society are not yet demarcated.

New spaces

Unitron’s story suggests new spaces. The frontiers between Apple and Unitron machines could not be conclusively established once and for all, as if there were stable borders. As in all contacts and contracts, frontiers between designs of machines of different manufacturers can never be specified to their definitive limits for they are moving borders. At any given moment they can only be an effect of permanent movements of patent offices, referees, lawyers, lobbyists, courts, engineers, chemicals, boxes, electrons, semiconductors, governments, subcontractors, competitors and users.

More traditionally, laboratories are perceived as spaces of purification, restricted places where purified objects (theories and machines) are constructed. In the last

decades, however, STS have highlighted that hybridization proliferates intensively in the contemporary life-world, and actually hybridization has never ceased to accompany purification. If we take the standpoint that even the colonizers "have never been modern" we will see a life-world where there are no pure beings, all actions are always mediated and there are only provisional juxtapositions of heterogeneous materials. What is the effect of this perception of overall presence and permanence of hybridization upon our perception of the laboratories? One effect is the following: a great part of the previously invisible work necessary to create stable borders and origins of objects (purity as opposed to hybridization) becomes visible, and a great deal of it happens outside the laboratory. Or, alternatively, if we approach the question from the other side, a whole lot of places that we previously took for granted to be separated from the laboratory are part of it. A new space is created: the laboratory space expands into the spaces of many other institutions in society, reaching out for the limits of its entirety.

More specifically, Unitron's story suggests a new laboratory space for the colonized. In this new space the work of hybridization, which accompanies the work of purification, is made explicit. The first move towards the creation of this new space in the business firm is the explicit deconstruction and crossing of the borders between factories and laboratories and law offices and courtrooms. Inside the firm, the same space and time establish the laboratory and the law office. A laboratory-law-office is created. Developments of purification in the lab become explicitly entangled with, and inseparable developments of, hybridization in the law office. Decisions about what and how to purify are taken with explicit concern for those forms of hybridization that best contemplate local, colonized agents or interests, that is, (always provisionally) situated agents or interests that oppose the primacy of the origin. The work of division, that is, the construction and stabilization of origins and borders that define objects and subjects, is made explicit taking into account local conditions of the colonized. Every technoscientific element – a scientific fact, a technological artifact, a specialized profession or

discipline – is an open network and extends itself over an intricate mesh of present and absent patents, several colonizer's technological control policies, import-export balances, job opportunities, labor practices, and other changes, which it undergoes and prompts. The extended laboratory-law-office space seriously recognizes that all this – this heterogeneous network – constitutes the technoscientific element and should be part of its assessment when it is considered incorporated into a machine or an agreement in the colonized world. The move to establish the extended laboratory-law-office space is nothing more than the late recognition by the colonized of how technoscientific actants are really made. While the always provisional form of a technoscientific element may be incorporated in the colonized world, its origins and borders constructed by the colonizers may be redefined, even radically so. In an optimistic trend, when and if taken seriously, such late recognition may bring colonizer-colonized relations to a more balanced situation, and transform and relieve its tension.[24]

Modern laboratories and courtrooms are places where the separation between Nature and Society are constructed and maintained. Cloning takes place on the construction of this frontier,

> "capitalizing on the fact that you can not tell by looking at a motor vehicle [or a computer] whose it is, or the power it mobilizes."[25]

Bruno Latour refers to technoscientific elements as the "unexpected allies [of fact builders]" in the construction of the modern world, actants who come to the help of the colonizers in the work of division, helping them constantly to reconstruct and keep stable the borders separating their nature from their society. However, the fidelity of these actants is not something natural or guaranteed. The Unitron case

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[24] Note that radical redefinition of their origins and borders is what the colonizers usually do with certain elements of knowledge of the colonized, such as the healing properties of plants, possessed by certain members of tribal societies, such as the shaman.
[25] Strathern, Marilyn. 1999. *Property, Substance and Effect – Anthropological Essays on Persons and Things.* London: The Athlone Press. p.158.

shows that the fidelities of technoscientific elements do not spontaneously maintain themselves – technocientific elements are more or less easily diverted on the frontiers. The unexpected allies of the colonizers are prone to be unveiled, modified and cloned.

Fidelity of these unexpected allies is maintained and imposed through the work of division, the construction of specific frontiers and links. Movements that alter links and cross frontiers may be regarded as unacceptable 'copying' and rejected, or, alternatively, as unavoidable (and socially beneficial) 'reverse engineering' and accepted in negotiations concerning the work of division between colonizers and colonized. And one important thing that the work of division intertwines with is the naturalization of the mechanisms of attribution of authorship and the intellectual property that results from them. And this is where this article hopes to fix a stake into concerns with investments in intellectual property framing and the mobilization of philosophical deconstruction together with STS studies, to fight relations of effective colonizer-colonized dominance.

Unitron's case suggests that the colonized explore the ontological politics that flow from the fact that the fidelity of technoscientific elements to the colonizers partially depends on

> "the possibility of being able to attribute 'authorship' to products of the intellect, and thus turn debate about property rights from rights of possession to rights of creation." (Strathern 1999:161).

According to Bruno Latour, those unexpected and indispensable allies "do not look like men or women"[26] and with the benefit of hindsight the colonized can verify that that is true for an iron ax, a hunting rifle, a motor, a microbe, a medicament, a vaccine, a paved road, or a telephone. So now the question is: how can the

[26] Latour, Bruno. 1987. *Science in Action – How to follow scientists and engineers through society*. Cambridge: Harvard University Press. P. 121.

colonized better negotiate their encounter with a computer, a virus, a drug, a cell phone, a diagnosis equipment? How can these unexpected and indispensable allies of the colonizers be seen? Unitron's case, and also previous developments of mini-computer systems in Brazil, suggest that the colonized may see these contemporary artifacts constructed in the extended modern laboratories-factories-law-office-courtrooms of the colonizers as natural objects, and *ab initio* research into them by integrating them into a not yet demarcated Nature-Society whole.

New translations and other respectful accounts

During the 1970s the proposal to develop a computer technology in Brazil was partially grounded in the idea of granting the high status of "scientific research" to the local activity of "discovering" the workings of foreign technologies and learning how to reproduce them. The relative originality of this activity was recognized among computer professionals, who claimed that "discovering the works of foreign technology" should be considered legitimate work of original research within a nation that does not know how to make the technoscientific artifacts it uses. Brazilian computer professionals in the 1970s thought as if the unknown in foreign technology were embodied into the unknown in Nature. The evolvements of such attribution of meaning (foreign technological products to be regarded as part of Nature) exceeded, and very much so, the walls of the university departments of linguistics and philosophy. It was in the 1970s that governmental financial agencies started to provide money for the graduate schools of engineering to accomplish the reverse engineering of foreign technology products that were already available on the market. The decisions to allocate public money to open the technological black boxes that were commercially available came together with a rhetoric that, in the 1970s, granted the high status of academic scientific researchers to those who were researching into foreign technological black-boxes in the universities. More traditionally, this high status had always been reserved only for those who pursued the so called uninterested search of knowledge, or who did research interested in knowledge for its own sake, or research solely interested in the advancement of

"Man's knowledge" about Nature (human knowledge imagined as unified and metaphorically made equivalent to a stock of knowledge of the human species).

In Brazil in the 1970s, computer professionals argued that development of local scientific and technological knowledge would produce better effects than imported knowledge. This vision of localizing and locating knowledge (which resonates with the later STS/feminist notion of "situated knowledge") became dominant for a time among Brazilian computer professionals, who rendered problematic the dominant meanings of "efficiency" and "not re-inventing the wheel" that granted legitimacy to the adoption of ready, imported technology. Thus computer professionals mobilized nationalist sentiments and partially deconstructed the universalism vested in sciences and technologies imported from the colonizers ("developed world").

The idea of the inadequacy of foreign technology was brought to the foreground by computer professionals, who translated to the realm of conception and adoption of minicomputer technology what Roberto Schwarz calls a "cultural *malaise*":

> "the fake, unauthentic and imitative character of [Brazilian] cultural life ... [which] is in tune with the feeling of contradiction between national reality and the ideological prestige of the countries which serve Brazil as models ... [which] goes from the inoffensive (Santa Claus wearing an Eskimo outfit in a tropical country) to the horrifying (when the policy of Human Rights of the Franco Montoro administration was put in use for the benefit prisoners [in Sao Paulo], there were manifestations of popular discontent: why should warranties be granted to the convicted, since they lack for many people outside the jails? From this standpoint, the Human Rights would be fake in Brazil ...)."[27]

[27] Page 29-30 in Schwarz, Robert. 1987. "Nacional por subtração" In *Que horas são?* – Ensaios. Sao Paulo, Brazil: Companhia das Letras, p. 29-48. Also published as Schwarz, Roberto, 1988. "Brazilian Culture: Nationalism by Elimination" In *New Left Review*, No. 167, Jan-Feb, p. 77-90 (translated by Linda Briggs).

Schwarz argues that, since the 19th century, those whom he calls the "educated people of Brazil"[28] live this *malaise*. They have the feeling of living among ideas and institutions that are copied from abroad and do not reflect local reality. They feel an inadequacy. As members of the social category "educated people of Brazil", living between colonizers and colonized, Brazilian computer professionals in the 1970s experienced this *malaise* and inadequacy in various ways. Sometimes they submitted to it. But they also created prototypes whose design reflected the inadequacy of foreign products in a local context.[29] In one way or another, then, Brazilian computer professionals translated cultural *malaise* into technological dependence, and tried to experiment with it.

Brazilian computer professionals first appropriated a marked difference in the discourse of the industrial engineering of the colonizer: the difference that separates the activities of industrial assemblage of computers from what would more properly be called production (conception, design, fabrication, circulation and use) of computers. They used this marked difference to accentuate that, with the help of techniques of the organization of production, modern industrial engineering makes it possible that a specially guided and (historically) conditioned group of people perform the assemblage of industrially produced goods without expanding the context of their activities and without actually knowing (discovering) how these

[28] Schwarz stresses that the concept does not mean a homage but refers to a social category. (Schwarz, *op. cit.*, p.38-39)

[29] In the data processing center of the Brazilian internal revenue service, SERPRO, they developed a "keyboard concentrator", which was inexpensive and simple but, for SERPRO's needs, advantageously substituted for the imported data entry systems equipped with expensive video terminals that were used abroad. In the data processing center of the Federal University of Rio de Janeiro (NCE/UFRJ) they developed a floating point electronic processing unit, a hardware piece that executed floating point arithmetic operations typical of scientific calculations much faster than software subroutines. This kind of hardware processor was not an option offered by IBM for the IBM1130 computer. Since most of the workload of university IBM1130 computers was scientific calculus, this development more than doubled the throughput of the machines, extending their use period and postponing the importation of new machines. In the Brazilian Navy, military security was problematized by military computer professionals. They claimed Brazilian engineers did not have the technological capacity to maintain Ferranti computers on board the frigates recently acquired from England. Brazilian computer professionals translated cultural *malaise* into technological dependence and interacted with it by constructing local prototypes.

goods are made and created. On their journals and conferences, computer professionals pointed out that IBM and Burroughs were assembling the latest generation of computers in Brazil with nearly no participation of Brazilian engineering. In a semiotic turn they used a constructed frontier that organizes the discourse of the industrial engineering of the colonizers – the separation between conception and execution of work basic in the until then (1970s) consecrated taylorist-fordist paradigm of labor and production organization – to create a new field of meaning with different effects among the colonized. Computer professionals claimed that the reproduction of the marked separation conception / execution on the scale of countries or nations reified an international division of labor which assigned the execution, i.e. the task of assembling, to the colonized, while preserving the conception, i.e. the tasks of discovering, inventing, constructing, creating, and organizing computers, to the colonizers.

Another semiotic move (or translation) accrued two meanings to the imbalance of international division of labor previously highlighted: 1) the lack of knowledge of how computers were created (conceived and designed) became the cause of the engagement of Brazil on the side of execution in the international division of labor; 2) engagement on the side of execution meant a comparative economic disadvantage. This double (indeed more complex) construction of meaning, which translated lack of scientific-technological knowledge as the cause of the economic disadvantage in the (con)text of the international division of labor, and consequently as the cause of poverty, was spread by a short story repeatedly circulated and discussed among Brazilian computer professionals in the 1970s.

The “story of the Indian” told about a tribe who depended on hunting buffaloes to eat. They had adopted the rifle as a hunting tool, fascinated at first by the free time gained through the use of the rifle (since free time was promised by the “efficiency” of modern technology). But in adopting the rifle for more than one generation the Indians had forgotten the techniques of the arrows and bows and had taken no

steps to discover how the rifle and the bullets were made (since "re-inventing the wheel", they were told, would not be a good investment of their resources). Having convinced the Indians, the white man could then increase the price of the rifle, demanding in exchange for it more and more products from the tribe. In the extreme situation the Indians were assembling the rifles and even exporting them to the white man to pay for the methods of fabrication of the rifle. Hundreds of Indians had to work many months to "barter and trade" what they produced for something a few white men took much less time to produce.

This was, in short, the economic explanation for the tribe's trajectory from abundance to misery. Just like every statement that is running to become a fact, this one would be true or false depending on what the others did with it. And yet, more important than its veracity or falseness were its effects of truth. One of its effects of truth was to help to elevate the status of the activity of researching into foreign computers that were already commercially available, but Brazilian engineers did not know how to make them (conceive and design). The higher status helped to multiply the funds for technological research in the labs and graduate schools of computer engineering in Brazilian universities. Complex and rich histories of the development of a minicomputer industry in Brazil followed in a sequence of configurations and translations of meanings.[30] A stock of prototypes (texts, facts, and meanings under construction) demanded a channel to flow to the market. Obligatory points of passage would be the firms that would transform prototypes into marketable industrial products.

[30] See, among others, Adler, Emmanuel. 1987. *The Power of Ideology – The Quest for Technological Autonomy in Argentina and Brazil.* Berkeley: University of California Press; Dantas, Vera. 1988. *Guerrilha tecnológica – a verdadeira história da Política Nacional de Informática*. Rio de Janeiro: LTC Editora; Evans, Peter. 1995. *Embedded Autonomy – States and Industrial Transformation.* Princeton: Princeton University Press; Schoonmaker, Sara. 2002. *High-Tech Trade Wars – U.S.-Brazilian Conflicts in the Global Economy.* Pittsburgh: University of Pittsburgh Press.

But there were no Brazilian firms or foreign computer manufacturers who were inclined to run the risk of adopting locally developed prototypes to complete their path to the market. In other words, to complete their construction as technoscientific facts. An alliance with the State was designed by computer professionals to catalyze and attract entrepreneurs who would be willing to develop these technologies so long as they were protected in the market from other entrepreneurs in possession of foreign technologies. Thus the industrial policy proposal was made around 1975, which in 1977 resulted in a minicomputer market reserve, conceived and sketched by a community of professionals. Strangely, they did not have a significant presence of businessmen among them but, rather, mainly university professors and managers of state owned data processing bureaus. So, I claim, the Brazilian computer business entrepreneur and manufacturer was *ab initio* an imagined semiotic character, an interlocutor for a material discourse (texts and prototypes) created in a community of professionals, who went after their interlocutor, searching for and actually constructing her/ him together with a government agency (CAPRE). All of which worked well, for within five years the Brazilian minicomputer market was supplied with locally developed products by local firms.[31]

This, I contend, can be understood as a situated encounter between two colonizer-colonized discourses. One of economic development (globalization, Enlightenment). And the other about the generation of science and technology in Brazil (autonomy, Romanticism). The different translations of the "story of the Indian" led to new links between heterogeneous actors (actants) and configured a campaign for technological autonomy. It suggested that artifacts produced by foreign technologies should be studied just like natural phenomena – that this was legitimate scientific work. It materialized the idea, implicit in the "story of the

[31] See Tigre, Paulo Bastos. 1983. *Technology and Competition in the Brazilian Computer Industry*. London: Frances Pinter (Publishers).

Indian", that what is made by (an artifact for) the white man (_foreign) may belong to Nature for the Indian (_Brazilian). That is, it may be "non-Indian", or "non-human" for the Indian. "Technology is imported magic" is a Brazilian saying. The foreign computer, something which can be felt and sensed but not understood, integrated itself into Nature and thus became "non-human".

Foreign computers experienced the effects of a process of "othering": they became part of nature, their commercial entanglements could be *ab initio* unmade and they could be studied in the realm of "things in themselves", separated from the realm of "men among themselves". This move would also constitute Brazilian scientists-engineers-lawyers as fact constructors, whose work was *ab initio* directed upon foreign technological black-boxes as if they were natural phenomena. And Brazilian scientists-engineers-lawyers were constituting themselves as professional subjects in the same process that was constituting their objects. And, also, the persons who were these scientists-engineers-lawyers were complex entities with many other links, which might or might not resist the tests of strength that would succeed. And tests of strength are linked to schemes of domination involving the interplay of the visible and the invisible.

In/visibility

When a friend of mine who is a knowledgeable professor in England first went to Rio de Janeiro, he *ab initio* saw a child begging by a car as a child who belonged to that car. Though he had no difficulty in seeing the adult beggars straight away (they immediately recall the categories of the beggars in the big cities of rich countries), he did not see that attractive and androgynous figure as a child wandering alone in the night, begging in a big city. It may be that for someone coming from the affluent

North, the category "street child" is not strongly or immediately stabilized.[32] In the absence of stabilized categories things become invisible, they are not recognized and may be more easily repressed or denied. "That child who belonged to no adult" might be an entity that remained invisible, outside the universe. An entity which did not exist.

This little story illustrates something we know well: categories construct what is visible. They shape, conform and confirm objects (and subjects as well). And categories also hide.[33] In addition to making visibility possible, categories are like Pierre Bourdieu's schemes of domination, and when their form is sufficiently stabilized, they acquire "the opacity of things"[34], rendering that which is behind them invisible or removing it from the field of sight. The struggle for power is the struggle for the imposition of the categories of perception of this world. Categories of technoscience[35] are constructed in the (extended) laboratories of the colonizers, and the latter try to ensure that the tests of strength (in controversies) are squeezed through laboratories and courtrooms because in these locations they are better equipped to stabilize their categories.[36] Colonizers have learned to construct a rhetoric so powerful that those who insist on denying their categories are ridiculed, isolated and considered mad. If different ontologies create different entities that populate Nature-Society, then one battle- front in the contact zone between

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[32] Law, John & Ivan Marques, 2000. "Invisibilities" In Steve Pile & Nigel Thrift, (eds.) *City A – Z*. London: Routledge, p. 119-121.

[33] To illustrate a correlative point in a simple way, Thomas Kuhn refers to experiments in which people had difficulties promptly recognizing playing cards where the colors did not correspond to their suits (a black king of hearts, for example).

[34] "... domination no longer needs to be exerted in a direct, personal way when it is entailed in ... social formations in which, mediated by objective, institutionalized mechanisms, such as those producing and guaranteeing the distribution of "titles" (titles of nobility, deeds of possession, academic degrees, etc.), relations of domination have the opacity and permanence of things and escape the grasp of individual consciousness and power." Bourdieu, Pierre, 1977 (1972). *Outline of a Theory of Practice*. Cambridge : Cambridge University Press, p. 183-184.

[35] Categories of technoscience are (n-1)th ... n ... (n+1) order forms constructed "in heterogeneous and dominating centers of calculation" (Latour, 1987, *op. cit.*, p. 245). See also Latour, Bruno, 1999. *Pandora's Hope – Essays on the Reality of Science Studies*. Cambridge, Mass.: Harvard University Press.

[36] Geoffrey Bowker's study (*op. cit.*) of Schlumberger magnificently shows this.

colonized-colonizer – the tests of strength of their categories – concerns in/visibility.

To understand science and technology as ontologies (systems of belief), which originate from the material work of purification that takes place in the colonizer's extended laboratories-courtrooms, is vital if we want to approach modernity autonomously. We need to understand how the attribution of meaning to categories works; categories that create, for instance, the opaque wall which is the effect of truth of the claim: "modern Western sciences and technologies are the legitimate spokesmen of Nature". By using apparatuses of objectification from metropolitan centers of calculation and purification (laboratories and courtrooms), extended-science-and-technology professionals align heterogeneous interests and appropriate other agents' labor, services, and deference. This is how subjection of the countries approaching modernity is created and reproduced. And the colonized need to fight a battle in order to understand the opacity of this wall. STS supply some tools to fight this battle on grounds of materiality.

The Unitron case makes it prominent that meanings attributed to 'copy' and 'authorship' shape apparatuses of modern objectification and domination that acquire the opacity of things. A copy is secondary, depends on an original, is worth less, etc. In this version of reality the author would be the creator of the original, of the independent, of what is worth more, etc. This places a minus sign before the scientific and technological efforts of the colonized, and it became the basis of the intellectual malaise of Brazilian computer professionals mentioned above. But 'authorship' directs us more to authority than to originality. There was a time when oeuvres (artifacts) circulated with no mention of their creators, freely used and modified in part by other creators. There was a time when the author – a modern

category that would identify the original creator – did not exist, and therefore there was no need to respect him or her.[37]

In order to acquire the right to be paid for their work, the creators had to assert their authority (and their authorship) over the oeuvre before others – which took place in controversies and tests of strength. They had to achieve what Latour calls the "secondary mechanism" of attribution and its spaces of in/visibility.[38] French philosophy has deconstructed the notion of copy and STS have shown that hierarchies of this sort are provisional stabilizations maintained by juxtaposition of heterogeneous materials. And, furthermore, the alignment of human and non-human interests that juxtapose materials may be researched into and put to tests of strength according to the materiality of each case.

Colonized/ national is opposed to colonizer/ foreign and original to imitated, oppositions that hide much: parts of the alien in the autogenous and parts of the imitated in the original. Though, of course, understanding these oppositions is not the same as undoing them. There is a large gap between this promise of relief and its actualization: breaking the intellectual bewildering of the colonized alone does not in itself have the strength to undo the links of the situation. It is clear that the colonizers' unexpected allies (technoscientific innovations) do not become immediately dispensable once the colonizers' prestige of originality has been partially removed.

[37] I thank Marcia J. Bossy for her comments on this point.
[38] "To follow these trials [of responsibility, where the winner takes all,] a distinction had to be made between the primary mechanism that enlists people, and the secondary mechanism that designates a few elements among the enlisted allies as the cause of the general movement." (Latour, 1987, op. cit, p. 174) and (Latour, 1987, *op. cit.*, p. 134)

Malaise, ambivalence, and impasse

Returning to the question of *malaise* and the idea that Western culture has been inappropriately copied in Brazil, the ambivalence between simultaneously copying and rejecting the models they imitate often leads those located between colonized and colonizers (like Brazilian computer professionals) into a kind of *impasse*. They simultaneously imitate and are hostile to the models they imitate. They copy to the extent that they accept the standards diffused by modernity. But those attempting to approach modernity autonomously are also involved in at least two rejections,

> "both of them ambivalent: rejection of the alien intruder and dominator who is nevertheless to be imitated and surpassed by his own standards; and rejection of the ancestral ways which are seen as obstacles to progress and yet also cherished as marks of identity."[39]

In the 1920s, Oswald de Andrade addressed these rejections. Roberto Schwarz notes that the "anthropophagous" Pau-Brazil program sought to give a triumphalist interpretation of Brazil's distance to modernity, with the disharmony between bourgeois models and the realities of rural patriarchy at its very heart. Its novelty lay in the fact that the lack of accord was seen as a source not of distress but of optimism, evidence of the country's innocence and the possibility of an alternative, non-bourgeois historical development. This *sui generis* cult of progress was rounded out with a technological wager: Brazil's innocence (the result of Christianization and bourgeoisification barely scraping the surface) plus technology equals utopia; modern material progress would make possible a direct leap from pre-bourgeois society to paradise.[40]

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[39] Chatterjee, Partha, 1993 (1986). *Nationalist Thought and the Colonial World – A Derivative Discourse*. Minneapolis: University of Minnsota Press, p. 2. Anti-Americanism amid the preference for the practicality of the modern life, requiring the individual home, car, telephone, computer, etc., and "jeitinho brasileiro" would be two examples of such ambivalent rejections noted by Partha Chatterjee. In his prized study of nationalism Chatterjee takes anchorage on John Plamenatz's distinction between two types of nationalism ('western' and 'eastern') to clarify the premises "the liberal-rationalist *dilemma* in talking about nationalist thought" (my enphasis).

[40] Schwarz, 1987, *op. cit.*, p. 37. Schwarz notes that "Marx himself, in his famous letter of 1881 to Vera Zasulich, came up with a similar hypothesis that the Russian peasant commune would achieve

Schwarz argues that Oswald's program introduced a change of tone. Local primitivism would give back a modern sense to tired European culture, liberating it from Christian mortification and capitalist utilitarianism. Brazil's experience would be a differentiated and utopian cornerstone on the map of contemporary history. Brazilian modernism therefore brought about a profound change of values: for the first time processes in Brazil were said to have something to offer the modern world. Oswald de Andrade advocated cultural irreverence in place of subaltern obfuscation, using the metaphor of "swallowing up" the alien: a copy, to be sure, but with regenerating effect. Schwarz claims that

> "[h]istorical distance allows one to see that the programmatic innocence of the Antropofagos, which allows them to ignore the *malaise*, does not prevent it from emerging anew. "Tupi or not Tupi, that is the question!" – Oswald's famous saying, with its contradictory use of the English language to pursue the search for national identity, a classical line and a play on words, itself says a great deal about the nature of the *impasse*."[41]

Programmatically innocent perhaps, but questions posed by an autonomous approach to the attributes of modernity (including the study of options in the construction of sciences and technologies) are precisely those which face the most consistent opposition among colonizers. At least until the end of the 20th century few things tended to provoke more opposition than "denaturalizing" scientific and technological progress. Albert Hirschman writes that

> "otherwise rather enterprising United Nations experts who wrote the report on commodity trade and economic development [said]: 'We are strongly opposed to retarding technological progress for the sake of avoiding the pains of adjustment which inevitably attend progress.' And they went on to advocate a father-knows-better attitude in case the industrial countries were to encourage the production of substitutes through

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socialism without a capitalist interregnum, thanks to the means made available by progress in the West. Similarly, albeit in a register combining jokes, provocation, philosophy of history and prophesy, Pau-Brazil programme set itself the aim of leaping a whole stage."

[41] Schwarz, 1987, *op. cit.*, p. 37.

> subsidies: 'Industrial countries are not in the habit of following such course unless there are weighty reasons.'"[42]

Among colonizers there is a prospect even more distasteful than interfering in market pricing: that of interfering with supposed neutral technical progress! On the other hand, the Unitron case suggests that the colonizers act differently if the prospects of winning contests of strength with standards and within established spaces are not favorable. In this case they do not hesitate to abandon their own standards and established spaces if necessary. In one of his most compelling paragraphs Latour remarks that

> "[b]y separating the relations of political power from the relations of [extended] scientific reasoning while continuing to shore up power with reason and reason with power, the moderns have always had two irons in the fire. They have become invincible. ... Native Americans were not mistaken when they accused the White [colonizers] of having forked tongues."[43]

Conclusion – inevitable hybrid embraces and dangerous dialogues

Marilyn Strathern shows how the "hybrid embrace"[44] promoted by intellectual property rights entails new practices of purification, and the right to intellectual property seeks its own new separations of Nature and Society. In the 1970s, the Brazilian computer professionals, in defending the incorporation of the unknown in foreign technology (that is, artifacts which are the intellectual property of an author) into the unknown in Nature (that is, non appropriated natural phenomena), committed what seems to be an unbearable transgression in the imperial eyes of the colonizers. But they were retracing the division between Nature (which expanded to encompass new entities or objects) and Society (which contracted to lose, for

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[42] Hirschman, Albert O., 1971. *A Bias for Hope - Essays on Development and Latin America*. New Haven and London: Yale University Press, p. 167.
[43] Latour, Bruno, 1993. *We Have Never Been Modern*. Harvard University Press. P.38.
[44] Strathern, Marilyn, *op. cit.*, p. 161.

example, copyrights and patents). We may hence think about two Natures, one delineated by the colonized (computer professionals of Brazil) and the other by the colonizers (western international capital and technoscience): the former *ab initio* incorporates as natural objects the artifacts of foreign technology, while the latter loses them as social objects assigned to an author (creator). Neither Nature (nor Society) refers to something given in a pre-discursive reality. In other words, the struggle for the fidelity of the allies of the colonizers may be displaced to new (less violent?) spaces of negotiation by increasing the visibility of the ontological policing (surveillance and punishment) of the colonizer. Colonizers appeal to a transcendent Nature and repress other ontological possibilities in order to legitimate and impose social rules and hierarchies (for example, differentiated treatment of research seeking to produce knowledge and research seeking to produce a commodity).

It is at this point that we can appreciate the ontological political character of the proposal that colonized might see artifacts constructed in the extended modern laboratories (factory-laboratories attached to law-office-courtrooms) of the colonizers as natural objects, and *ab initio* to research into them by integrating them into an unknown Nature-Society whole. In this unknown, Nature and Society are not yet demarcated. And maybe STS are teaching us how to move around on this ground treating these heterogeneous phenomena evenhandedly. But for this treatment to become effective it is clear that the colonized need to build extended counter-laboratories, which will construct new ontologies. Veritable new worlds that are not just nagging and inauthentic replications, "colonies" of Europe. Which means colonized equipped with semiotic apparatuses that can account for the forked tongues of the colonizers.

Dialogue between colonizers and colonized is inevitable but it is also dangerous. This is because the material capacity of the apparatuses of production of meaning of the colonizer ([extended] centers of calculation in Bruno Latour's terms) is

incomparably greater than that of the colonized. An asymmetrical situation is promptly established, where the colonizers' categories stabilize and acquire Bourdieu's "opacity of things", blocking the visibility of what lies behind them. Initial integration of the unknown in foreign technology into an undifferentiated nature-society seeks instead to maximize the possibilities of different "hybrid embraces". And this is the best hope at the beginning of a dangerous dialogue between colonizers and colonized. To overcome the illusion and the costs of a monologue in the imperative mode: the unidirectional vision of a civilization that flows from Europe to the rest of the world.

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