UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL
INSTITUTO DE PSICOLOGIA
Programa de Pós-Graduação em Psicologia Social e Institucional

CARLOS BAUM

Políticas cognitivas:
Negociação e performance entre psicologia e neurociências

2017

CARLOS BAUM

Políticas cognitivas:
Negociação e performance entre psicologia e neurociências

Tese apresentada como requisito parcial para obtenção do grau de Doutor em Psicologia Social e Institucional. Programa de Pós Graduação em Psicologia Social e Institucional. Instituto de Psicologia. Universidade Federal do Rio Grande do Sul.

Orientadora: Profa. Dra. Cleci Maraschin

Orientador (Sanduíche): Prof. Dr. Maarten Derksen

Porto Alegre

2017

À minha família
Composta por todos aqueles que se sentem parte dela

À Cleci pelos anos de parceria e por toda as transformações que eles oportunizaram.

To Maarten for the friendship and enduring support

À Luciana pelo amor e todos os outros elementos pré-textuais

To Annemarie, Else and other STS'ers for the adventures in a strange land

Aos membros NUCOGS pelo espaço de discussão e enfrentamento

À Carolina, Felipe, Oriana e Pablo pela reiterada acolhida quando mas importou

À Renata e Everson por todo o mimimi e ingratidão

Ao Lucas por ter tornado esses anos suportáveis

À Camila, pela leitura e escuta atenta

À Karina, Marcos, Mário, Thiago e Aline pela vida

Resumo

Baum, C. (2017). Políticas cognitivas: Negociação e performance entre psicologia e neurociências. Tese de Doutorado. Instituto de Psicologia. Universidade Federal do Rio Grande do Sul. Porto Alegre

As explicações centradas em discursos sobre o cérebro ganham cada vez mais espaço em nosso coletivo, produzindo uma multiplicação no prefixo "neuro" nas mais diversas áreas, como neuropsicologia, neurolinguística ou neuroeducação. A prevalência das explicações neurocientíficas sobre outras perspectivas parece estar relacionada à criação de um plano biológico capaz de conectar objetos das Ciências Humanas e das Ciências Naturais produzindo um apagamento das fronteiras entre as duas através de uma sobreposição do Natural. Essa tese se insere no debate das relações entre psicologia e neurociências cognitivas. Nosso objetivo é propor através de conceito de políticas cognitivas uma forma de discutir as relações entre psicologia e neurociências evitando uma hierarquia pré-definida. Divimos a tese em duas partes. A primeira opera uma discussão histórica a respeito da temporalidade moderna e do progresso como forma de pensar a relação entre teorias, bem como discute a institucionalização das ciências da cognição. Sugerimos bifurcação e acontecimento como conceitos que nos permitem pensar a trajetória científica em outros termos, assim como mostramos que como campo multidisciplinar as ciências cognitivas só foram possíveis por uma oscilação entre a unidade e a multiplicidade da cognição. A segunda parte desenvolve o conceito de políticas cognitivas e o contraste com outras formas de pensar a multidisciplinaridade nas ciências da cognição e em seguida, apresenta diferentes políticas que se organizam ao redor da consciência de si, considerando por fim, como a relação entre essas políticas não precisa se estabelecer a partir da objetividade. Nas conclusões propomos algumas condições para relacionar diferentes políticas, bem como sugerimos uma postura ética necessária para a discussão.

Palavras-chave: Ciências Cognitivas, STS, Políticas Cognitivas, Autoconsciência

Abstract

Baum, C. (2017). Cognitive politics: Negotiation and performance between psychology and neurosciences. Doctoral thesis. Instituto de Psicologia. Universidade Federal do Rio Grande do Sul. Porto Alegre

Explanations centered on concepts about the brain gain more and more space in our collective, producing a multiplication in the prefix "neuro" in the most diverse areas, such as neuropsychology, neurolinguistics or neuroeducation. The prevalence of neuroscientific explanations over other perspectives seems to be related to the creation of a biological speech capable of connecting objects of the Human Sciences and Natural Sciences producing a blurring of the boundaries between the two through an overlap of the Natural. This thesis is inserted in the debate of the relations between cognitive psychology and cognitive neurosciences. Our objective is to propose through concept of cognitive politics a way of discussing the relations between psychology and neurosciences avoiding a pre-defined hierarchy. We divided the thesis into two parts. The first operates a historical discussion on modern temporality and progress as a way of thinking the relation between theories, as well as discusses the institutionalization of the cognitive sciences. We suggest bifurcation and event as concepts that allow us to think the scientific trajectory in other terms, just as we showed that as a multidisciplinary field the cognitive sciences were only possible by an oscillation between the unity and multiplicity of cognition. The second part develops the concept of cognitive politics and the contrast with other ways of thinking the multidisciplinarity in the sciences of cognition and then presents different politics that are organized around the self-awareness, considering finally how the relationship between these politics need not be established from objectivity. In the conclusions we propose some conditions to relate different politics, as well as we suggest a necessary ethical stance for the discussion.

Keywords: Cognitive Sciences, STS, Cognitive Politics, Self-Awareness

Sumário

1 Introdução - Máquinas e Políticas

Da primeira à última frase esta tese é efeito de uma trajetória no Núcleo de estudos em Ecologia e Políticas Cognitivas (NUCOGS) coordenado pela Prof. Cleci Maraschin na Universidade Federal do Rio Grande do Sul. O objetivo do grupo é investigar o coengendramento entre cognição, tecnologias e instituições. O principal projeto Núcleo é conhecido como Oficinando em Rede -e frequentemente é usado de modo intercambiável em relação ao NUCOGS -, utiliza-se da pesquisa-intervenção como um método que nos ajuda a descrever e compreender algumas das formas como esses engendramentos podem tomar. Essas pesquisas têm sido realizadas através da proposição de oficinas com diversas tecnologias como fotografia, computadores, robótica e videogames em instituições como Hospitais Psiquiátricos, Unidades Básicas de Saúde, Fundações e Escolas.

A inspiração nos conceitos Ecologia Cognitiva de Pierre Levy (1993) e de política cognitiva de Kastrup (1999), evidencia um modo de compreender a cognição distinto do cognitivismo clássico. Enquanto o cognitivismo propõe descrever a cognição como aquilo que liga um sujeito a um objeto a ser conhecido, unindo duas realidades pré-existentes através de um sistema de regras invariantes; apostamos numa compreensão da cognição como um ato performático que produz sujeito e objeto, destacando a dimensão processual que torna esses últimos efeitos do ato cognitivo.

Um dos principais objetivos da tese foi ampliar a definição e aplicação da abordagem das políticas cognitivas principalmente através de aproximações com os Estudos de Ciência Tecnologia e Sociedade (STS, do inglês Science and Technology Studies). Em sua concepção, Kastrup propõe utilizar o termo Políticas Cognitivas para afirmar que tanto as explicações teóricas quanto as práticas envolvendo a cognição produzem certas formas de cognição. O termo é, muitas vezes, trabalhado a partir da proposta teórica da Cognição Inventiva (Kastrup, 1999), a qual assume o caráter produtivo da cognição cuja característica fundamental é diferenciar-se continuamente de si mesma. A tese, contudo, se utiliza das Políticas Cognitivas como uma abordagem independente da proposta teórica específica da autora sobre a cognição. Sseguimos a constatação de que as explicações e práticas de qualquer teoria/abordagem produzem efeitos nos modos de constituição da cognição e ampliamos o potencial de uso do abordagem das políticas cognitivas para as ciências da cognição. A análise dos efeitos das práticas nos modos como a cognição é concebida propicia levar adiante a proposta da autora de negar centralidade para uma única explicação sobre a cognição.

É com tal propósito, que buscamos conceitos operacionais da STS em particular da Teoria Ator-Rede desenvolvida por Callon (1986), Law (1986) e Latour (1988), inserindo nosso projeto nesse campo de estudos. Embora não haja nenhum indicativo por parte de Kastrup, a proposta da STS de estudar etnograficamente as práticas de cientistas e engenheiros nos parece coadunar com uma provocação da autora, a de nos deslocarmos dos conceitos para as práticas que dão forma à cognição.

Ainda com o intuito de desdobrar as aplicações da abordagem sobre políticas cognitivas deslocamos nosso foco das práticas de aprendizagem estudadas por Kastrup (1999) e nos voltamos para as ciências da cognição, um conjunto de práticas que tem justamente como função desenvolver e estabilizar diferentes políticas cognitivas. Mais especificamente, nos voltamos para as relações que podem ser estabelecidas entre as disciplinas que tomam a cognição como objeto, tal como a psicologia, a linguística, a neurociência ou a inteligência artificial. Nossa intenção é sugerir que quando colocamos as diferentes políticas em evidência podemos repensar os termos dessas relações. Ao investigar as práticas pedagógicas, Kastrup propõe a dupla recognição-inventividade, como duas políticas possíveis. A primeira compreende a aprendizagem como aquisição de um saber e produção adequada do saber adquirido. A segunda propõe uma tipo de meta-aprendizagem, um aprender a aprender, e concentra-se na possibilidade de colocar novos problemas mantendo acessível um funcionamento divergente da própria cognição. Porém, se nos voltamos para outras práticas, como as ciências da cognição, discutida o par e políticas proposto por Kastrup não aparece em evidência. Como veremos ao longo da tese outras políticas podem ser propostas de acordo com a prática investigada.

O que nos interessa, aqui, é deslocar a análise da efetividade para a desejabilidade daquilo que produzimos com diferentes explicações e, nesse ponto a ideia de ciência como descrição de uma Natureza única e universal é refratária a qualquer discussão sobre o valor do que é produzido. Com isso em mente, deslocamos nossa atenção para as práticas e performances associadas a diferentes formas de pesquisar a cognição. Proponho, então, que as práticas envolvendo a produção da cognição possuem uma dimensão política e, mesmo não podendo ser reduzidas à essa dimensão, elas são passíveis de avaliação. A análise das práticas científicas a partir da abordagem das políticas cognitivas nega uma assimetria a priori entre elas e, assim, inclui a possibilidade de práticas mistas a partir de explicações distintas.

O ponto que segue apresenta alguns elementos que permitiram a composição da questão que organiza a tese, trazendo algumas discussões contemporâneas sobre as relações entre as ciências cognitivas, particularmente entre as neurociências cognitivas e a psicologia cognitiva

assim como pontos introdutórios à Teoria Ator-Rede. Em seguida Apresentamos o problema da tese bem como o delineamento dos capítulo.

1.1 Computação, atores e máquinas

As ciências cognitivas se configuraram a partir da associação de disciplinas, entre elas a psicologia, a inteligências artificial, a filosofia, a antropologia e as neurociências, cada uma com suas obrigações e restrições, em torno do estudo da mente. O núcleo articulador conceitual das ciências cognitivas é derivado da tecnologias da informação e de analogias entre os processos mentais e o computador desenvolvidas a partir da década de 1950 pelo movimento cibernético. A produção teórica das ciências cognitivas ressoou em áreas bastante diversas como a inteligência artificial e a psicoterapia cognitiva. Frequentemente, a tentativa de isolar aspectos específicos do desenvolvimento dessas ciências não deixa transparecer a vitalidade que a conjunção de interesses tão distintos - como a engenharia informática e o pensamento filosófico - confere a investigações a respeito da compreensão da linguagem, do reconhecimento de imagens ou da tomada de decisão. O avanço conceitual provocado por tal empreendimento é tão amplo e duradouro que sua importância já foi comparada ao advento da física nuclear (Varela, 1990) e, mais recentemente, descrito como "...undoubtedly one of the major interdisciplinary successes of the twentieth century, with its own society, journal, and textbooks, and with more than sixty cognitive science programs established at universities in North American[sic] and Europe" (Thagard, 2014, p. 317). Apesar de possuir uma história bem documentada e amplamente discutida (Baars, 1986; Boden, 2006; Dupuy, 1996; Gardner, 1995; Miller, 2003), esse conjunto de teorias parece não ter despertado o interesse de autores relacionados aos STS.

Neste trabalho discutimos o campo das ciências cognitivas a partir do enfoque desenvolvido pelos STS. Usamos a expressão STS para descrever um campo multidisciplinar que conecta de modo vago abordagens empíricas a práticas científicas. Embora os STS não contenham uma unidade teórica, agregamos autores como Steve Woolgar, Bruno Latour, John Law, Donna Haraway e Annemarie Mol, por compartilharem uma descrição da ciência enquanto prática situada, uma valorização dos processos coletivos de produção do conhecimento e as contingências históricas da objetividade. Os STS se tornaram, desde os anos de 1990, um dos principais campos de estudos sobre a dinâmica e as decorrências da produção científica, sendo fonte de inspiração para a construção de críticas e alternativas a toda a sorte de estudos e áreas de atuação em nosso contemporâneo.

Apesar de sua relevância e disseminação, as ciências cognitivas ocupam um lugar bastante marginal entre os autores envolvidos com os STS[1]. Ainda nos anos 1980, quando o movimento cognitivo era bastante jovem, alguns poucos trabalhos relacionados aos estudos científicos tomaram as ciências cognitivas como objeto de análise (Collins, 1987; Suchman, 1988; Woolgar, 1985), entretanto esses trabalhos concentram-se nas ciências da informática e na inteligência artificial. Contudo, esses dois ramos das Ciências Cognitivas são apenas a face mais visível de uma rede ampla de investigações que articulam de teorias do conhecimento, da informação e da comunicação. Entre os autores relacionados à Teoria Ator-Rede (TAR), nosso recorte de interesse dentro da STS, não fomos capazes de encontrar trabalhos diretamente relacionados às ciências cognitivas.

Sugiro que a escassez de trabalhos envolvendo os estudos científicos e as ciências da cognição relaciona-se à tradição de pensarmos a tecnologia como um objeto palpável, como uma máquina de metal ou um aparelho eletrônico. Tal tradição dificulta o reconhecimento de uma tecnologia que envolva pessoas e fenômenos intangíveis. Gostaríamos, entretanto, de nos referirmos à tecnologia tal como Rose (2011), como formas através das quais organizamos práticas para produzir determinados resultados. Combinamos pessoas, dispositivos e ações de modo estável e reprodutível, produzindo e transformando grupos e indivíduos de acordo com objetivos particulares. Nas palavras do autor: “Uso o termo 'tecnologia' para encaminhar nossa análise em direção às formas características pelas quais as práticas se organizam de modo a produzir certos resultados em termos de conduta” (p. 125). Nos referimos, por tanto a toda a ação ou possibilidade de conectar elementos heterogêneos para a produção de transformações calculáveis e/ou redes sociotécnicas estáveis. A estabilização dessas redes e a condução de outros (humanos ou não) por esse caminho de pensamento e ação permite que esse tipo de tecnologia também fabrique a realidade tanto quanto aquelas que produzem efeitos palpáveis. Não se trata de “apenas” interpretar entidades e relações existentes no mundo, mas de estabelecer novas associações, modificando as possibilidades de ação dos agentes envolvidos, gerando procedimentos duradouros de pensamento ou ação.

Ao tratar as ciências cognitivas como tecnologias gostaríamos de destacar seus elementos constituintes, seus processos e seus efeitos. Ao invés de considerar as realidades sociais e psicológicas como espaços onde as ciências poderiam acessar a verdade, buscamos tratar as ciências da cognição como práticas historicamente situadas, ligadas a seus

1 Essa afirmação exclui os trabalhos recentes que voltam-se para as neurociências e, particularmente, para disseminação de imagens a cerca do funcionamento cerebral. Isso porque esses estudos não consideram as ciências cognitivas como um coletivo de ciências. Para uma revisão em inglês de como as neurociências têm sido tratadas ver Rose, 2013.

investigadores e suas circunstâncias de produção. Com isso, reconhecemos o papel central que o movimento cognitivo possui na produção da realidade da mente. Esperamos que o entendimento da tecnologia como produção nos permita lançar novos olhares sobre os métodos, ferramentas e fenômenos mentais a partir dos estudos empíricos desenvolvidos pelos STS.

1.2 Problemas Ecológicos e Políticos

Quando examinamos os movimentos contemporâneos das ciências cognitivas percebemos um grande progresso e popularização das neurociências. O prefixo neuro multiplica-se entre as mais variadas disciplinas, reforçando a importância e a legitimação que a associação com o conhecimento do cérebro pode trazer. Um dos elementos que permite essa disseminação são os avanços das tecnologias de imageamento através das quais é possível relacionar a atividade cerebral a uma infinidade de aspectos da vida, gradualmente tornando o cérebro como o órgão capaz de definir o que é "ser alguém" (Ortega & Bezerra, 2006). No imaginário popular, visualizamos a participação definitiva do cérebro na definição do sujeito quando refletimos sobre um transplante fictício do cérebro da pessoa "A" para o corpo da pessoa "B". Poderíamos facilmente considerar que o beneficiário desse transplante foi a pessoa "A" que ganhou o corpo inteiro de "B". Michael Gazzaniga, considerado o fundador da neurociência cognitiva, comenta essa situação imaginaria afirmando: "This simple fact makes it clear that you are your brain" (2006, p. 31).

Os avanços das neurociências e o desenvolvimento dos dispositivos tecnológicos de produção de imagens do cérebro levam a um processo de colonização do interior do sujeito, que conduz a uma suposta "desmistificação" de várias interrogações e verdades produzidas em relação à alma humana e nos encaminham a um movimento de desvelamento dos códigos, dos sinais e dos circuitos pelos quais trafega a informação neural (Ortega, 2006). Tal processo parece sugerir que, em algum momento, as neurociências proporcionarão o que outras ciências cognitivas, em particular a psicologia, não foram capazes: a possibilidade de acessar, mostrar e manipular a mente. A psicologia, na ausência de um dispositivo de visualização direta, tradicionalmente estudou a mente através de diferentes exterioridades, seja pelo comportamento, seja pelo artifício da fala, os códigos que permitem o acesso à mente seriam exteriores a ela mesmo. As neurociências, por outro lado, advogam poder mostrar efetivamente onde está a psique e como ela funciona no cérebro, ou melhor, como ela é produto do cérebro, através das imagens escaneadas, coloridas e em movimento. Nos parece estranho que as imagens produzidas, por exemplo, pela ressonância magnética funcional (fMRI) sejam

consideradas como a visualização precisa do mental e não, ao menos, como mais outra exterioridade, sua representação (Azambuja, 2012).

A conexão imediata que a produção de imagens parece estabelecer entre a mente e o pesquisador conduz gradualmente a uma prevalência da pesquisa neurocientífica sobre objetos tipicamente psicológicos, o que por sua vez tem estimulado o debate sobre as relações - atuais e futuras - entre psicologia e neurociências. No horizonte mais radical desse debate encontramos a possibilidade de localizarmos todo o conhecimento psicológico no corpo, ou melhor, no cérebro, tornando a psicologia obsoleta e desnecessária. A produção neurocientífica parece construir um plano biológico que permite ligar distintos objetos entre Ciências Naturais e Humanas (Azambuja, 2012), assegurando, nesse processo, a existência empírica do humano como um objeto concreto em termos de investimentos e regulações: a mente é fugidia, conecta-se mais ao íntimo, ao inacessível; o cérebro, por outro lado, tornou-se evidência.

A premissa que pauta o debate entre psicologia e neurociências nessa perspectiva é que a mente reside no cérebro e, portanto, o investimento nas ciências neurais equivale ao esforço por encontrar as bases da "alma" em um estrato concreto, palpável e real, no qual se possa erigir a verdade da mente; em última instância, uma tentativa de chegar à essência do ser humano, tal como coloca Azambuja:

> O cérebro permite essa intersecção entre várias ciências, sem subdividi-las entre naturais e humanas: o cérebro permite pensar a natureza, permite o homem pensar sobre si mesmo e o mundo, torna-se tanto um objeto que se dá a conhecer como o recurso para o conhecimento. Nessa lógica só podemos pensar porque temos cérebro! (2012, p. 21-22).

O que essa pauta propõe é o desaparecimento das fronteiras entre as Ciências Naturais e as Ciências Humanas, contudo, esse desaparecimento se dá pela assimilação de todos os objetos das Ciências Humanas pelas Ciências Naturais. Qualquer verdade que a linguística ou a psicologia, por exemplo, poderiam produzir estaria então submetida às explicações das neurociências.

Esse trabalho se insere no debate sobre as relações entre ciências da cognição, restringindo sua discussão e análise às relações entre psicologia cognitiva e neurociência cognitiva. Um dos elementos que gostaria de trazer para esse debate é uma abordagem que evite ao mesmo tempo a crítica e o entusiasmo, nos termos descritos abaixo.

1.2.1 Uma posição crítica

A crítica parece ser a posição mais comum a partir da qual as ciências humanas e sociais abordam sua relação com as neurociências. A crítica assume como tarefa se utilizar de análises

histórias e sociais para revelar vieses secretos (ou eventualmente inconscientes) nas ciências do cérebro e assim localizar no interior dessas ciências motivações perversas de origem social, econômica ou política (Choudhury Nagel and Slaby, 2009). Ou ainda procuram reduzir a importância de afirmações ou linhas de pesquisa que se favoreceram de argumentos originalmente desenvolvidos pelas ciências humanas ou sociais (Kramnick, 2011). Apesar desse tipo de abordagem apoiar-se em argumentos semelhantes aos dessa tese, em particular, nas características socioculturais da produção do conhecimento; ela busca tenazmente denunciar os malefícios políticos que uma insistência na redução neurocientífica do eu pode causar (Ortega & Bezerra, 2006) e a necessidade de uma reinvenção completa das ciências do cérebro (Choudhury Nagel and Slaby, 2009).

Os expoentes dessa abordagem têm se denominado "Neurociência Crítica" (Choudhury et al., 2009; Choudhury and Slaby,2012). Inspirada na escola de Frankfurt, tais autores tratam as tentativas de localizar o "eu" em sua dimensão orgânica como precedente das novas ciências do cérebro e, portanto, não como um avanço dessas ciências, mas como uma ideologia mapeada *post hoc.* A possibilidade de reduzir o sujeito a seu cérebro não é o resultado dos avanços neurocientíficos, mas um pré-requisito para suas investigações. Com isso, o objetivo do movimento da neurociência crítica é uma reforma na neurociência, tornando seus praticantes mais conscientes das limitações e vieses que se inserem na produção e subsequente aplicação do conhecimento neurocientífico. Em outras palavras, buscam tonar a própria neurociência uma atividade crítica, consciente de sua condição política e econômica.

Contudo, essa postura muito prontamente lança mão do termo reducionista, como uma espécie de chave-mestra para caracterizar tanto o conhecimento produzido por neurocientistas quanto os efeitos desse conhecimento sobre outras ciências. A ponto de tornar qualquer elemento analíticamente interessante, qualquer tentativa de relação com outras ciências invisível (Fitzgerald & Callard, 2014). Essa posição impossibilita aquilo que é o ponto central de minha tese, reimaginar e ressituar as relações entre psicologia e neurociência. Outro ponto que afasta esse texto da posição crítica é a compreensão de um ontologia sociocultural que se sobreporia em todos os campos, impedindo-nos de perceber a neurociência como um terreno que reconstitui aquilo que pensamos sobre o social. Adoto, em relação ao social, a mesma postura de Latour (2005) ao defini-lo não como um conjunto ontologicamente pré-definido, mas como a própria tarefa reassociar e reagregar elementos heterogêneos.

1.2.2 Os problemas no entusiasmo

Se a posição crítica compreende o social como aquilo que sobrecodifica todas as atividades e, portanto, explica todos os resultados. Existe uma outra corrente que tende a se apropriar das produções e teorias neurocientíficas, sem uma discussão do impacto epistemológico que elas representam para diferentes ciências ou seu contexto de produção. De forma geral, o resultado dessa postura são relatos que buscam estabelecer uma interação dinâmica entre as ciências humanas ou sociais e as ciências biológicas; demonstrando, entretanto uma atenção hábil e precisa em relação às primeiras e uma conhecimento raso e ingênuo em relação às últimas.

Papoulias and Callard (2010) localizam na *Affect Theory*, uma das principais fontes de entuasmo em relação as neurociências. Supreendentemente, nessa abordagem o conhecimento sobre neurociência vai pouco além das públicações orientadas para o público leigo - com o trabalho de Damásio (2000, 2009) figurando com proeminência – o que evidencia uma pratica de leitura crédula e limitada justamente daqueles que investem intelectualmente refinamento arguitivo das ciências humanas (Fitzgerald & Callard, 2014). Apesar do desejo de produzir um espaço onde sociedade e cérebro possam misturar-se, ao aceitar tão prontamente proposições das ciências biológicas, a posição entusiasmada inadvertidamente impede as trocas que permitiram uma constituição mútua e dinâmica desse ambos os campos. Ou seja, eles estão demasiadamente dispostos a atribuir às ciências naturais e experimentais a tarefa de gerar os achados que irão confirmar, verificar e/ou revelar as percepções teóricas que eles já possuiam.

1.2.3 Uma posição ecológica

Para a posição crítica, existe uma separação entre o neural e o psicológico e sua tarefa é a denúncia dos limites, a demarcação das fronteiras e a reafirmação das diferenças. Enquanto a posição entusiasmada, reafirma a mesma separação, mas esta assume uma forma da divisão hierárquica de trabalho, com uma disposição de ceder às neurociências a papel de revelação e confirmação de tudo que interessa ao mental.

O que busco, mais uma vez, é uma forma de abordar a relação entre psicologia e neurociência que possa fugir do julgamento da crítica e da submissão do entusiasmo. Outros autores buscam um equilíbrio semelhando, por exemplo, em seu livro sobre neurosciências Rose (2013) enuncia a tentativa de desenvolver essa relação a partir do que chama de amizade crítica. Uma relação afirmativa por parte da das ciências humanas, que reconhece o papel do cérebro, das imagens neurocientíficas e das novas ontologias propostas pelas neurociências,

sem temer por uma aniquilação das ciências humanas e se beneficiando das aberturas para a discussão com outras ciências que a sofisticação teórica das neurobiologias tem possibilitado.

Desenvolvo a tese em uma posição semelhante a de Rose, mas inspirado em um modo de compreender as relações intercientíficas proposto por Stengers (2010), compreendendo as ciências cognitivas, o coletivo o qual abriga ambas (psicologia cognitiva e neurociência cognitiva), como uma ecologia de práticas. Para a autora as vantagem do termo ecologia derivam de um duplo sentido: 1) Chamamos de ecológico o modo de compreender a interdependência entre uma população de seres vivos. Por analogia, podemos considerar a população que as diferentes práticas cognitivas constituem por sua "condição ecológica", voltando nosso interesse para o modo como a existência de cada membro contribui para a existência dos demais. Simultaneamente, 2) para todos aqueles envolvidos com a ecologia política, é preciso reconhecer que nem todas as "situações ecológicas" são desejadas. Em cada relação que se estabelece é preciso considerar os valores, significados e modos de avaliação que são criados. Essas avaliações e valores, não tem a pretensão de transcender sua situação de origem, mas produzem novas associações nessa ecologia que já é constituída por uma multiplicidade de relações. As novas associações também podem, por sua vez, ser compreendidas em termos de valores, significados e avaliações. A autora propõe que existe uma certa indicernibilidade entre os julgamentos que fazemos e a construção de relações que se estabelecem no mundo. Ou seja, é preciso, a cada novo ator - seja ele um lipídio, uma técnica ou uma medida -, levar em consideração suas "consequências ambientais". Isso quer dizer, que ao reconhecermos as ciências cognitivas como tecnologias de produção da cognição, gostaríamos de poder questionar como as diferentes produções podem interagir, bem como a desejabilidade dessas produções e suas interações. Essa avaliação, entretanto, não tem nenhuma pretensão universal, mas é um processo que deve ser constantemente retomado cada vez que uma nova situação se apresente. Reconhecendo, contudo, que a discussão produzida pelo próprio texto é parte integrante da situação posta e não pode ser considerada independentemente.

Com isso, o objetivo da tese pode descrito como: **ressituar a pesquisa neurocientífica e psicológica entre as demais práticas relacionadas às ciências cognitivas sem uma hierarquia pré-estabelecida e sem a desqualificação das práticas envolvendo a cognição**. Ao assumir um problema em termos de ecologia, somos forçados a reconhece-lo como um processo que agrega elementos heterogêneos, tratando as ciências cognitivas como uma multiplicidade que abarca causalidades e significados díspares. Isso é, devemos considerar as consequências e juízos que fazemos a partir daquilo que cada uma das ciências que a compõe essa ecologia cognitiva define e produz, da mesma forma que a ciência ecológica leva em

consideração uma mudança climática repentina ou o descobrimento de uma nova espécie. Nesses casos, as consequências não podem ser diretamente derivadas de suas causas e é preciso levar em conta o entrelaçamento que os modos de viver naquele ambiente constituem. Além disso, cada membro dessa população, cujos modos de vida estão entrelaçados, não pode ser definido exclusivamente pelo papel que desempenha nesse embaraço; quer dizer, não podemos deduzir o que são com base em seu papel. Isso porque seu papel possui uma estabilidade temporária, ele não compõe um sistema, no sentido de que cada participante é necessariamente parte de um todo maior. O objetivo que se impõe a nós, por tanto, é o da coerência; não no sentido da submissão ou da construção de um ponto de vista unificador a partir do qual o papel de cada participante poderia ser atribuído, mas da construção de uma possibilidade de convivência que não implique redução, onde cada um se interessa pelo sucesso dos demais a partir de seus próprios interesses. Ou seja, buscamos considerar o conjunto das ciências cognitivas sem buscar produzir um consenso ou tentar, como na tradição epistemológica, submeter sua diversidade a um critério que esteja para além de seus interesses comuns. Nessa situação, a questão do papel que cada prática desempenha não pode ser feito a partir de um diagnóstico estático, mas deve ser colocado a partir do que cada prática é capaz de apresentar às demais, o que "conta" e o que "deveria contar" como valor para ela (Stengers, 2010).

Me utilizei de algumas práticas envolvendo a psicologia e as neurociências como foco para pensar as relações entre as ciências cognitivas. Uma estratégia semelhante foi utilizada por Gold e Stoljar (1999), que ao discutir a tentativa das neurociências de impor seu conhecimento sobre as demais práticas científicas, agregam diversas ciências humanas sob o título de "ciências psicológicas". Embora, as "disputas" entre psicologia e neurociências me parecem ser a maior fonte de controvérsias nesse campo em nosso tempo, não é possível ignorar os possíveis choques com outras ciências humanas. De modo que a psicologia aparece nessa tese como um represente das demais ciências cognição não-biológicas. Como veremos a seguir, no momento em que destaco os mecanismo gerativos de cada ciência me utilizo de mais de uma método de pesquisa em psicologia afim de emular parte da diversidade das ciências humanas. Com isso, apesar de ao longo do texto o termo psicologia aparecer no singular, reconheço que não se trata de um campo homogêneo, mas de múltiplas redes de práticas que possuem pontos de intersecção e diferenças que merecem ser constantemente discutidas e reavaliadas nos espaços apropriados.

Com isso, essa tese se aproxima da posição de Dale, Dietrich e Chemero (2009) ao assumir que o debate sobre abordagens nas ciências cognitivas é insolúvel. Ao menos no sentido de que uma solução implica um consenso definitivo. As discussões envolvendo mente e cérebro possuem um conjunto vasto o suficiente de elementos para sustentar uma pluralidade de

objetivos explicativos. Assim, ao invés de esperar por uma nova revolução paradigmática, gostaríamos de nos ocupar com o que cada conjunto de práticas nos permite fazer e pensar.

Com recorrência, nomeamos a atividade de deliberação sobre a ação coletiva de política. No meio científico é comum evitarmos o uso do termo política pelo temor de que os "fatos puros" sejam contaminados pela ideologia ou corrompidos pelo senso comum. Ele é, entretanto, duplamente pertinente em nosso projeto. Em primeiro lugar, é apropriado para nomear nossa disposição de constituir e agir em um espaço de indeterminação que o fazer em conjunto impõe. Em segundo lugar, define nosso recorte do problema: ao tratarmos as ciências da cognição como tecnologias de produção, escolhemos nos concentrar nas formas como psicologia e neurociência distribuem os papeis dos atores envolvidos. Por exemplo, o que um modelo cognitivo permite a um psicólogo fazer? Ou, o que faz a cognição quando toma a forma de uma imagem cerebral? Essas são algumas das perguntas que nosso trabalho buscou responder, "o que cada um de nós pode fazer?" é uma pergunta tipicamente política.

O texto do trabalho pode ser divido de pelo menos dois modos. Primeiro ele se divide em capítulos escritos em língua inglesa e outros em português. Essa divisão é efeito do intenso trabalho no período sanduíche em conjunto com o prof. Maarten Derksen da Universidade de Groningen o que resultou na escrita de cinco dos sete capítulos da tese.

Em uma segunda divisão possível, a tese possui dois eixos um histórico e outro filosófico ou analítico.

Os capítulos dois e três compõem um eixo histórico que trata das relações entre psicologia e neurociência. O **capítulo dois** discute o estabelecimento do conceito de revolução com um modo de entender a passagem do tempo na ciência que conduz a uma imagem do cientista como um guerreiro que só obtém sucesso na vitória sobre seus adversários. Nessa perspectiva, a ciência só avança libertando-se do seu passado e aniquilando posições contrárias. A partir da noção de rede sociotecnica desenvolvida por Latour propomos compreender o desenvolvimento científico como bifurcações nessa rede que a estendem em direções diversas, sem que esses desdobramentos sejam capazes de sobrepor um ao outro por completo. Essa proposição cria uma imagem em que teorias e metodologias podem compartilhar atores (ainda que em versões diferentes) porém rearranjam os papeis que eles desempenham. Na segunda metade desse mesmo capítulo discutimos como o conceito de acontecimento recoloca o problema do progresso em ciência sem entende-lo como revolução. Com isso, exploramos a invenção do conceito de informação como algo que cria uma dissimetria entre o passado e o futuro, mas cujo deslocamento do campo da matemática para o campo da psicologia atrai novos interesse e coloca questões para os quais ele não foi criado o que torna o seu desenvolvimento uma fonta de incertezas e suas atualizações imprevisíveis a partir de sua origem.

A história das ciências cognitivas até esse ponto aparece como uma história da psicologia cognitiva, uma vez que é o trabalho (não apenas teórico) de psicólogos como George Miller que o conceito de cognição como processamento de informação passa a ser também do interesse de ciências como a linguística e as neurociências. Esse processo fica mais evidente no **capítulo três** quando analisamos o que é considerados por alguns autores (Boden, 2006; Garder, 1995) o documento central para a institucionalização das ciências cognitivas, o relatório da fundação Sloan. O ponto de partida da análise é a acusação por parte de detratores das ciências da cognição de que sua invenção não passou de uma mudança de linguagem, uma mudança retórica, em relação ao behaviorismo e, portanto, nenhuma mudança significativa foi construída. O enfrentamento dessa crítica permitiu um avanço teórico no campo da STS ao propor uma relação complementar entre o conceito de factishe, desenvolvido por Latour (2010) e o de performance proposto por Mol (2002). O primeiro sugere que existe um entrelaçamento indivisível entre o que dizemos e fazemos com os objetos com os quais lidamos; o segundo, por sua vez, entende que os objetos com os quais lidamos não possuem nenhuma estabilidade intrínseca e portanto só existem enquanto uma rede sociotécnica sustenta essa existência, com isso uma transformação no discurso implica uma transformação nas práticas e, portanto, uma transformação na existência dos objetos. Com isso, a leitura do relatório Sloan sugere que cognição possui uma existência que oscila entre singular e plural e que a estabilização das práticas ao redor da cognição foram possíveis a partir dessa oscilação. Esse primeiro eixo, além de estudo histórico desempenha o papel de apresentar ao leitor conceitos da STS que servirão de base para as análises posteriores como mediação ou tradução, rede sociotécnica, performance e acontecimento.

O restante dos capítulos compõe o eixo analítico da tese: o **capítulo quatro** discute minha apropriação do conceito de políticas cognitivas a partir do trabalho de Kastrup (1999) e desenvolve seu uso para pensarmos a relação entre psicologia e neurociência, aproveito a oportunidade para me distanciar da proposta mais tradicional dessa relação, a redução. O trabalho de redução assume que uma certa multidisciplinariedade é necessária de forma a guiar e organizar o trabalho de ciências mais específicas. Por exemplo, a psicologia delimita funções da cognição que, por sua vez, podem ser localizadas no cérebro e, em seguida, podem ser molecularmente rastreadas. Porém, essa colaboração acaba quando o nível seguinte é atingido com sucesso. Esse nível passa a ser o único nível explicativo, ou verdadeiro, por ser o mais objetivo; transformando os níveis anteriores em curiosidades ou pano de fundo para o único conhecimento de valor. Lanço mão dos conceitos de Política tal como desenvolvido por Stengers (2000) e questões de interesse (*Matters of Concern*) desenvolvido por Latour (2005), como bases alternativas para noções como verdade e objetividade no desenvolvimento de

relações intercientíficas. Através desses conceitos destaco os processos de negociação e composição necessários para a coexistência em um coletivo heterogêneo.

O **capítulo cinco** descreve diferentes políticas cognitivas que são compostas ao redor do objeto autoconsciência. Buscando fugir da divisão proposta por Kastrup (1999) entre políticas inventivas e recognitivas, investigamos a distribuição dos atores que tornam a consciência de si visível, mensurável e conhecível. A psicologia experimental opera por uma política de mensuração que compõe a autoconsciência como um número ordinal que a distribui e ordena em relação a outras autoconsciências constituídas da mesma forma. Através do processos de imageamento cerebral, as neurociências compõe a consciência de si através de uma política de simulação. As imagens produzidas nessa política não são reproduções fiéis da atividade de um cérebro, mas gráficos estatísticos cujas variáveis são manipuladas afim de encontrarem espaço em uma narrativa conceitual pré-estabelecida. Por fim, a pesquisa-intervenção através do estabelecimento de zonas de contato (Haraway, 2008), constitui uma política de metamorfose que ao invés de estabelecer limites e localizações para o funcionamento da cognição só é capaz de conhecê-la transformando-a.

O **capítulo seis** é um exercício de difração (Barad, 2007), retornamos às políticas descritas no capítulo anterior e as colocamos em contato com o conceito de disciplina de Foucault (1997). A partir desse encontro buscamos algumas reverberações sem a intenção de estabelecer uma coerência com toda a obra foucaultiana. Assim, exploramos como os sujeitos aos quais essas políticas se referem são construídos na própria rede de relações que a torna possível. Para a localização da atividade neural correlata a atenção é si é necessário um longo treinamento para que o sujeito torne-se capaz de reproduzir um conjunto bem definido de comportamentos em uma situação muito específica, ou seja, é preciso que o sujeito torne-se parte de um mecanismo muito mais para que seja capaz de isolar a atividade de atenção a si. O preenchimento de questionários, comum na política de mensuração não requer treinamento algum, porém são necessários meses para o desenvolvimento de um instrumento que permita que o sujeito que responde conecte-se com a própria experiência. Nesse ponto buscamos superar as críticas que sugerem que testes psicológicos reduzem sujeitos a elementos essenciais para a disciplina e mostramos como as respostas podem ser oportunidades para o estabelecimento e modificações das conexões que o sujeito estabelece com as entidades que compõe sua cognição. Por fim, a pesquisa intervenção opera através do estabelecimento guiado de novas conexões a fim de construir uma nova atenção a si nos sujeitos que compõe essa rede.

O **capítulo sete** conclui a tese retomando e amarrando os capítulos ao redor uma proposta ética. Concluímos o trabalho discutindo duas condições necessárias para cultivar uma cumplicidade nas ciências da cognição. A primeira é um espaço necessário para que essas

políticas adquiram alguma estabilidade. O segunda é uma postura ética que chamei de diplomata (Baum et. al., 2014) inspirado no trabalho de Stengers (2011b) e Despret (2002).

2 Reframing Revolution: some alternatives for the modern temporality

You tell me that it's evolution
Well, you know
We all want to change the world
(Revolution – Lennon & McCartney,1968).

As the history[2] goes, sometime between the late 1950`s and the early 1980`s a new, silent movement in psychology arose to overthrow a supposedly inadequate approach, behaviorism. The so-called "Cognitive Revolution" happened, despite its pompous title, gradually between the 1940s and 1970s, mainly on US soil and has been well documented by several authors (Baars, 1986; Boden, 2006; Dupuy, 1996; Gardner, 1995; Miller, 2003). The revolution established a new paradigm, "putting the mind back into experimental psychology", which at the time suffered the dominance of the behaviorist program started by Watson forty years earlier. In the behaviorist proposal, psychology should be the science of prediction and control of behavior, be it human or animal. The two major behavioral influences were the emphasis on animal research[3], and the insistence on the stimulus-response approach, according to which any behavior had an associationist basis (Mandler, 2002). In the standard account it is a matter of cognitivism vs behaviorism, where the former displaced the latter with the return to psychological or mental topics that had been left out of the American research agenda because of the dominance of the behaviorist movement.

The first reference to a Cognitive Revolution can be found in an article from Dember (1974) where he states that developments in psychology in the years prior to his paper were significant enough to be called revolutionary and the radically new concepts should be understood in terms of a new paradigm as recently proposed by Thomas Kuhn. But it was not until the publication of Howard Gardner´s *The mind's new science: A history of the cognitive revolution*" (1985) and Bernard Baars` *The Cognitive Revolution in psychology* (1986) that the phrase achieved prominence. From that point we can trace its spreading through introductory textbooks (Hobbs & Chiesa, 2011). The Cognitive Revolution took the form of the collapse of the behaviorist paradigm and the ascension of cognitive paradigm focused on themes by John Watson`s manifesto like memory, attention and perception. This new paradigm would be capable of unifying the psychologists once more, well, at least in America.

---

2 There are many historians as well as historiographies of psychology. In this chapter I focus in the history as described by those directly involved in cognitive science. In other words, I engage with how scientists tell their own history.

3 Which came to be 30% of the papers published in The Journal of Experimental Psychology in 1947 (Mandler, 2002).

Almost as old as the idea of the Cognitive Revolution is the assertion that revolution is an inaccurate characterization of what happened in the second half of the last century in the psychological community (Leahey, 1992; Hobbs & Chiesa, 2011; Hatfield, 2002; O'Donohue et al. 2003). The controversy about the cognitive revolution has divided historians and philosophers of psychology and it was "staged" in a dialog published by the British Psychological Society between Sandy Hobbs and Jeremy Burman (2009) and both positions can be summarized with quotations from the authors. Hobbs states that the idea that there was a cognitive revolution is "Historically false (…) Throughout the 20th century, and into the 21st, different paradigms for psychology have existed side by side. In these circumstances, to employ the term 'revolution' to any movement at any time seems inappropriate" (Hobbs in Hobbs & Burman, 2009, p.813). The position of Burman on the other hand is: "It is certainly the case that a body of critical work supports the 'no revolution' hypothesis. (…) Nevertheless, many authors of similar persuasion have argued that something definitely did happen, whether 'whatever it was' meets Kuhn's criteria or not" (Burman in Hobbs & Burman, 2009, p.812).

The questions I'd like to propose in this chapter is: If there was no revolution in psychology, how can we describe this "something" that "definitely did happen"? And, more specifically, how can Actor-network theory help us to account for the cognitive movement? If it wasn't a revolution, what should we call it? To answer these questions, I first take a closer look at the "no revolution case". I would like to weigh their arguments and explain why, although I can't agree that a revolution took place, I cannot simply stay on that side. Further I explore two alternatives for the concept of revolution that still consider that something important happened without caring all the weight of this concept. The first is the idea of bifurcation on a network, that allow us to think about scientific development without the linear trajectory of progress. The second one is the concept of event as developed by Latour and Stengers as a way to think about answers displace from their original field or question promoting unpredictable changes without breaking with their past as the idea of revolution suggest.

I look for a description of the cognitive turn that does justice to a history of science as proposed by Serres (1995a): we want to move away from tracing sequences of turning-points and revolutions and aim for a history that goes forward and backward through a complex network of paths that overlap and cross, forming nodes and crossroads, interchanges that bifurcate into two or more routes. The development of science cannot be depicted as an ascending line of cumulative knowledge, but as a circle expanding in all directions (Latour, 1991). This way the past is not vanquished or crushed, it is surrounded, recombined, revisited, repeated and reinterpreted. If we follow the network, elements that appear remote may be quite

nearby. This network grows under a principle of connections, without a unifying center or a teleology. The history does not progress toward a growing unity, but bifurcates in the invention of new problems. In this scenario a science is measured according to the connections that it can establish. The more the better. This growing mobilization multiplies the actors who make up our world, but nothing in their mobilization implies an ordered and systematic passage of time.

2.1 You say you want a revolution[4]

The main line of argument against the idea of a cognitive revolution can be found in three papers (Leahey, 1992; Hobbs & Chiesa, 2011; O'Donohue et al. 2003) that argue that the term revolution is not accurate because the events that have passed in the third quarter of the last century do not meet the criteria established by Kuhn. Although with slightly different takes, the three articles deny that the cognitive turn can be characterized as a scientific revolution, the two most recent describe it as a social-rhetorical occurrence. We will concentrate our discussion on Leahey`s paper because it develops the argument more fully. The following articles seek to add evidence to his initial proposals, rather than take the discussion forward.

Leahey (1992) bases his analysis on the idea of scientific revolution as described by Kuhn. According to Kuhn, science passes through four stages: 1) *Normal science*: the dominant paradigm establishes a research agenda, in which empirical research solves explanatory puzzles within the established framework; 2) *Appearance of anomalies:* at some point some puzzles start to resist solution and the accumulation of unanswered questions causes unrest in the scientific community involved, leading to the third stage; 3) *Crisis:* the adherence of scientists to the paradigm weakens. Some of the axioms of the paradigm are rejected and new ones are proposed; 4) *Revolution:* a crisis becomes a revolution when the emerging paradigm gains control over "the levers of power in science": granting agencies, journals and textbooks. Leahey supplements Kuhn's criteria with those proposed by Bernard Cohen, which stress one point: There can't be a silent revolution, there must be a deliberate struggle between the proponents of both regimes and the scientists of the time must be able to describe their experiences as revolutionary as well as historians and scientists later. If we follow Leahey`s description closely a revolution can only take place when a science is dominated by a regime that starts to show signs of aging and cannot accommodate new findings. The new paradigm has to overthrow the old one showing its superiority in solving puzzles.

4 For this and other subheadings Lennon & McCartney (1968).

Based on these criteria Leahey points out that Behaviorism couldn't be considered a dominant paradigm in psychology. Although overshadowed by behavior analysis, mentalist psychology never complete disappeared from American experimental psychology. And even among those committed to the behavioral movement no unity could be found. Lashley, for example, included neurophysiology in the theoretical framework, others like Tolman and Hull proposed intervenient variables between stimulus and response, while Skinner would avoid them, suggesting they are an invitation to pseudo-scientific myth making. This kind of issues are usually associated with a preparadigmatic period in science and without a reigning regime to be overthrown there can be no revolution. Ignoring the well documented (Gardner, 1985; Miller, 2003; Boden, 2006) exaltation of spirits caused by the publication of Chomsky`s critical review of Skinner's *Verbal Behavior*, Leahey states there was no unrest regarding anomalies in behavioristic findings. It's important to realize that to uphold this statement Leahey is forced to diminish the importance of the famous discourse from Karl Lashley in the Hixon symposium in 1943 (the speech was later published under the title "The problem of serial order in behavior." (1951)). In the center of Lashley`s argument was the idea that long and complex behaviors could not be explained by a simple stimulus-response chain. Playing a piano, for example, involves such a rapid sequence of notes that the push of a key could not be triggered by the previous sound. Another problem was that some common speech errors seemed to demonstrate an anticipation of words that would come later in the speech. According to Lashley there had to be a mental system that could organize a general plan of action in which the effectiveness of each element of the plan was independent of the manifestation of the previous. Although Lashley was a former student of Watson, according to Leahey we should not consider the speech a sign of unrest among psychologists because Lashley was speaking as a physiologist in this particular seminar[5]. For Leahey "the birth of cognitive psychology owed nothing to empirical anomalies demanding innovation in order to solve them" (1992, p. 314). To him the experiments invented by cognitive psychologists didn't solve any anomalies stumbled on by behaviorists, but just advanced the cause of cognitive psychology in itself and were used rhetorically to persuade others to join their research program. As we follow Leahey applying the Kuhn/Cohen criteria to papers published by psychologists between the 1960`s and the 1980`s the arguments against a revolution grow stronger. Although there was no unity among the behaviorists, the number of unexpected laboratory results was not high (enough) to be felt as a crisis[6]. On the other hand, the theories and experiments proposed by cognitive

5 Even if Leahey himself used Lashley as an example of diversity inside the behaviorist movement just one page before.

6 Leahey, however, recognize that some of the difficulties faced by behaviorists were addressed by authors from outside psychology. Some well-known examples would be Noan Chomsky from linguistic, Herbert Simon

psychologists at the time did not address any of the theoretical difficulties faced by behaviorists. O'Donohue et al. (2003) expand this analysis through 23 interviews (6 made by the authors, 17 transcripted in Baars' (1986) book) using not only Kuhn's criteria but also criteria of revolutionary progress proposed by other key philosophers of science like Popper, Lakatos and Laudan.

The interviewees were asked which were the anomalies encountered by the behaviorists and which evidence the cognitivism has of his superior puzzle-solving power. We use here one of the answers selected by the authors as an example:

> The major empirical evidence was the less-than-adequate explanation, from the cognitivists' point of view, of complex processing, such as language development and thinking. Chomsky's review of Verbal Behavior [1959] was taken as showing that behaviorism could not well account for language development, and Miller, Galanter, and Pribram's Plans and Structure of Behavior [1960] was taken as counterindicating the depiction of higher processing. Note that the issue is not quite one of empirical evidence. Empirical evidence does not change paradigms, which in themselves cannot be proven. ... The main issue was that people began to be more questioning of what goes on 'inside the head.' I don't think the questions you are asking are quite what was at issue. The important thing is that the questions changed, not the answers. People became interested in different questions that they believed behaviorism did not adequately address. ... I see your questions as not quite to the point. There is not such a thing as evidence for or against a paradigm. Paradigms are not right or wrong (as Kuhn pointed out!). Rather, different paradigms address different questions, and what paradigm people follow is a function of what questions they want answered. Behaviorism is no more or less valid now than it was before. Those who want to answer the questions behaviorism addresses still use this paradigm.... This may sound strange, but I don't really see it quite as a shift. There are still behaviorists. What changes is the distribution of people interested in answering particular sets of questions. I still use behavioral concepts, such as various forms of reinforcement, and believe they are as valid now as ever. But such concepts provide less than sufficient basis for answering all the questions I have. By the way, the questions of cognitivism are, in my opinion, also insufficient! (Sternberg in O'Donohue et al., 2003).

Once again no substantive revolution took place according to these accounts. Neither Sternberg nor the other interviewees were able to demonstrate that behavioral theories needed an extemporary theory to explain with an insurmountable amount of anomalous data. None of them could demonstrate the superiority of the puzzle-solving models of the cognitive theory. According to the authors the interest for complex [anomalous] behavior doesn't constitute a prove of relative superiority in solving this problems. One by one the interviewees fail the test that would grant them the title of revolutionary.

---

from economy and Allen Newell from computer science. Still, for Leahey this work as an argument against the notion of revolution, showing that the changes in psychology didn`t came from internal, technical failures of psychological research, but were conceptual forces driven from the outside.

2.1.1 But when you talk about destruction/ Don't you know that you can count me out?

Of course, we can't blame any of them since the price to advance science as depicted by these authors is the dramatic overthrow of some kind of tyranny, either political or intellectual. It's not enough to be interest in new questions or to construct experiments in novel ways. To be to truly revolutionary one have to wage war against his predecessors and erase from history every connection with them.

Before this emotional and political meaning, the word revolution concerned astronomy, having its origins in the orbit performed by a body through space or the cyclical pattern of events, like the appearance of Halley`s comet every 76 years; when a revolution is concluded the planet returns to its original point, and there is no difference between the state of affairs at the beginning and at the end of the cycle. During the 17th and 18th century revolution begun to mean a sudden breach with traditional ideologies or practices, more related with coup d'état, insurrection or rebellion than with the movement of celestial bodies. Ironically the expression "scientific revolution" derives from this second meaning, suggesting a break with institutions and new ideologies supplanting older ways of thinking (Cohen, 1985; Serres, 1885b). With this change, revolution lost its cyclical component and acquired a sense of a break with the past, with progressive leaps in which older, conservative notions are permanently replaced. The connection between political and scientific revolutions created a romantic image, dramatic and daringly progressive, in which breaks with the past unfold similarly on the battlefield and in the laboratory. Much like a soldier on the battle front, a sacrificial commitment to the cause [of the advance of science] is expected from the scientist. Probably no one better symbolizes this ideal scientist than Carnot who at the same time had to confront Lagrange for the definition of differential calculus and take part in the war effort of Napoleon, as richly described by Serres (1995b):

> He [Carnot] combined success in mathematics and physics. Elected as Deputy to the Convention (…) he became a ruler. He joined the Committee of Public Safety, where he embodied the spirit of war, creating fourteen armies for the republic, working out at all campaign plans, organizing victory and preparing the destiny of Napoleon. His was a thoroughgoing triumph in the analysis and in reason, pure and applied, in politics and in strategy, crowned by ideological martyrdom when he was exiled at the Restoration. (…) Carnot was science, Carnot was power, Carnot was victory (p. 427).

In science as in war one must live with the competition, rivalry and friction of the community. "True" science is described in this way as a battle for the scientific consensus and upholding a scientific consensus as a necessary condition of the accumulation of knowledge. In this way, the distinction between the outdated past and the unknown future has to be irreversible.

It should be no surprise that when compared with the image of general-scientist, psychologists like Sternberg, Johnson-Laird and George Miller don't recognize their work as a military venture. The psychologists interviewed by O'Donohue, unable to turn behaviorism into "scorched earth", generally use more humble metaphors to describe the events in which they were involved, such as this proposal by Miller in the mid-eighties: "I wouldn't use words like 'revolution'. To me, it's not like that. A lot of people were living in this house for a long time, and then some people built a house next door, and pretty soon, a lot of people moved from one house to the other" (Miller in Baars, 1986, p. 210). Remember that according to Cohen that the inability to describe themselves as revolutionary is evidence of the absence of revolution.

More than a review of the merits of cognitive movement, the criteria cast a shadow on how we think about the history of psychology. Latour (1991) called modern temporality the interpretation of the passage of time as a succession of radical revolutions, a temporal framework in which time passes as if it were really abolishing the past behind it. The arrow of time consumes the past in a way that we are not removed from our ancestors by a certain number of decades or centuries, but by Copernican revolutions, epistemological breaks, epistemic ruptures so radical that nothing of that past survives in us. Since everything that passes is eliminated forever, we should sense time as an irreversible arrow, as progress; but at the same time, time as a revolution that always has to start over and over again. There is no other way to advance except breaking with the past, every connection with the past is regarded a retrogress.

> The present is outlined by a series of radical breaks, revolutions, which constitute so many irreversible ratchets that prevent us from ever going backward. In itself, this line is as empty as the scansion of a metronome. Yet it is on to this line that the moderns (…) will trace two series of irreversible advances: one upward, toward progress, and the other downward, toward decadence (Latour, 1993, p 71).

The modernization front that advances from the past to the future lets behind us an archaic and unhappy past and puts ahead of us a radiant future where we can finally see clearly what the world is made of. This pioneer front allows one to qualify as irrational everything that had to be torn away and as rational the whole toward which it is imperative to move in order to progress. In this way modern is everyone who is cutting himself loose from the past in order to advance for the future, from the darkness into light.

There is another historical figure who can help us to contemplate the difficulties created by the modern temporality. If "Carnot was science", Lavoisier was revolution. His work provided the structure in which philosophers such as Kuhn and Cohen analyze the occurrence of a scientific revolution: crisis, controversies among chemists, emergence of a new paradigm. Lavoisier`s endeavor also forces us to directly confront the scientific and political meaning of

the word revolution, as his book *Traité élémentaire de la chimie*, climax of the chemical revolution, was published in 1789, the year in which the French Revolution begun. Involved in both movements, he came out of the chemical revolution victorious, but fell victim of the political revolution. Analyzing the two careers of Lavoisier, as scientist and tax-farmer, Bensaude-Vincent (1995) suggests at the end of her article that his death by guillotine helped forge his image of founding hero. The silence of his colleagues of the former royal academy before his arrest and sentencing, obscured their support in performing and promoting Lavoisier's experiments, transforming him in a tenacious and methodical entrepreneur, who borrowed nothing from others and was martyred by the Revolution. As we can see in this paragraph:

> Lavoisier embodies the revolution so well that after him no revolution is possible. Hence the paradoxical effect of his cult of the founder: by ejecting pre-Lavoisierian chemistry into the darkness of chaos and prehistory, it is accepted that the history of chemistry begins with Lavoisier. But there`s no history after this revolution because everything is definitively embedded in the foundation. (…) The positive mythology abolishes history; past, present and future, all gathered together and condensed in a miracle formula: revolution (Bensaude-Vincent, 1995, p. 480).

This romantic image of Lavoisier doesn't only forbid new revolutions in chemistry but in all sciences. We are forced to eradicate all the traces of the construction of a theory and cut all the ties that bound it to his predecessors, whom we have to relegate to obscurity. Any connection one could establish between a scientist and his/her ancestry would stain the image of a true revolutionary. Without a past, everything Lavoisier created is concentrated in a powerful intuition. Simultaneous, this *fiat lux* that created chemistry is so effective that cannot be ignored, cannot be overturned. Everything succeeding its allowed by his creation and only came into existence because of him. The image is extemporaneous it cannot really happen in any point of time, it condense in a single act past and future in a way that cannot be reproduced.

To go forward one has to fully break with the past; if one chooses to go backward, then one has to break with the vanguard, which has broken with its own past. But if we look at the practices of the psychological community at the middle of the last century (or even today for that matter) using the examples provided by Leahey (1992) we see a heterogeneous mix of epochs and ideas; gestalt theory and psychoanalysis with their "mental" interests coexisted with behaviorism, and even inside the behavioral trenches unison voices were hard to find. This scenario is usually associated with pre-paradigmatic period, a period before "real" science starts. In this sense, one can feel that time never passes in psychology, because time never really started, we have no first step in the ladder of progress. As we can read in the last phrase of Leahey`s paper: "Save for Wundt's founding of psychology, revolution in psychology is a myth" (1992, p. 316).

For Latour (1991) it's not unusual to feel disappointed with this scenario where some elements of the past refuse to disappear for the benefit of future ones. In these cases some may try to overcome it with by juxtaposing in a collage elements from all times, all of them equally outdated. This is what Leahey (1992) does toward the end of his paper where he states:

> The coming of cognitive psychology is best regarded (…) as the appearance of a new form of behavioralism[sic] based on a new technology, the computer. (…) Information-processing psychology, no less than any form of historical behaviorism, aims at the description, prediction, control, and explanation of behavior. The mainstream of psychology in 1992 remains as firmly behavioralistic as it was in 1910 (p. 316).

By assuming the image of progress through revolutions, as described by Kuhn, and creating a parallel between information-processing and the control and prediction of behavior pursued by Watson, Leahey creates a psychology where nothing new really happened since the beginning of the last century. The notion of "revolution" seems to be too intimately connected with a break with what precedes it, too concerned with disqualifying its past and looking towards its irreversible future, to allow Leahey to acknowledge the transformations brought by the cognitive turn as revolutionary.

By assuming that modern temporality is a specific mode of narrating the passage of time we imply that there may be other forms of narrating it. We look for one that doesn't obliges us to start again and again in the search of a final revolution, but still allows us to celebrate the inventiveness of the cognitive movement. Can we accept that no revolution took place and yet describe the development of the last century in psychology in a manner "*that something definitely did happen",* in Burman's words?

2.1.2 You say you'll change the constitution

When we pay close attention to the scientific practices of behaviorists and cognitivists we quickly notice that there`s no need to completely obliterate the work of the former to recognize the advancements of the later. Resorting to the basic concepts of ANT is our first way to reposition the history of cognitive science.

We try to understand objects such as cognition or S-R association as the effect of a stable arrangement or network of relations. The identity of an object is stable just as long as those relations also hold together and do not change their shape. The word network became very popular with the propagation of internet usage. It commonly means instantaneous and unmediated access or transport without transformation of every piece of information. But inspired by Deleuze`s and Guattari`s (1988) rhizome, the network pole of the expression actor-network means exactly the opposite. It points to a series of transformations, transductions and

translations. In this way, entities have no inherited qualities, they take their form and attributes as a result of the relations in which they are located (Law, 1999; 2002; Latour, 1999; 2001).

The appeal to a series of transformations that brought cognition into existence is our way to avoid a binary definition of the cognitive revolution, a simple yes or no. The transformation of a chain of actors is our way to present the question in a more complex form. Thus, in this section we do not try answer whether cognitivism displaced or overthrew behaviorism but strive to show the different relations installed by the cognitive shift.

To sum it up, the cognition that emerged at the end of the seventies is not the same thing that was tested by Watson and baby Albert or Skinner and his rats. And it`s only a slight exaggeration to say that they got nothing to do with each other. But even if they have very little in common they are still partially connected. One could always track for points that connect them both. These connections might be texts, papers or chapters like this one; sharing a similar actor, like rats (there are always rats) or practices like timekeeping. They are not the same thing because they are not made of the same actors or instruments nor do they answer the same questions. As proposed by Latour (1999; 2005) the existence of each actor is defined by the chain of association with other actors, a chain of associations that diffuses or displaces a work of production or creation. It is a source of action that can be human or non-human. An actor is anything that has sufficient effectiveness to do things, or enough consistency to make a difference or effect, but the competence can only be derived from its performance and cannot be assumed before it acts. In a Latourian formula: essence is equal to the existence, existence equals action (essence = existence = action) (Latour, 2001). On the foundation of this argument, the world is a network of relationships and these relationships have no form reality or status outside their continuous production network. Each aggregate will constitute the reality of beings, human and non-human, which belong to its composition. ANT moves away from a relativistic position toward a relational ontology, "where it is not a matter of affirming the relativity of the true, but rather of affirming the truth of the relative "[7]. In this way the cognition that is able to process only so much information (Miller, 1956) is not the same as the process in the black box that is able to associate stimuli and responses (Watson & Watson, 1928). Each gathers together a different multiplicity of agents into a stable and coherent whole.

This idea becomes clearer when we compare, for example, the network of production of the cognitive maps as described by Tolman (1948) and the one used by Miller (1956) to measure the limits of information processing in humans. Both articles are classics in their respective fields and share some similarities, they report the number of previous experiments

7 Viveiro de Castro (2002) attributes this expression to Deleuze, although without precise reference.

to build their objects and some idea of cognition is present in both. But what cognition does in each one in radically different because it share the stage with completely different actors.

In the case of cognitive maps the author himself, right at the beginning, tells us which sociotechnical network necessary for him to be able to write about his maps.

> In the typical experiment a hungry rat is put at the entrance of the maze (alley or elevated), and wanders about through the various true path segments and blind alleys until he finally comes to the food box and eats. This is repeated (again in the typical experiment) one trial every 24 hours and the animal tends to make fewer and fewer errors (that is, blind-alley entrances) and to take less and less time between start and goal-box until finally he is entering no blinds at all and running in a very few seconds from start to goal. The results are usually presented in the form of average curves of blind-entrances, or of seconds from start 4:0 finish, for groups of rats (p. 189).

We should add, as Tolman does, to his hungry rats, mazes and average curves, his Berkley laboratory, underpaid research assistants and graduate students. But even with those implied it's easy to get the picture: rats desperate for food run through mazes and get their trials and errors counted. Some other behaviors are also measured like the "vicarious trial and error" which stands for the behavior of looking back and forth that can be observed in rats before they go one way or the other, the active search for the origin of a stimulus (usually an electric shock) and some ability of spatial orientation. These devices and behaviors allow Tolman to devise the contours or layout of the cognitive map. To use the ANT vocabulary the mediate they relationship.

Miller`s magical number seven, in turn, is connected to a larger mediation chain and sometimes the connections cannot be followed so easily. The basic experiment consists in human observers recognizing differences in inputs. These inputs could be sounds, phonemes, colors, positions of figures, color luminance (s), sweetness or saltiness of solutions. Time is specifically left aside since the observers have as much time as they need to decide between likely alternatives. Decision, by the way, is an important actor in these experiments. But the main actor here is information. The question is how much information can we process? How much can we remember? The measures are not presented as an average number of blind entrances but in bits, the amount of information needed to make a decision between two likely alternatives. How many different sounds can we distinguish or recognize in a sequence?

Right from the beginning the cognitive map and the capacity to process information are made in complete different ways. Rats, mazes, running and hungry in one side; decision, information, sounds and colors in the other. Therefore, we couldn`t consider them as the same object. A common objection would be that both speak of or point to the same object that lies behind or under the rats behaviors or the human decisions - and the concepts just represent different aspects of this same object. We will treat this objection more carefully in the next

chapter. We should stick with Latour`s definition for now and distinguish each actor by its performance in the network. And through this understand the mediation process.

Mediation, more than transportation, is an act of creation that develops through the combination of several elements, generating convergence and homologies between elements that without it would be different or foreign to each other. It allows for negotiation and delimitation of identities, the possibilities for action and scope of the actors. In other words, the mediation work constantly redefines what humans and non-humans are capable (Callon, 1986; Latour, 1993).

There are three types of mediation[8] important to comprehend our cases, interference, composition and interlacing of time and space. The first one, interference, refers to the possibility of the actors involved in a situation to exchange properties and goals together. In the modern vocabulary, subject and object have an essence and its capacity for action is defined *a priori*, before any relationship or association. Subject and object cannot exchange properties with each other. The actors, on the other hand, are defined by the actions and modifications together with other actors. Interference is the capacity for establish a relationship that changes the possibilities action or objectives of one or more actors involved.

As an example we could ask ourselves: who could solve a maze puzzle faster, a rat or a mouse? In the traditional (or modern) answers the rat and the mouse have specific spatial abilities and one of them is able to find food faster than the other whenever or wherever they run. If we could not perceive any differences in the time they take we could say they share similar spatial abilities. It is the case, indeed that rats and mice have similar performances running in normal mazes, but if you change the maze to a swimming pool rats become faster them mice and mazes become harder to mice (Whishaw & Tomie, 1996). Interference suggests that we can reflect on the establishment of a relationship between rats, mice and mazes, about a translation of capabilities. All the three are modified in this process. The rat that run in a mazes it`s different when swims in a pool. Correlatively the rats that runs in a laboratory is distinct from that one looking for food in your kitchen (Timberlake, 2002). And even running the same maze inbreed laboratory rats and wild one don`t behave much alike (Bamber & Boice, 1972).

Translation, in this case, does not mean the passage of a word of a vocabulary to another, such as between two languages, but indicates a dislocation of the action or the creation of a bond that did not exist. Rats are not only conceptually different as they are materially different (Epp, Barker, & Galea, 2009; Klaus & Amrein, 2012). Running it`s not an action that could be

8 In Pandoras` Hope Latour (2001) defines four mediating operations: interference, composition, interlacing of time and space and crossing the border between signs and things.

restricted to the mouse, but to another actor, a maze-rat, a laboratory-rat, a kitchen-rat or a wild-rat. What we can understand from the interference process is that the responsibility for the action should be divided between all the actors involved.

The second type of mediation, the composition, is a derivation of the possibility of interference in the modes of existence. The action in the world should be thought from the associations between actors. Let`s consider for this case how do we make absolute judgments of tone:

> [a scientist] asked listeners to identify tones by assigning numerals to them. The tones were different with respect to frequency, and covered the range from 100 to 8000 cps in equal logarithmic steps. A tone was sounded and the listener responded by giving a numeral. After the listener had made his response, he was told the correct identification of the tone (Miller, 1956, p 83).

Together listeners, numerals, tones and corrections enable each other to distinguish and be distinguished. An actor empowers, enables or authorizes another to act. Every action is a composition of forces, a property associated entities, which cannot be isolated in a single actor. Even if we can assign the role of original motor to an actor, we cannot ignore the composition necessary for the performance of the action.

It is just by mistake that we can say that the man fly. As much as it is not only the listener that distinguishes, but the whole scene that allows the distinction, it is not a pilot who remember how to fly, but the whole cockpit (Hutchins,1995). Flying is only possible for an association of entities including, flaps, handler, airspeed indicators labels, speed bugs… The B-52 does not fly, who flies is the US Air Force. The action is not therefore a human property, but from a combination of actors. The role each actor plays is provisionally assigned exclusively while he is in a network of property exchanges (Latour, 2001).

When a network of exchanges is stabilized, mediation between the actors may be obscured, their work becomes invisible and constitutes what Latour (1987, 2001) calls a black box. The black box adds the work of several actors distributed in time and space, but remain transparent during the course of the action. It is only when we turn our attention to them, or resumed their production process is that we can visualize the network that determines its operation. This network may, in turn, be constituted by other black boxes indefinitely. When someone write today about human capacity limits of information processing (Marois & Ivanoff, 2005), it easy to overlook that “limits of information process” is a package which includes the limit to the accuracy with which we can identify absolutely the magnitude of a unidimensional stimulus (span of absolute judgment), but also the capacity to make relative judgment, of compound multiple dimension along which the stimulus can differ, order the task in order to make a sequence of several judgments (introducing memory in the decision process). The span

of absolute judgment by its turn it`s compose over various distinctions such as tones, loudness, sweetness, saltiness, hue and saturation of colors (Miller, 1956). We can read *The magical number seven…* as the intertwining of this network that allow us to speak about an information bottleneck without the need to refer to all the actors and relationships that constitute it.

Both articles, *The magical number seven…* and *Cognitive Maps…* gradually distribute and stabilize visibilities and articulations through differential patterns of activities and thus discriminates which and how actors take part to their compositions. The elements (at least some of them) must belong to a place or set of places for some length of time. With suitable places stablished, with elements assigned to these places and with the provisory arrangement enduring for some time, it`s possible to tell what an actor can do. Each set of relations separate out one capability for action. In a fractal logic, each actor is, in itself, a stabilized network.

So what does a cognitive map do? It mediates (Tolman`s word, not mine) the stimulus-responses relationship. It establishes paths between sets of stimuli and appropriate responses. It plays the role of an intervenient variable and it helps the scientist to explain *a posteriori* differences between the behavior expected and the one presented during the experiments. It has no dignity of itself. It cannot be directly interrogated and cannot help to create new hypothesis or types of assessment. The only grownup variables that can respond by themselves and be accounted for are stimuli and responses.

The role played by the cognitive map and other mediated forms of behaviorism (Greenwood, 1999) explains the reluctance of Skinner toward the study of cognition. Skinner didn`t denied the existence of cognitive process which he called a "second link" between stimuli (the first) and behavior (the third), but he rejected the redundancy of supposed explanatory references to cognitive states once they are operationally defined in terms of stimulus inputs and behavioral outputs. As he stated:

> The objection to inner states is not that they do not exist, but that they are not relevant in a functional analysis. We cannot account for the behavior of any system while staying wholly inside it; eventually we must turn to forces operating upon the organism from without. Unless there is a weak spot in our causal chain so that the second link is not lawfully determined by the first, or the third by the second, then the first and third links must be lawfully related. If we must always go back beyond the second link for prediction and control, we may avoid many tiresome and exhausting digressions by examining the third link as a function of the first. (Skinner, 1953, p. 35).

This can be described as the classical example of intermediary as described by Latour (1991). The cognitive map and similar concepts establish a connection between two real actors, the stimulus and the response. In itself has no ontological value. They do nothing other than to carry or convey. They may eventually fail, transport badly. "But their lack of faithfulness does

not give them any importance in their own right, since that is what proves, on the contrary, their intermediary status" (Latour, 1991, p 80).

To discriminate an actor we describe how he is enrolled in an effort, how he contributes, but also who and how is affected by him and share the profits of belonging to that arrangement. But the price paid for us to be able to identify a discrete order to which some elements may belong is the banishment of those who doesn`t belong. Some behavior are not allowed, some passages are blocked. These suppressions and interruptions frame the object and its proprieties. They allow us to differentiate the cognitive maps of Tollman from the information process of Miller.

If we look into Miller`s description, on the other hand, stimuli and behaviors lose their importance. As previously described, the inputs are the most different. The outputs, in their turn, are not described as behaviors nor are they measured by their repetition. Almost all the data is presented as *bits*. Coming straight from information theory a bit represents in Miller`s report the amount of information one needs to make a decision among two equally likely alternatives. If we have to decide whether the side of a square has more or less than ten centimeters, and the chances are 50 - 50, we need one bit of information. Two bits of information would allow us to decide among four likely alternatives, four bits among sixteen alternatives and so on. This unit of information has no direct relation with the units of length used in the experiments nor does with difference between pitches or intensity of luminescence. It also does not have any direct relation with the behavior presented in the experiment, whether it is to speak a word, press a button or assign order to a list of objects. The abilities to discriminate, remember and decide are much more important than the resultant behavior. In this way, through to paper there are no correlations stablished between inputs and outputs. The amount of information transmitted assumes a reverse form of efficacy while a behaviorist would be interest in how fast or frequently a correct answer come up, the issue in Miller`s article is: when de we start to make mistakes? Information as an actor help us to track this question, to compare different kinds of mistake, compare set of mistakes made in different times. Without information the other actors are loose, they would drift apart, information holds them together and attributes places to them.

The act that builds continuities between pitches, memory and decision, marginalize behavior. If an actor it what put other actor into circulation. The constitution of specific assemblages render some movements difficult or even impossible. While Miller aggregates a set of performances to attribute competence (with a magical number) and stablish boundaries to information process, he server ties with timekeeping, falters and mazes. The performance of these discontinuities allow the constitution of a relatively autonomous agent.

Between cognitive maps and information process don`t lie the unbridgeable chasm of epistemological rupture, but a difficult terrain, with bad and awkward passages that need to be bridged and bypassed The later it`s not an evolution of the former but the two are processes that flow in different angles. Through this description science don`t advance in a linear way it constitute new connections and reorganize old ones, it expands in distinct directions. The cognitive Revolution in this way don`t imply an annihilation or a substitution what came before, but a bifurcation in the process of fabrication.

After the Revolution cognition is materially and conceptually different, it recruits distinct actors to distinct roles, it answer and imposes different questions. Far from an abstract or "merely philosophical" claim this is a common description among those defending the cognitive revolution. We can see it in the "newly built house" metaphor from Miller we quoted above, but it is Greenwood (1999) who shows us most clearly that cognitivist and behaviorism appeal to a complete different set of agents. Although neobehaviorists did employ expressions like cognition, thought, representation and meaning, he writes:

> Concepts such as "drive," "habit strength," "divergent habit family hierarchy," "pure stimulus act," and the like, and all the internal variables of "mediation theory," were provided with rigorous operational definitions, no matter how awkward and unwieldy they proved to be. (…) While theoretical definitions of the sensory register, attention, long- and short-term memory, depth grammar, cognitive heuristics, visual perception, propositional and imagery coding, episodic and semantic memory, template-matching, procedural networks, inference, induction, and the like have abounded in the cognitive psychological literature, operational definitions — as opposed to specified operational measures — of these phenomena have been virtually non-existent (Greenwood, 1999, p. 6 – 7).

As Greenwood allows us to realize, despite the fact that behaviorists and cognitivist could share some terms, each assemblage was completely different. They resort to different concepts, but also to different tools and different questions, constructing distinct networks.

But even if they diverge in almost every aspect, the history between the two could is not best described as a salto mortale from one to the other, but rather as a series of transformations, the appearance of new connections, the progressive accumulation of original mediations. The construction or breaking of associations through time constitutes the history of a specific object, and in this sense its revolution isn`t irreversible, but it could drift in any direction. The image of development moves from a line to a network where could be connected in inumerous ways, and one can link disparate elements in disparate times without making assumption about level or hierarchy.

Without the necessity of a linear development any new form or connection is possible. One can always discovers new links with the past and still go forward, slightly changing the angle of movement. The identification of a new connections with the past don't halt the

inventiveness of the process. We can always see new forms, new elements and new logics appearing through the establishment of new links with present or past elements. The connection with objects of the past don't imply a retrogress but a bifurcation, a change of route.

So our first proposal is that we could see the Cognitive Revolution as a bifurcation in the development of psychology. Without destruction or substitution of what came before, the fabrication of new elements like information processing allowed the establishment of a new chain of connection. Even if this chain is somehow connected with what came before this don't diminish the importance of their creations. In the case *something definitely did happen* and can be described as the fabrication of a new ordainment that forked the work in psychology allowing a new branch of development.

This kind of diferenciation cannot be account as progress anymore once we are not going straight forward as an arrow of time. So if we are not going forward who can we say we are moving at all?

2.2 Information Event

The second half of this chapter reiterates the question about the cognitive revolution. If it wasn't a revolution, what should we call it? We appeal to the concept of event as proposed by Latour (1999) and Stengers (2000, 2005, 2010)[9] as a way to avoid a binary definition of the cognitive revolution, a simple yes or no. The transformation of a chain of actors is our way to present the question in a more complex form. My concern here is to address the revision proposed by the critics of cognitive revolution that state that in the absent of a crisis or a complete break with the past, nothing important happened in psychology, as if we were stuck in time. In this perspective, the passage of time can only be perceived trough anomalies and new (paradigmatic) agreements. Without new agreements no real change took place.

Other contemporary readings of the Cognitive Revolution might concede that a paradigmatic shift may not be the best description for the movement that rose in the middle of last century and try to reframe these changes as a shift from “intervenient variables” to “conceptual constructs” (Greenwood, 1999) or a return to traditional themes that were prevented by Watson’s manifesto (Mandler, 2002), for some examples. But this descriptions

9 The concept of event was originally proposed by Alfred Whitehead and lately developed by Gilles Deleuze, as a way to contest mechanistic accounts of the world. More than something the simply happens, it describe a existence related with a set of specific problems. We focus here on the aspects and developments of the concept that help us in the history of sciences, for a more comprehensive genealogy of this concept see Fraser, 2010.

based on the conflict between Behaviorism vs. Cognitivist and the rise of the later could only be active through the expense of the former.

We present the concept of event as a diverse way to comprehend the passage of time. Through this concept we follow the contingent developments of the cybernetics era and the invention of information processing as well as the establishment of information in the psychological practice as a way to present the implications of this approach.

We assume that an account of temporality that doesn't employ ruptures or jumps to explain progress reframe the way we understand the history of cognitive psychology. More specifically, allows a narrative that doesn't rely on the conflict behaviorism vs. cognitivism, but still celebrate the changes and inventions promoted by scientists involved with information processing. In other words, we can accept that no revolution took place and yet describe the development of the last century in psychology as something new and interesting.

2.2.1 From an arrow to events[10]

In the last section we moved the image of history of science from a line to a network. Expanding rather than advancing, we can see the history of psychology as the mobilization of a larger number of actors through time. The question that this shift imposes is: how do we describe the movement in this network? If we are not going forward in an arrow of time, how do we know we are going somewhere? Are we moving at all? Or are we going in circles, remaining "as firmly behavioralistic as it was in 1910*"*, as Leahey (1992, p. 316) claimed more than twenty years ago? The aim of this section is to describe a relation with history and time in cognitive sciences without the appeal to progressive jumps, but still recognizing the developments involving the Cognitive Revolution as something creative and new in the account of psychology and related sciences. In other words, we want to explain what we meant by 'bifurcation' at the end of last section. We want to speak not only about the construction/invention/discovery of information processing, but also about the difference it created.

When the passage of time is described as a line (or an arrow) it implies a unidirectional, mechanistic account of this passage, presided by the order of causes. This is what Latour (1999) would call a zero-sum game, when no matter what happens everything that we have after has to be matched with what came before. Every experiment would have a fixed list of factors and actors; fabrication, as described in the last section, would only rearrange them in other ways.

10 This section greatly expands the arguments previously presented in Baum, Derksen & Cardoso Filho (in press).

“Whatever the scientists' genius, they always play with a fixed set of Lego blocks” (Latour, 1999, p. 125).

When the passage of time is described as a line (or an arrow) it implies a unidirectional, mechanistic account of this passage, presided by the order of causes. This is what Latour (1999) would call a zero-sum game, when no matter what happens everything that we have after has to be matched with what came before. Every experiment would have a fixed list of factors and actors. “Whatever the scientists' genius, they always play with a fixed set of Lego blocks” (Latour, 1999: 125).

We look for inspiration the concept of event as presented by Latour (1999) and Stengers (2000, 2005, 2010), to suggest that we can understand the happenings involving the Cognitive Revolution as an event that brought information processing into being. As a philosophical concept, an event is not just something that happens, but rather something that creates a difference between past and future. This difference creates a space for the production of new actors, human or not, without telling us precisely what the difference is about, how far it goes or how it settles. In other words, this difference created between future and past cannot definitely specify to whom or to what it will matter. Every identity and relation acquire definition through the event in such a way that there`s no complete list of entities related to it. For the same reason, no one can step outside an event and pass judgment upon it or explain it; every explanation that tries to confer a logically deducible character to an event falls in the trap of giving the causes that one discovers *a posteriori* the power of making the event occur, when they would have no such power in different circumstances. A movement of retrograde truth, as Latour (1999) suggests: *Causality follows from events and does not precede them* (p. 152) An event doesn`t have a precise present, it`s never something that is happening, but is always and simultaneously something that has just happened and something that is about to happen. It unfolds itself in the problems raised in the future it creates, but also in the interpretations, readings and discussions about its past. Even an interpretation that denounces the event and calls it a fake, still situates the one who proposed this reading as an heir, as belonging to the future the constitution of which the event contributed to (Stengers, 2000).

An event persists as an effect on each new association created at in the problematic spaced that it opened. These creations do not function on the basis of strict causal necessitation and determination. To raise the question about the Cognitive Revolution under the event sign implies recognizing this history as a contingent process (Stengers, 2000). That means we cannot deduce from a neutral historical context how a theory could be created. Nor can we equate the meanings and the problems constructed all related to their context. A historical period offers more than a context, since the issues raised and the answers offered would be meaningless

elsewhere or before. From time to time, the actors turn against the solutions devised for other problems the requirements of a problem that these solutions neither prescribe nor predict, but of which they constituted the invention field. These shifts upkeep maintain and expand the problematic spaced opened by the event in unpredictable ways, making the event simultaneously ongoing and contingent to each specific occurrence. This contingent process invites us to "follow it", each sequence being at the same time extension and reinvention. This way, we follow the theoretical narrative that arcs from the beginning of the 1940`s to mid-50`s. This narrative allowed information processing to come into being. We discuss how this creation marks a difference in future and in the past, and consider the relation of this analysis with the ones that follow the concept of revolution.

In what follows, we explore the three conditions described by Stengers (2005) to understand the meaning of an event: 1) the creation of a dissymmetry between past and present; 2) the irreducible character of uncertainty; 3) the interests created and the consequences of their development.

2.2.2 Information as dissymmetry between past and present

Between 1947 and 1953, a select group of engineers, psychologists, mathematicians, anthropologists, sociologists and neurobiologists met regularly in order to discuss circular causality and feedback mechanisms in biological and social systems. The annual conferences sponsored by the Josiah Macy foundation constituted the first organized confrontation with behaviorism (Dupuy, 2000) and were a pioneer example of the feasibility of a multidisciplinary project. The Macy Conferences on Cybernetics, as they were retrospectively called, were intended to formulate a theory of communication and control that applied equally to animals, humans and machines[11].

The conceptual development of cybernetics, however, has its origin some years before, in 1943, in two foundational articles: "Behavior, Purpose and Teleology" by Arturo Rosenblueth, Norbert Wiener and Julian Bigelow (1943) and "A logical calculus of the ideas immanent in nervous activity" by Warren McCulloch and Walter Pitts[12]. The first article is the

11 For a detailed history of the Macy Conferences see Heims, 1991; Dupuy, 2000; Boden, 2006.

12 We focus our analysis on these two articles as a way to understand the kind of questions raised and the answers available in a 'pre-cognitive scenario'. As we mentioned above, later – when this theoretical approach arrives in other disciplines - these issues will be used to face different problems and new application will be required from them. This is the movement that really interest us here. For a contemporary approach of cybernetics see Abraham, 2012; Galison, 2012; Kline, 2009; 2011.

work of Wiener's, an applied mathematician specialized in the creation of models, and Bigelow, an engineer. Together, they worked on an anti-aircraft defense system (AADS). The central problem of such system is the need to hit a moving target – an enemy aircraft not flying in a straight line – predicting its position based on partial information from its previous trajectory. Anticipating the movement of the tracked target (by extrapolation of its path observed so far), the AADS would aim at the point where the target would be at some time in the future. Wiener then developed a mathematical model that incorporated an innovative concept to date, the possibility of feedback, allowing the regulation of the system based on the difference between the effect of their action (output) and the expected outcome. In informal conversations with Rosenblueth, a physiologist, they developed analogies between the missile system and the human being, mainly inspired by war wounded that with lesions in the cerebellum. When these men try to bring to the mouth a glass of water, can only produce increasing circles around the lips, pulling away instead of bringing closer the cup to the "target". This situation suggested to the authors that there was an issue in the feedback loop of the action.

Retrospectively, the article offers an agenda for the future cybernetic field. The analogical link between the AADS and war wounded decisively collaborates to create a discursive domain in which humans, animals and machines could be treated as equivalent. It also created a discursive style that produced the objects of its analysis as black boxes able of continuous predictive adaptations. Later seen by cyberneticians as a paradigmatic case of ‘‘purposive’’ or ‘‘teleological’’ behavior (Boden, 2006; Hayles, 1999).

For an article that supposedly announced the Cognitive Revolution, it is surprisingly behaviorist. In the very first paragraph we read: “This essay has two goals. The first is to define the behavioristic study of natural events and to classify behavior. The second is to stress the importance of the concept of purpose” (Rosenblueth at al., 1943: 18). According to Hayles (1999) the behavioristic approach, relatively unconcerned with the internal structure, allows the analogy between a black box in an engineering laboratory and the organism as a black box whose content is relatively unknown. But even knowing little or nothing about their internal structure we can still draw conclusions from their behavior. But Rosenblueth at al. go further, asserting that because machines and humans sometimes behave the same, they are essentially alike. “The methods of study for the two groups are at present similar. Whether they should always be the same may depend on whether or not there are one or more qualitatively distinct, unique characteristics present in one group and absent in the other. Such qualitative differences have not appeared so far” (Rosenblueth at al., 1943: 22).

The cybernetic viewpoint, however, is built to omit the real differences between the internal structures of organisms and machines, focusing its attention on a very circumscribed

array of behaviors, called teleological, purposeful behaviors. The notion of *purpose* is understood as an action toward a goal. *Teleology* means a goal that is achieved through negative feedback. Teleological Behavior, based on the offered definitions, means "behavior controlled by negative feedback" (p. 24). As explained by the authors "behavior controlled by the margin of error at which the [behaving] object stands at a given time with reference to a relatively specific goal... The signals from the goal are used to restrict outputs which would otherwise go beyond the goal" (Rosenblueth at al., 1943: 19). This way the notion of purpose is analyzable in terms of difference reduction between the current state and the goal, and in terms of the possibility of a system that *extrapolates*, predicting some future location of its goal and aiming for it.

These restrictions create a set of situations where biological systems – like a cat pursuing a rat – and electronic systems – an anti-aircraft aiming a plane – could be treated as analogous. For Rosenblueth at al. there`s no metaphor in their paper, concerning teleological behaviors there`s no "as if". Cats and mice, missiles and planes, glasses and mouths are systematically the same in a strong sense. The difference created by this paper allows Wiener, Rosenblueth and all those who followed to occupy a position from where machine, man and animal could be the target of the same questions. Animals, men and machine could, in turn, answer with similar behaviors.

If this first article stated the agenda of cybernetics, our second provided a functional model. Written by neuropsychiatrist McCulloch and mathematician Pitts, "A logical calculus of the ideas immanent in nervous activity" (1943) seeks to describe neurons as capable of a "all-or-nothing" inhibitory or excitatory output with a threshold determining how much excitation is needed for one to fire. Above a certain threshold voltage, neurons are excited to produce a "yes" signal; below that threshold, or by inhibition, they produce a "no" signal. Neurons are connected into nets and several neurons could act together on firing a neuron or inhibiting its firing. Each net has its sets of inputs, outputs and internal states. The central idea of the paper is that neurons connected this way can be expressed by logical propositions. For example, if neurons A and B are connected and are necessary for C to fire, this would correspond to the proposition "If A and B are true, then C is true" ($A \wedge B \rightarrow C$). If, in turn, B is inhibitory and C will fire on a input from A only if B doesn`t fire, the correspondent proposition is "C is true only if A is true and B is not true" ($A \wedge \sim B \rightarrow C$). From this proposal several mathematical theorems about neural nets were proposed. The most important of them was that these neural nets could calculate any number - that is, any proposition – that a Turing machine could calculate.

Although conceptualizations of the brain as a calculation device were nothing new (Boden, 2006; Kay, 2001), the McCulloch-Pitts model makes a decisive advance, by demonstrating that the structure and behavior of a logic machine with all the proprieties of a Turing Machine could be considered as an idealization of the physiology and anatomy of the brain. Thus, like the universal Turing Machine can host any Turing Machine, the mind could be considered a logical function of the biological brain, both of them functioning under the same logic (Dupuy, 2000). Thus, from a logical perspective, mind and brain were one and the same.

The great difference created by "*A logical calculus…"* was the possibility to conceptualize mind and/or mental processes, as somehow distinct from matter and understood in machine-based terms. While the brain had been compared with different machines in history – even with jukeboxes – the mind lay untouched until that point. The neurons in the model are far from realistic, they are deliberately impoverished as much as possible. Like Bohr atoms and frictionless Newtonian surfaces, the McCulloch-Pitts neurons were idealizations, abstract models. And they were a specific kind of models – axiomatized models – where constructing was predicated first on translation of a phenomenon into a mathematical-logical operation (Kay, 2001). Here, a move very similar to the bracketing of the systems produced by Rosenblueth at al. (1943) takes place. The mathematical model is so general that it could be applied to man and machine alike, leaving aside all the specifications of how each entity would realize the propositional computation. But, it`s important to realize at this point that unlike "Behavior, Purpose and Teleology", 'machine' here doesn't mean a concrete, physical object, but a an abstract mathematical concept. There's no indication (neither in Turing, 1936; nor in McCulloch; Pitts, 1943) that it could be somehow implemented[13].

At this point there`s no direct connection between the two papers we have discussed, except for a long friendship between McCulloch and Rosenblueth. And even during the Cybernetic years McCulloch resisted the idea that his model could be seen as disembodied metaphor. What allowed a more strict connection between the two theories and eventually their fusion was the development of the Information Theory by Claude Shannon, published five years later, in 1948. The flow of information became what allow the feedback loop in the teleological behavior as well as what flows through neural nets. Information was, as we suggested before, what turned these results toward problems that weren`t predicted in their formulations.

13 A few years later, around 1946, Pitts started his doctoral dissertation about probabilistic three-dimensional neural networks. This was supposed to be a more realistic mathematical model of the brain with more direct applications. However, in a depression crises years later, Pitts burned all his written work and nothing could be restored of his model (Gefter, 2015).

Information Theory was developed by Shannon at the Bell Laboratories as a way to measure the reliability or degradation of messages in a physical medium, like telegraphs or telephone lines. Messages in this case are much more connected with patterns and predictable proprieties of sound signals than with meaningful content or intelligibility. Information is a probabilistic function with no materiality, no dimension and no necessary connection with meaning. Originally Shannon was concerned with the possibility of maximizing the rate of transmission without the loss accuracy. To solve this problem, Shannon`s theory deliberately dissociates the information from the meaning of the message as a way to quantify and measure the transmission of signals and reduce uncertainty. His ideas and concerns were directly related wartime concerns, especially cryptography: message transmission was treated as encoding, while message reception became decoding. This model could be applied to a variety of fundamental engineering problems such as coding in general, rate of transmission, channel capacity and, especially, problems of discriminating signal from noise. As we`ll see later, this model became the main metaphor in many psychological issues such as the functioning of human language and memory. But originally Information wasn`t a semantic notion linked with meaning or truth. It was a technical term related with statistically recognizable and predictable patterns. What was being predicted was the statistics of a physical signal, not the meaning (if any) being conducted by the signal. As Hayles (1999) notes, although Shannon`s proposal wasn`t the only one on the table, its quantification was reliable and it was theoretically general enough to flow unaffected by the changes in the contexts.

Here once more an invention in the contingent process takes place: while Shannon was very careful about how to apply information theory, stressing its technical importance and restricting its concerns to the efficiency of transmission of messages in communication channels, in the hands of the cybernetics the medium that could transmit information expanded from electrical circuits to the physical process in the neuron, as well as a letter written from one person to another. The Macy Conferences were a highly interdisciplinary and engineers, neurophysiologists, psychologists, etc. struggled to understand one another and make connections between the proposed ideas and their own area of expertise. In this process a concept that had a strict application came to have a broader significance, acting simultaneously as mechanism and as metaphor. As we showed before, it was the case of McCulloch-Pitts`s neurons that mutated from an idealization of a physical neuron to the mechanism through which information could flow.

But it is information itself as an entity, a method of measurement, that constitutes the major event. From the very first Macy conference information figured as the most important entity in the man-machine equation (Hayles, 1999). This way, information creates a

dissymmetry between past and present allowing the constitution of a radically new collective. As Stengers (2005) proposes, for an event to have meaning, the asymmetry created has to have consequences. We could consider the cybernetic collective created around information as the first nonmodern[14] collective where human, as well as other natural and technical systems would receive the same treatment[15]. One in which humans and machines could not only be inquired in the same way, but in which their answers could be compared and their distance could be measured. The same concepts and models applied to both with the "realization distinction" in a distant horizon. This created a new common language that excluded context specific meaning. Information extended the number of situations where man-machine comparison would apply to the point that the result of a well-defined number of computations of discrete representations could take place in the human brain and in electronic boards. In this framework human and machines are communication and control systems dealing with (computing) information. To the point that as soon as we could ask "Can a machine think?", we quickly jump to "How fast?" and "How similar to a human?".

2.2.3 A source of indetermination and interest

Until now we treated the concept of event as a novelty in the world that creates a difference between a "before" and an "after". However, unlike the idea of Revolution previously associated with the modern temporality, an event does not designate its own signification. While a revolution ends in a new paradigm determining new ways to frame problem and puzzle solving, the solutions that will be brought to the open problem – as well as the commentaries and criticisms these solutions will provoke – aren`t attributes of the event. The way these differences will be taken on are a part of its effects, of the problem posed in the future it creates (Stengers 2000). In this section we explore how information – connected with behavior – arrived at psychology trough the work of George Miller. In a similar way that information turned the McCulloch-Pitts model to unpredicted problems, like realization, information in experimental psychology had to face different requirements, as the possibility to address

14 For a complete discussion about the distinction between modern and nonmodern see Latour, 1993.

15 Pickering (2010) makes a similar statement based on the image of the cyborg – the fusion between man and machine – created during the cybernetics era. Curiously, as Kline (2009) points out, the idea of cyborg creation constituted a minor research field among the cybernetics mostly restricted to the medical area.

content in communication, for example. Once more, in this case the relation is not one of cause-effect, neither break or jump, but invention and development.

When we think about information processing and thinking machines today we almost immediately make associations with computers. Cognitive Science after all, is widely known for its reliance on the computer metaphor: to think is to manipulate symbols by following rules, similar to what a computer program does. But when the idea of thinking as computation came into being, digital computers, as we know today, were yet to be invented. As Dupuy (2000) points out it was the cybernetic movement, especially "*A logical calculus…"*, that inspired the design of John Von Newman`s first digital computer. When the cybernetics referred to thinking machines they were talking about electronic machines that could respond to external stimuli like the thermostat or the anti-aircraft system.

If the information event, as described before led us to contemporary cognitivism, it is not a matter of causal determination, but of development and invention. According to Collins (2007) the term information degenerated from a precise mathematical definition to a vague, undefined term in the psychology vocabulary. When information arrived in psychology – mainly through the work of George Miller's Psycho-Acoustic Laboratory at Havard – it was not in the form of a technical definition, but as a methodological tool to analyze serial dependencies in a succession of answers in a theoretically neutral way. In other words, to search for statistical chances of a behavior to repeat itself in a recurrent task; not necessarily connected with behaviorism and far from proposing a 'mental' theory. In those studies information promised to provide precise measures of how predictable behavior were.

The first papers involving information theory didn`t related to cognition, but were attempts to describe behavioral sequences. Information was soon applied to stimuli as well as to responses when used to measure the accuracy of stimulus identification. It was only in later years that subjects like perception were recast as information and subjected to experiment.

Still according to Collins (2007), the narrow mathematical definition of information, particularly the absence of a theory of content or meaning, soon appeared to have severe limitations in relation to psychology and psychological interests. For example, a person during a conversation would have prior expectations about the probabilities of particular signals occurring and these expectations — or knowledge — would vary between individuals. Thus, from a psychological point of view, the amount of information in a signal is also the result of the receiver's level of prior knowledge. These limitations forced a loosening of the meaning of information that eventually led to a definition that was vague.

The contemporary form of information in the cognitive sciences as a whole was summarized in Ulrich Neisser`s "Cognitive psychology" from the second half of the seventies

(Collins, 2007; Gardner, 1985; Hatfield, 2002). In the text Neisser retained the term "information" but rejected information theory. He didn`t want to make reference to Information without regard for "amount of information", divorcing himself from Shannon's Information Theory and his "narrow" definition of information. Curiously, he does this with a computer metaphor. Human cognition, like computer programs, is not an information measuring device, but consists of procedures for storing, recovering, selecting and generally manipulating information. He even adopted flow-chart models for recording information through various processes by which it was received and manipulated. This way, Neisser compared the psychologist`s effort to map the cognitive process with that of discovering the human cognition "computer program". Adopting this computational aspect, stripped away from its technical measuring meaning, Neisser defined the loose definition in use that information would have in Cognitive Science from the seventies to the present.

In each new encounter information change, assuming a different role. The previous roles or meanings are unable to determine the trajectory of change, even so information, not as a presence but as an event, is what allow us to still compare thinking and machines be it to say that we are close or away. A similar trajectory can be traced for the concept of symbol.

As proposed during the 1970`s, cognition would be the result of the interaction of discrete, pre-conscious symbols processed by operations sensitive to their syntactic meaning. In other words, the mind in humans and animals runs like a digital computer[16]. In the 1980`s Kosslyn developed a Neisser-like model for visual imagery, decomposing human imaging capacities into a flowchart of processing activities.

Despite the fact that this theory fits perfectly well in the standard model of computational theory[17], the symbol processing part of the theory were completely useless (Hatfield, 2002). The flowchart and functional decomposition into visual task did work and could be experimentally tested, the inference that these operations are instantiated in a underlying symbol system added nothing to the theory. Kosslyn considered to abandon the symbol system, nut later he reconceptualized it into neural instantiated points, a collection of these points could still be called symbol. But unlike the traditional symbol processing approach the individual variations of these point have no operational definition.

Another distance taking from the traditional symbolic computation model in experimental cognitive psychology came from the work of Barsalou (2003; 2012). According to him, symbols described by Fodor and Phylyshyn, as independent of sensory modalities like

16 In updated versions of this theory this computation device is understood as a massively parallel, natural evolved and modularized, but still symbol-using computation machine as we can see in Pinker, 2009.

17 To the point that Barbara von Eckardt (1995) described it as the paradigm for work in cognitive science.

vision or hearing don`t represent most of the cases in human cognition. In his experimental work he show that the majority of concepts are stored in a form that represents the way things look, sound, fell, etc., in perceptual - and opposed to the amodal - form.

But if Hatfield (2002) amass these arguments to suggest that experimental psychology were never truly part of the cognitive movement, we want to propose, based on these separation and deviations, that we – Kosslyn, Barsalou, Hatfield and we – are all heirs of the future that the information event created. We are all bound by the problems it created and involved in unfolding it. Each event is a twofold, correlated creation of a new actor and those who address it (Stengers, 2010). It invite us to take into account the historical immanence of the means invented to stablish each of our claims having no greater truth than the effects it produces.

The reference to an information event also help us remind the difference between ideas and practices. When we describe the transformations of the concepts of information, and symbols, we want to remind our reader the practices behind each alteration. As Stengers (2010) remind us, originally Kuhn's paradigm was about the way members of a scientific group learn to recognize and *treat* problems. But the treatment part as been almost forgotten, assimilated into an ordinary notion of a "vision of the world", correlated to the equally ordinary idea of a silent, indifferently deciphered world that could be interpreted according to whatever ideas are prevalent at the time (Stengers, 2000). This disparity between ideas and practice is crucial to a hierarchical articulation among them: Ideas understood as a "vision" would precede and command practices, the latter being a simple application or implementation. Under this definition, ideas run freely, unaffected by the constrains of its local implementation. Having no other resistance than antagonist ideas. What we`ve showed is that at the face of each new problem concepts must be reinvented and extended, but they do not break with their past. Each invention conserve its past in a new way to the extent that the very definition of the event depends of what we do with it today, always an effect rather than a cause. As versions of this argument might be found elsewhere[18], the concept of event help us highlight the practices that enable these changes. As well the different temporality that this frame assumes drive us to face these reinventions not as a straight movement from past to future, but as something that is spread in time.

Here we face the most paradoxal aspect of the event: each event is composed of a simultaneous movement in two directions, opening both the past and the future. We`ve been arguing that Information Theory proposed a new future where "cognition as information

18 See for example Dazinger, 2008 and Smith, 1992.

processing" came into existence. This existence, by its turn, redefine the information event as its principle.

But the same way that any new implementation redefine the Information event, this event redefined the whole history – past and future – of psychology. When Gardner (1985) and Hatfield (2002) revisit the history of psychology, they do it comparing the practices of psychologists of the past with the theories developed during the rising of information processing psychology. Through opposite perspectives both create an optical illusion where cognition, as we understand it today, always was the concern of one or another branch of psychology. Having knowledge of the importance that issues such as attention, perception and memory play in processing information they reinterpreted the past in a new light, saying for example that Gestalt preannounces Cognitive Science.

> Note that the kinds of molar problem posed stood in sharp contrast to those molecular tasks typically posed by the early German structuralists and the American behaviorists. These molar problems are (…) forerunners of problems favored today by many researchers in artificial intelligence (Gardner, 1985: 113).

From the eighties it possible for Gardner to understand retrospectively what the Gestalt psychologists were doing without realizing. The difference between past and future is that Gardner knows the part that symbolic representation plays in recognize exterior information, what he calls top-down processing. In these cases patters of previous information influence the perception in a way similar to the idea of the "good form" proposed by Gestalt. Gardner assumes that information processing was the underling object of the gestalt phenomena. In other words, Gardner reinterpreted the past practices of psychology as heralds of cognition. As we can see when he speaks about William James.

> In his Principles of Psychology, (…) He [James] suggested that psychological mechanisms exist because they are useful and help individuals to survive and carry out important activities of living. As he declared, "Our various ways of feeling and thinking have grown to be what they are because of their utility in shaping our reactions to the outer world." Without hesitation, he assumed purpose to be the mark of mentality - Romeo wants Juliet as filings want a magnet, he asserted (Gardner, 1985: 108).

Although James really address themes similar to those discussed by cognitive psychology such as attention and memory, he does it without once using the word information (Collins, 2007). But Gardner achieve a retrospective vision of the past constructing a new version of the history of psychology. From that moment William James always spoke about purpose as a category of human behavior. This history includes new actors such as purposeful behavior and information processing. He retrofits the past (Latour, 1999) with cognitive science. History of psychology after 1985 doesn`t have the same components, associations or texture as it had during its composition.

This retroproduction of history could only be achieved extending information process in time. Suddenly cognition became substrate of other people's unwitting actions, what all psychologists were always looking for. This, by no means, indicate that there is a durable and ahistorical “substrate” behind cognitive attributes. But only that through the sedimentation of time we can turn a new actor into what lies beneath or behind other entities. As proposed by Latour (1999) “Yes, there are substances that have been there all along, but on the condition that they are made the substrate of activities, in the past as well as in space” (p. 170).

To understand the process of retrofitting or retrocausation, Latour (1999) proposes an image of time defined along two axes, as opposed to the one direction arrow of time. The first axis would register the linear dimension of time i. e., the succession of the years. In this sense *Principles of Psychology* from William James and the work of Gestalt psychology really happened before Cognitive psychology in the 1980`s. But that is not all there is to say about them. We can trace a second axis, a column, that registers the sedimentary succession of time. In this dimension there`s a portion of the history of psychology that was produced after it happened and made retrospectively a part of the ensemble that form, from then on, the sum of what happened in psychology.

2.3 Final Remarks

This process of sedimentation never ends. Even today – even of this very paper – we establish new connections and recreate part of the history of psychology. As we suggested before, the information event constantly assumes new meanings as it unfolds itself through the past and the future. In this way no event can claim to have put its past behind - nor can become the bearer of the progress. What it accomplishes is the creation of a difference. But the difference it creates belongs to the future as long as it retain some memory of its own novelty (Stengers, 2005).

Correspondingly, when we look at Gardner`s history of psychology we do not intend to accuse him of anachronism or presentism (Danzinger, 2013), as if all he did was an unintended allocation of past occurrences based on his contemporary concerns and dispositions. Latour’s retrocausation helps us to perceive the event as a movement that subsists – rather than exists – in time, having no present, an event disperses itself through past and future.

Relating the concept of event as described by Latour and Stengers to the Cognitive Revolution is our way to avoid the modern temporality usually associated with it, while reclaim the inventive character of the “Revolution”. “To retain a memory”, as Stengers proposes, is to acknowledge that the difference produced did not break with its past, that it only mattered **because** of its past, and thus, to the extent as it might still matter, the past with respect to which

it marks a difference must persist in a way. It is the innovation, the production of new practices and new actors that, in reconfiguring and transforming the associations among already existing practices and actor from different times and spaces, may also reconfigure temporality itself.

When we state that events create actors we dot mean that entities such as memory, attention or information didn`t exist before the information event, but they just did not exist in the same way; the event transformed them in relation to one another in a way that there is a before and an after. The production of new relations among entities and practices into new and unforeseen arrangements. No event can be accounted for by a list of the elements that entered the situation before its conclusion.

3 Oscilations of cognition[19]

In the 1970's the Alfred P. Sloan Foundation; a philanthropic, non-profit grantmaking institution, had what it called "Particular Programs", in which it invested a substantial amount of money in an area of research over a few years' time, in the hope of stimulating significant progress. After successfully funding a neurosciences program, it was the understanding of the organization that the next step would be to invest in a field that could bridge the body-mind gap. The original intention was to invest in artificial intelligence: the field had provided the language for cognitive studies and showed some initial results in simulating mental operation (Gardner, 1985). An intervention of George Miller with the vice-president of the foundation translated this intention into funding a multidisciplinary field, and choosing cognitive science as its name. As Miller himself describes it:

> I argued that in that case [of investing in artificial intelligence] the Foundation's money would be spent buying computers. I claimed that AI was merely part of a much larger movement. (...) I argued that at least six disciplines were involved: psychology, linguistics, neuroscience, computer science, anthropology and philosophy. I saw psychology, linguistics and computer science as central, the other three as peripheral (2003, p.143).

As part of the process of acquiring the grant, a committee was assembled to summarize the state of cognitive science in 1978, and to write a report recommending appropriate action. The committee and its report should deliberate and settle what Cognition Science meant and what it was able to do at that point. As we understand them today, the Cognitive Sciences could be defined as a multidisciplinary movement that took shape from the association of disciplines such as psychology, computer science, philosophy, anthropology and neuroscience. The conceptual core of the movement is derived from the information theory developed from the 1950s by the cybernetic movement and from later analogies between mental processes and the digital computer. The Sloan Report (Keyser, Miller, Walker, 1978), although unpublished, played a key role in this definition and is widely recognized for giving birth to and shaping the field (Boden, 2006; Gardner, 1985; Miller, 2003). Based on this report, the foundation committed twenty million dollars over the following seven years to finance research in the United States and abroad. This amount allowed the founding of the journal Cognitive Science in 1977, to date one of the most important journals in the field, and soon thereafter, in 1979, a

19 This chapter has been published as Stabilizing Cognition – An Sts approach to the Sloan Foundation Report (Baum, 2016)

society of the same name. Likewise, programs, courses and newsletters arose all around. The Sloan initiative was so catalytic that, as Gardner describes: "… more than one person quipped, 'Suddenly I woke up and discovered that I had been a cognitive scientist all of my life.'" (1985, p. 36).

The advent of the field of Cognitive Sciences has been, traditionally, called the Cognitive Revolution (Baars, 1986; Boden, 2006; Dupuy, 1996; Gardner, 1985; Miller, 2003) in reference to the concept of paradigmatic revolution of Thomas Kuhn, and the deliberate opposition to behaviorism, which by the 1960's dominated the landscape of experimental psychology (Mandler, 2002). In this way, the Cognitive Revolution began in psychology in the 1960s (Boden, 2006), as computational accounts of perception, language use and concept construction increased their influence in departments and journals of psychology.

The phrase Cognitive Revolution achieved prominence during the 1980's with the publication of *The mind's new science: A history of the cognitive revolution*" (1985) by Howard Gardner and *The Cognitive Revolution in psychology* (1986) by Bernard Baars. From that point on it spread through introductory textbooks (Hobbs & Chiesa, 2011). At this point the Cognitive Revolution took the form of the collapse of the behaviorist paradigm, and the ascent of the cognitive paradigm focused on themes left out by John Watson's behaviorist manifesto like memory, attention and perception.

Concomitantly it has been discussed whether the philosophical idea of a scientific revolution can be applied to the development of the cognitive sciences (Leahey, 1992; Hobbs & Chiesa, 2011; Hatfield, 2002; O'Donohue et al. 2003). The controversy about the cognitive revolution has divided historians and philosophers of psychology in the last 30 years, and this paper aims to contribute to this discussion. The main argument against the Cognitive Revolution states that the events of the third quarter of the last century do not meet the criteria established by Kuhn and, therefore, the term 'revolution' does not describe them accurately (Leahey, 1992; O'Donohue et al. 2003). I will start my own argument with the conclusion proposed by these papers: that in the absence of a **true** revolution the movement should be better understood as a socio-rhetorical phenomenon that merely changed the language used by psychologists, but not its objects or objectives, behavior and control and prediction of behavior, respectively. According to these critics, the experiments and data produced by the cognitivists at the time didn't bring novelty to the field or solve any important question about the mind or behavior. These experiments and data were, instead, used as a persuasion tool that led to a social shift in favor of the computation metaphor. In other words; for Leahey, O`Donohue and his colleagues, we shouldn't understand cognition as a real fact, but as a discourse built upon behavior

observation. Behavior, more concrete than the cognitive concepts, should be taken as the real facts on which psychology should be developed.

I adopt the concept of factish as described by Bruno Latour (1999; 2010) and Isabelle Stengers (2010) as a way to reconcile these criticisms with the changes brought about by information-processing theory in psychology and other cognitive disciplines. The term is a neologism that combines fact, that which refers to an external and independent reality, and fetish, the accusation that someone projects onto a meaningless object his/her own desires and beliefs. The neologism is an attempt to stress that both facts and fetishes have some degree of fabrication. Instead of opposing facts to fetishes, or denouncing facts as discourse, as the critics described in the last paragraph, my intention is to take seriously the role of actors (humans or not) in research activities and thus to move away from the notion of rhetoric as 'merely' discursive.

My main argument is that contemporary cognition is a kind of factish that from the beginning was institutionalized in a way that allowed multiple performances (Mol, 1999; 2002). Its stabilization had to be obtained by respecting very diverse requirements and obligations from disparate disciplines. While psychologists had to construct quantifiable and replicable experiments to define cognition`s aspects, programmers had to be able to instantiate it on memory and power-limited computers, not just cognitive tasks but the structure and processes that generate them. While linguists had to ask if these structures could explain natural language, neuroscientists had to explore how all this could be realized into the brain. As Annemarie Mol (2002) suggests, if we foreground the way each of these disciplines puts cognition into play, we realize that in every set of relations it comes into being in a different way. With this in mind, I turn to the Sloan Foundation Report of 1978 (Keyser, Miller, Walker). As we will see, reading it we realize that the institutionalization of cognition was only possible through an oscillation between convergence and multiplicity. I conclude that a definitive consensus or a single approach to cognition doesn't represent a possible - or desirable - final goal for the multidisciplinarity of cognitive sciences. Multiple accounts, explanations and practices in cognitive sciences should reflect the multiplicity of human experiences, as scientists and subjects and contribute to the expansion of these experiences. As Gad and Jensen (2014) have recently done, our approach joins the concepts of factish and of enaction as a way to point to changes in the very composition of the world, accomplished through a variety of means.

3.1 Myth

In his analysis Leahey (1992) concludes that what happened in psychology in the 1960s and 1970s was not the revolutionary creation of a new paradigm, but the rearrangement, or reform, of behaviorism under a different language based on the computer metaphor. According to the same author, the set of experiments and data developed and provided by the cognitivists didn't have a superior ability to solve problems when compared to the behaviorists experiments. The new experiments had a merely *rhetorical* use to persuade others to join the cognitivist cause. The information-processing language, in turn, was bolstered not by new psychological data but by external forces like the aforementioned linguistic theory of Chomsky, as well as Herbert Simon's economics and Lashley's neurophysiology. This language took the momentum provided by the manufacturing of artificial intelligence devices capable of purposeful behavior, restoring the faith that mental process could be embodied in material devices rather than being immaterial souls. But despite this new language and methodological apparatus, for Leahey (1992) mainstream psychology remained as behaviorist as it was in the first half of the last century.

Based on Gross's rhetoric of science theory, O'Donohue et al. (2003) develop and deepen the *experiment as persuasion* argument proposed by Leahey, according to which the cognitive research program had a greater rhetorical power and promise in comparison with behaviorism. According to them, if we describe the events related to the cognitive revolution as a matter of the overthrow of behaviorism by cognitivism, it wasn't a matter of falsifying theories, or the number of anomalies, or problem solving power; instead, cognitivism was more attractive because, unlike behaviorism, it considered commonsense psychology, attributing importance to thoughts and concepts as memory and attention in its explanations. At the same time cognitive theories addressed contemporary concerns and could be connected with rising and promising fields of the time, like computer and brain sciences. Sandy Hobbs goes further and on two occasions (Hobbs & Burman, 2009; Hobbs & Chiesa, 2011) has proposed that the sole purpose of the phrase Cognitive Revolution is to establish an origin myth among cognitive psychologists which would allow them to recognize each other as belonging to a "tribe". It would provide cognitivists with a heritage that connects them with specific authors, and a sense of community that unites them to overcome something objectionable, namely behaviorism. All this, however, had no real impact in experimental psychology since most of it was still based on some form of behaviorism.

What the three critics share, and what I try to overcome here, are deep distinctions between discourse, reality and scientific practice. For them the emphasis on the socio-rhetorical

move is a disqualification: cognitive psychology either has no basis in reality (new data or problem solving power) or impact on scientific practice (still based on behavior observation); as if society, scientific practice and reality were different dimensions with only occasional contact. In this frame, criticism becomes an accusation, as if the cognitive scientists of today are mistaken about what they do or why their science works the way it does. The same way as the natives of the West coast of Africa constructed their fetish idols from wood and wires and later attributed them with godly powers, the cognitive scientists built a discourse and now credit it with their accomplishments; as if it has an autonomy that in fact it does not posses. What these critics try to do is to "invert an inversion, to grant the real master of the action credit for initiating i*t"* (Latour, 2010, p. 8). This ironic position tries to unmask cognitivists as idolizers of false gods - rhetorical gods. Carried away by the critics' denunciation, we would finally realize that what the Cognitive Revolution created was just a discourse in a world where only behavioral observation is possible. The socio-rhetorical movement of the cognitivists becomes "something that is nothing in itself, but simply the blank screen onto which we have projected, erroneously, our fancies, our labor, our hopes and passions" (Latour, 1999, p. 270). What they are trying to say is: It's just discourse, a mere myth.

As Latour has written, this makes it appear "as if scientific practice, technical practice, and political practice lead into entirely different realms than those of theory of science, theory of techniques, theory of politics" (1999, p. 266). His alternative to such purification is to emphasize the inseparability of the theoretical and the empirical, the mutual constitution of which he captures with the term 'factish'. Neither a 'fact' nor a 'fetish', the factish bypasses discussion of whether an object can be 'just found' (and is thus 'real') or is necessarily 'analytically fabricated' (and thus purely rhetorical, theoretical and possibly unreal). It does so by insisting that discourse and fabrication are not the reverse of reality, but rather its condition. Latour uses the notion of factishes to relocate scientific 'facts' in between the registers of realism and constructivism. To better understand how this concept can help us to explore the cognitive turn we should take a closer look at what this discourse is. I follow Cognitive Sciences, 1978 (Keyser, Miller, Walker, 1978), better known as the Sloan Report, as a way to understand this discourse and how it was used to institutionalize cognition as a multidisciplinary endeavor.

3.2 Enactment

As we open the Sloan Report the document is quite clear: "Cognitive Science is the study of the principles by which intelligent entities interact with [each other and] their environments"

(Keyser, Miller, Walker, 1978, p. 3) and the cognitive sciences should be united under the common objective "to discover the representational and computational capacities of the mind and their structural and functional representation in the brain" (Keyser, Miller, Walker, 1978, p. 6).

This objective "transcends disciplinary boundaries" (p. 3) and interconnects the six aforementioned disciplines, generating a long list of subdomains at each intersection of two disciplines, for example we would find neuropsychology between neurosciences and psychology as well as psycholinguistic between psychology and linguistic. Each of these eleven subdomains "involves the intellectual and physical tools of the two disciplines it ties together" (p. 3). As the authors propose, the main argument of the paper is that we should consider this network of disciplines and subdomains a single discipline under the name of cognitive science. The integration appears as a goal toward which the research groups involved should be moving. Although some examples of interdisciplinary collaboration are already presented, the report calls for a 'coordinated scientific attack' stressing the necessity of integrating different subfields through import and export of theoretical and methodological apparatus.

As Gardner (1985) highlights, quoting internal communications of the Sloan Foundation in the primary exploration with authorities in the field, the members of the foundation received indications that many areas of the cognitive sciences were converging. This way, funding would correspond with the importance to develop lines of communication from area to area so that research tools and techniques could be shared in building a single body of theoretical knowledge.

There's little doubt that cognition-as-information-processing was a discourse, one that foregrounded signals, transmission, reception and decision-making, one general enough that you could apply it to mind, machines, society and brains alike. This was precisely one of the major values of information processing. It provided a language, 'a communication line' to bridge disciplines such as linguistics, psychology, computer theory and neuroscience, creating a vocabulary that brought closer the problems encountered by members of these disciplines. With this language these problems could be theoretically framed in a way that made them look identical in a shared objective.

But, as often occurs, new discourses modify the quality of human action. As noted by several writers (Baars, 1986; Boden, 2006; Collins, 2007), information didn't arrive in psychology as a theory but as a methodological and statistical tool that would help to improve psychology's ability to predict behavior. Soon after that, however, it started to be used to design new experiments. Under the behaviorist regime no concept could be used unless rigidly and exhaustively described operationally. In this way, no cognitive concept could have a meaning

other than as an intervening variable relating independent and dependent variable, i.e, a way to relate *a posteriori* a stimulus to an internal state and this internal state to a response (Greenwood, 1999). They could not function as explanation of empirical observations, could not be creatively developed and lacked any capability of generating novel empirical predictions. In contrast, the computer metaphor in the 1950's allowed the development of theoretical constructions independent of operational meaning. To be more specific: the importance of concepts like short-term memory or attention was the possibility of retaining their meaning even when different operations and measures were employed in different experimental or empirical contexts.

We can perceive the computer metaphor at work, for example, in the buffer memories concept. Buffers are local, small memories used when two elements that arrived at different times at the computer processor must be related. These memories are used due the discrepancy of speed inside and outside the processor, and function as a temporary holding bins. In a psychological experiment described by Baars (1986), a bundle of 12 letters in a 3 x 4 arrangement like this:

x v t f

a l o z

g c e q

was presented for one-tenth of a second to human subjects. Right afterwards, a tone was sounded indicating to the observer which row of letters to report. At the end, people could report letters from any arbitrarily designated row, but not much more. They surely perceived for a moment more than they could report, because they could name all letters of a random row. Since the reporting signal was given after the letter display had been turned off, there was no way the observers would know beforehand which row would be chosen. These results led the researcher to infer that all information displayed was available to each subject, but only briefly. Like in a computer buffer memory, all the letters had been stored until a decision had been made.

The computer analogy supported the construction of an experiment based on a theoretical entity that cannot be measured directly. Vice versa, the results of this experiment provoked the narrative of a human kind of memory that briefly stores visual content but whose content cannot be fully reported at any one time. The boundaries between discourse and action, fabrication and reality become blurred. Like the traditional fetish of West coast Africa, cognition - in this case, buffer memory - inverts the origin of action and it transforms a creator into a creature (Latour, 1999; 2010). First, the "rhetorical" analogy movement fosters the design of an experimental scene, afterward the unfolding of the scene leads the human discourse. As Baars (1986) put it:

"[the] experiment… compels the inference that we have just made*"* (p. 164). The rhetoric modifies human action and work, but at the same time reveals that only human action gives voice and power to these objects that in their turn seize our discourse.

Although cognition was to become a profoundly important theoretical term, it was also more closely connected to methodological issues than is commonly supposed. The consequence of this dual attachment— both to theory and to method — was to make it a factish, that which allows a two way freedom of passage between word and world. According to Latour (1999) 'Factish' was supposed to create a resonance to the reiteration 'faire-faire' - in French, 'to make one do' and 'causing to be done'. With this expression he shifts our attention to multitudinous entities that give rise to action, and ultimately to existence.

In this way, we cannot say that the transformation in the discourse from behaviorism to cognitivism determined new actions and experiments. But at the same time, experimental actions were not completely detached from it. Discourse allows the action. In the experimental setting cognition was made to act, but, in turn, it makes others - scientists and subjects - act, revising in passing the golden rule: 'Make others do as you would have others make you do'. Each entity involved - scientist, subjects, memory, theory - achieve their existence and form as a consequence of the relations in which they are located. Which means that they are performed (Mol, 2002) in, by, and through those relations. The reality of these entities doesn't precede the mundane practices in which we interact with it, but is rather shaped within these practices. I should underline, as Mol (1999) did, that this is an active mode, a process of continuous shaping, and it's both open and contested.

While, with behaviorism, stimuli and responses allowed us to talk about observable behavior, the cognitive theory provided a language to discuss unobservable mental operations that take place in the nervous system. The independent mental level authorized the discussion of these events and possibly their electronic simulation without the theorist or programmer committing him/herself to a particular physiological organization. At the same time the shared concern with information processing allowed cognitive neuroscientists to relate their findings with already existing models and simulations. The invisibility of mental operations doesn't imply a non existence -- they are subject of a positive discourse -- but they are also modus operandi: their effects can be observed under conditions that can be as artificial as one might wish, as long as everything is made to revolve around them (Latour, 2010). These situations, thus, allow us to locate historically and materially the practice where reality is transformed and where new ways of doing reality are crafted. From there they are exported, not so much in the form of 'theory' or discourse but rather—or at least as much—in the form of computer programs, memory models, ADHD drugs, trained mice, electromagnetic graphs and other objects—

objects that carry new realities, new ontologies, with them. How we deal with this multiplicity and its contested character is the object of our last section. Before that it would be cautious to deal with some objections and implications of cognition as a factish as I proposed so far.

3.3 Subject

As we saw in the last section, the main objective of Miller and his colleagues was to develop a single discipline about the law and principles of interaction between intelligent entities. Whether these were human or not, this new discipline should look for structures and functions that could sustain representational and computational capacities. But soon after proposing this single and unifying objective, the authors admit that other descriptions need to be given and four different objectives are outlined: 1) The abstract description of structure, content and function of various mental processes. 2) Generate these processes or similar ones in physical systems - instantiation. 3) Developing plausible principles underlying systems (human or not) employing these processes. And 4) Understand the neurological foundations involved in cognition (Keyser, Miller, Walker, 1978).

If we can talk about cognition in these different ways, that's not because we can say whatever we want about it. If information processing needs any kind of *subjective* interpretation, it is in a very specific sense of the word: every scientist's interest in cognition is *subject* to it (Latour, 2013). If we fabricate cognition - as images, models or digital programs - these varied modes of existence fabricate us, the scientist receive from these fabricated beings autonomy and identity by giving them an autonomy and identity.

As Cohen-Cole (2005; 2014) discusses, during the 1950s and 1960s the computer metaphor and the design of experiments to account for the unobservable processes gradually defined at the same time the characteristics of cognition as well of the scientists interested in them. For example, when describing perception, the cognitivist would highlight the participation of previous experiences in "tuning" the organism for certain kinds of information to the detriment of others, selecting and grouping them. In other words, no human perceives raw stimulation, but only some features that match his/her perceptual expectancy. In a similar way, in Chomsky's theory, language development could not be described by a word by word association. For him, children should be able to construct abstract deductive theory for producing or recognizing proper sentences. The focal point of both theories - and other contemporary cognitivist theories - were hypothesis formation and insight. These two characteristics should serve as base not only for human cognition in general but also for the development of "good" science. Behaviorists were described as conformists that would settle

for methodological rigor and data accumulation. In contrast, cognitivists wanted to be free to develop theories and hypotheses, as well as design new experiments to test them. The former would be compared to naive realists, who saw science as a journey of discovery that needed to unveil the 'islands of truth'. The latter should be recognized as nominalists that do not discover but invent the categories whereby we understand our world and, ultimately, invent the world we live in.

This characterization of the cognitive scientist can also be found on the Sloan Report, in the preface written by Miller, where he stresses that one of the major achievements of the report is to transmit the "liveliness and energetic activity which today characterizes the field of Cognitive Science" (Keyser, Miller, Walker, 1978, p. II). The people working on the field are described as passionately committed and the initial interdisciplinary work as enjoying the ferment of creativity.

Inference, invention, problem-solving, making hypotheses, and model construction became at the same time descriptors of the bases of human thinking and of desirable scientific practice. The cognition-factish distributed not only what attention, memory, conscience were able to do, but also what scientists dealing with them should do. It allowed them, both cognition and scientists, to be alive, as Latour (1999, 2010) suggests, in a specific way. Yes, It has to do with discourse or belief, but it's much more connected with behavior. It's about the possibility to consistently pass between words and action, discourse and practice. If we fall for the myth accusation, 'the factish is broken' and we can no longer pass, we can no longer create. We have to live in another way.

If the interpretation of cognition diverges so much between behaviorists and cognitivists, and even between different cognitive disciplines, it's not because there's someone projecting his or her rhetoric or subjectivity onto it. As I explore in the next section, It is because cognition demands that they, psychologists, neuroscientists, programmers, linguists become part of its performance. The multiplicity does not imply that the constraints of truth and reality have been suspended, but that cognition must posses many folds and the more we perform it, the more we unfold its multiplicity and those interested in it (Latour, 2013; Mol 2002). Thus, the last question I try to answer is how the State of the Art committee managed this unfolding multiplicity of cognition.

3.4 Oscillation

As I proposed before, through the concept of performance we should understand ontologies in the plural. For, if the reality of the objects we deal with is done, if it is historically and materially

located, then it is also multiple, for it is done in different ways in different places. “Realities have become multiple”, Mol stresses (1999, p. 75). The cognitivist laboratory created the conditions to detect and describe invisible entities like memory and visual processing. In a very different way artificial intelligence and neuroimages do the same thing, create conditions in which these entities come into existence. In other words, the question ‘what is cognition?’ cannot be answered in a single way. So, how do these disparate and frequently irreducible realities come together?

Keyser, Miller, Walker and the rest of the committee assembled to report the state of the art of cognitive sciences faced the same question. Sure, in the first moment a possible answer appears: cognition is the representational and computational capacity of the mind and their structural and functional realization in the brain. But when trying to overview this objective the number of questions it raises grows fast:

“-- How is information about environments gathered, classified, and remembered?

-- How is such information represented mentally, and how are the resulting mental representations used as a basis for action?

-- How is action coordinated by communication?

-- How are action and communication guided by reason?”

(Keyser, Miller, Walker, 1978, p. V)

The list goes on and at the end the authors stress that the challenge they face is precisely to integrate such considerations in a coherent definition of cognition. As Miller proposes: “The questions on my list are not smaller and simpler than the whole; instead of delimiting a proper subproblem, each item is merely another view of the larger problem. To borrow a metaphor from William James, how can the bird be carved at its joints”? (Keyser, Miller, Walker, 1978, p. VI).

The introduction starts with a single definition and objective, but in a half-dozen pages these objectives are multiplied. The main body of the text is also divided, this time among the six disciplines represented in the committee. The chapters make no reference to one another, reflecting the personal account of Miller:

> The committee met once, in Kansas City. It quickly became apparent that everyone knew his own field and had heard of two or three interesting findings in other fields. After hours of discussion, experts in discipline X grew unwilling to make any judgments about discipline Y, and so forth. In the end, they did what they were competent to do: each summarized his or her own field and the editors - Samuel Jay Keyser, Edward Walker and myself - patched together a report (2003, p. 143).

Although many studies of controversies in Science and Technology Studies tell stories of convergence (Latour, 1987; Williams & Edge, 1996), of movements from plurality to sameness, I suggest that what supported the stabilization of cognition as factish was its

multiplicity. Instead of converging from many competing versions to a single reality, the document constantly oscillates between uniformity and difference. For example, in the preface the report team states that Cognitive Science is a unified and unifying discipline; however, subsequently each contributor represents a different discipline, like psychology, linguistics, computer science, anthropology, philosophy, and neuroscience. Still on the same page, the editors are forced to recognize that the diversity and creativity of people involved in it is so big, that "it's impossible that they are all destined to touch the mantle of truth" (Keyser, Miller, Walker, 1978, p. II). This oscillation between a single discipline to various fields and then back to a single truth produces multiplicity and singularity simultaneously.

To my insistence in the previous section on the word-world blurring produced by the factish I would add that this mode of existence is not necessarily coherent and unified. When we make visible that the practices simultaneously produce the factish and are produced by it we also make visible the multiplicity of cognition. This is because they are made in different ways according to the networks in which they are involved. This is not to say that the meaning of cognition changes according to the context. As suggested before, we must refrain from understanding the factish (in this case, cognition) as the central point of focus point of different people's perspective. If we describe cognition as it is manipulated in practice we soon realize that there's no sole object in the middle waiting to be seen from the point of view of a series of perspectives. At each set of interactions objects come into existence. As this existence differs from one practice to another, the object's reality differs (Mol, 2002). Our position therefore is to consider cognition as multiple factish, a multilayered entity composed by certain discourses and manipulated by different practices, that therefore has multiple coexistent - but not necessarily convergent - realities.

The heterogeneity of practices has been a source of tension since the early years of cognitive science. Computer programs able to simulate intelligent functions such as visual recognition or language comprehension already existed in the seventies. Although these artificially intelligent systems had an adequate competence when compared to humans beings when playing chess or solving mathematical problems, they extensively relied on theoretical entities, like buffer and long term memories, categorization and ranking, interacting with one another. These interactions were far too complex and fast to be tested empirically. Psychological research, in turn, favored the good old controlled experiment. These experiments are supposed to provide statistically significant outcomes. A common psychological experiment might measure subjects' reaction times in order to study what factors influence the subjects' execution. Unfortunately, when compared to the written digital programs, the theories that emerged from the experimental laboratory had the opposite problem: they were too simple and

economical, able to explain the experimental results, but usually not much more. We could also add the linguistic process which concentrates on the use of words (these are nouns, those are verbs) or phrases (this one is the subject, that one is the predicate of such and such a sentence) and develop theories to explain these uses. There is no search for evidence, in the sense used by experimental psychologists, and the main concern is the everyday use of language (Baars, 1986; Harman, 1988).

In the Sloan report we can read about computer programs able to simulate intelligent functions such as visual recognition, language comprehension and planned actions toward a goal; psychological experiments that compare human language performances with linguistic theories; and records of electrical chemical changes in the brain produced by presentation of touch, sound or light. In each chapter cognition is constituted as an object. Each of the chapters can be read as a story of arrangements, the weaving of a network containing different objects and subjects, distributions that perform different realities of cognition and its researchers. We can attend to each particular story as an arrangement of words which performs cognition as a particular kind of object. The final form of the document is a constant oscillation between the presupposition that there is a single object on the one hand and the action of different objects on the other. Cognitive Science - in the singular - should focus on "uncovering the fixed properties of mechanisms which might carry out cognitive processes" (Keyser, Miller, Walker, 1978: 204). Language, for example, is one of these processes. But this unity is a distant horizon that should be achieved through the theoretical components of grammar constructed by linguists, the neural functioning required for language sought by neuroscientists and the cultural manifestation of language described by anthropologists. So, language is on the one hand a unique process, on the other it can appear as a set of activated neurons, a manifestation of cultural differences or as group of generative rules. Singularity and multiplicity are both being done at the same time (Dugdale, 1999), and the settlement of the cognitive sciences as a multidisciplinary field was only possible because of this oscillation. The enactment of cognition as a singularity demanded the mobilization of various others. If the whole committee would have had to agree about the nature of cognition, we probably would not have seen the end of the discussion.

I want to propose that cognition is a factish with an oscillatory rather than convergent character. The situations in which it is performed are varied and mobilize a wide range of entities, but their performances are always both singular and multiple, rather than converging from multiplicities to singularity. Secondly, the course of work on cognition implies a continuous and constant oscillation between uniqueness and multiplicity rather than a movement from a momentary oscillation to a future rest. Each of the practices described above

stage cognition in a different way, which forces us to recognize that what cognition is can only be established if we explore these practices - since existence is not given outside of them. These methods and techniques do not put on display different aspects of a single object, but help to perform different versions of cognition. I resort to the word ‘version’ here as a way to consider the multiple coexisting forms of knowledge, controversies and contradictory definitions. Multiple forms of the reality itself of cognition, different but related.

3.5 Cognitions

In combining the factish and performance approaches my intention is to emphasize how science transforms the reality of the world. It produces ontological transformations of people and things and constantly rewires the ‘empirical’ and the ‘conceptual’. My intention was to point out that the changes created by the cognitive revolution are not restricted to mere words, as proposed by O'Donohue and colleagues (2003) or Hobbs and Chiesa (2011), but concern the very composition of the world. These transformations and creations of new entities, like buffer memory, attention and decision making - as well as memory specialists and ADHD drugs -- are accomplished through all kinds of means: controlled experiments, program lines, abstract accounts and ethnographic descriptions.

Gad and Jensen (2014) proposed a similar approach, constructing a parallelism between the concepts of factish and performance, since both ideas point to the mutual constitution and inseparability of practice and theory, and the way humans, technologies and ‘natural objects’ all construct each other in the same ‘practical’ process. As these are important points in my argument, I would like to stress that in Latour's theory the factish appears as an attractor that stabilizes and distributes the role of each actor. Usually Latour uses this idea to show how the execution of these roles grants coherence to objects. As I have shown in this paper, this is not entirely the case with cognition, at least not if we try to frame it from a unifying cognitive science perspective. On the contrary, multiplicity and difference play important roles, more in line with Mol`s uses of the concept of performance. This change in emphasis was crucial for my suggestion of oscillation as a particular type of stabilization that applies to cognition.

My proposal is that this combination of concepts -- factish and performance -- connects the existence of the discourse about cognition to the situations and practices that perform it. Through different practices, cognition is manipulated by various instruments, assuming each time a distinct ontology; now brain circuit, now speed of response; sometimes it appears as lines of a computer program or as common use of words, multiplying its forms of existence.

Both concepts allow us to invest in an understanding of reality always located historically, culturally and materially; dependent upon the field in which it answers questions relating to it.

There's no doubt about the importance of discourse, but the cognitive scientists were not machiavellian manipulators, nor is the discourse a world-creating despot that makes up whatever suits him. Discourse is modified, possessed, seized, altered by its subjects (human and non-human action). In their turn, these humans and non-humans alter their trajectories and histories in the research work.

By presenting the cognitive sciences as a multitude of factories that constantly produce new entities and multiple changes in the world, I argue that, rather than seek for integration (Costanza & Atkins, 2014; Wilson *et al.*, 2014), we should, as others (Derksen, 2005; Smith, 2006; Rorty, 1998) similarly have argued before, take advantage of the vitality indicated by the diversity created and make it more productive. As I have shown above, the theories of computer science, psychology and the neurosciences do not behave as pieces of a puzzle that could be joined together to form the real image of cognition. Rather, with different purposes and materialities, they produce different versions of cognition with different elements attached to it. This, on the other hand, doesn't mean that each of these sciences should take its own path and ignore the others. We should look for a viable way between isolation and integration that allows us to explore and amplify the effects of transformation in our biological and sociocultural environment.

4 Comparing cognitive politics

In the previous chapter I argued for an understanding of the cognitive sciences that considers the oscillations between unity and multiplicity. While sciences like psychology, computer sciences, linguistics and neurosciences share general goals and phenomena of interest, each of them engages in different specific goals through different questions, methods and instruments. Following Mol (2002) I suggested that objects such as memory, attention, decision making, perception, are enacted in the techniques that make them visible, audible, and knowable. In other words, actors are not quite the same from situation to situation. Instead, they are transformed when they move from one practice to another. Actors are found in different yet related versions, and practices develop through actors' transformational interactions. So, computer simulations, laboratory experiments, postmortem brain studies, scientific papers are different enactments of cognition. Different stages on which memory, attention and other cognitive objects can be performed.

We assume that these objects have no reality that precede these practices and in a classical ANT investigation we would be interested in how certain groups struggle for the monopoly of defining one of these objects - as between double and triple helix DNA presented by Latour (1987). However, Gad and Jensen (2010) stress that the approach developed by Mol shifts the focus of attention. The endeavor turns to shed light on the practical and local ways whereby different actors with different aims handle these objects. Doing so, we do not commit to the understanding that any specific actor has of an object, because this understanding is always the consequence, an effect, of the enactment of such object. We are therefore obliged to meticulously follow the efforts of involved actors to forge their relations in the networks of performance practices. Thus each practice has as effect a different version, a different ontology. The variety of methods employed by cognitive scientists multiply the ontologies, the realities, of these objects.

This chapter extends this argument by proposing a way to approach this diversity of versions, to discuss and reflect upon it. That is, how do we relate various versions of the same cognitive object? And how can we discuss their differences? Historically, the plurality of methods and approaches in the cognitive sciences alternates between those favoring a proliferation of theoretical and empirical approaches, and those who actively seek the synthesis and integration of explanations (Bigo and Negru, 2008). As I mentioned before, I look for a way to explore the diversity while simultaneously avoiding integration (the unification of multiple versions in a single theory, or in a single framework) and fragmentation, taking

relativism to its limit and assuming that each cognitive science is isolated and has no possibility of communicating with one another, letting us, in the end, with no capacity to understand and evaluate their differences.

It's my intention to keep following Mol (2002) in her understanding that these objects are multiple, but not plural. They are “more than one and less than many” (p. 82); each version is not an alternate facade of the same “real”, or underlying, object to which we don't have direct access; nor are they a fraction, a smaller piece, of a lost unity or exploded whole that we regret the demise of. Placed side by side, such versions would not fit together in an understandable landscape like perfectly matched pieces of a puzzle. Between versions, we can only establish partial connections, meaning that one enactment shapes and informs the other while staying different. The description of a traumatic event in a clinical set and the brain image of trauma related process are divergent, yet they are not independent. There’s an embedded tension between the multiple versions of trauma (cognition). They are related, but not in all points or in all dimensions.

It's relevant to highlight that these connections don't exist by themselves or in the object itself, but come into existence through the act of comparison. In other words, the comparison itself enacts the connections between versions of the same object. Unlike controversies - that Latour (1987; 2005) has taught us to follow and reopen - divergences or variations created by comparison are not “out there”, “in the wild” or in the laboratory to be found or followed they also do not strive for closure.

This conception reinforces the need to make clear the process of and criteria for comparison, to stress my factors, levels of analysis and the questions that draw my attention. I adopted the concept of cognitive politics (Gavillon, Baum and Maraschin, in press) as a way to refer to and compare specific assemblages of subjects, techniques, instruments and institutions that perform the mind, bringing forth how our practices shape and configure our cognition in multiple ways. In this early experiment my colleagues and I examined the role of the concept of representation in different explanations of cognitive functioning. For example, computational cognitive modeling frequently treats cognition as a 'strong representation', the subject internally reconstruct the knowable object following computational rules; in other explanations such as the enaction (Varela, Thompson and Rosch, 1991), the biology of knowledge (Maturana, 1987) and our own idea of cognitive politics, representation is understood as 'weak representation', where there is only a reference and not necessarily a correlation between subject and object. We could, thus, build an opposition between cognitive models and cognitive politics: the first understand cognition, and the result of research on cognition, as reconstruction of a pre-established world in which the action of knowing has next

to no effect on the known world. In the second, the development of the knowledge about the world is intertwined with the development of a world in which that knowledge make sense. The main property of cognition is not to solve a pre-given task, but to negotiate its entry into a world of shared meaning.

Our main point is that these differences contribute to different modes of existence of cognition. If we assume that no transcendental demarcation can be established – all methods and theories are enactments so all of them produce reality – what is left to us is the possibility of arguing over the terms of this coexistence. I – and my colleagues – resorted to the term politics in order to emphasize the necessity of a discussion about how these different versions of cognition can act together without discarding one another.

Cognitive politics could be described as a pluralist orientation, favorable for the co-existence of a variety of explanations, assumptions, methods, methodologies, approaches, theories, and so on. As such, it embodies the absence of an a priori rejection of theoretical or methodological ideas. To assume an indistinction between ways of approach and ways of existence of cognition, cognitive politics supposes a general concern about the diverse realities of cognition.

The general discussion on pluralism appears in the context of debates about the unity of science. In the sciences of the mind, philosophers and scientists have mainly (although not exclusively) approached the matter of the unity of science as a matter of reduction of higher-level theories to lower-level theories (Bechtel, 1988; Faucher, 2012; Nagel, 1961). In this scenario, pluralism appears as the rejection of a global project of unification in favor of local forms of unification. Although pluralism complicates – and multiplies – our understanding of the relations between theories, it insists on some kind of normative schematic as a way to create order among these disciplines. This schematic may appear as a typology of the intertheoretic relations (Faucher, 2012), as a common goal, for example to promote progress1 in understanding (Bigo & Negru, 2008) or as a meta-theoretical organization, a unifying theme or backbone to all of the various theories about the mind-brain (Hunt, 1999; Edelman, 2008; Von Eckardt, 2001). These meta-organizations recognize the importance of multidisciplinary approach but simultaneously inspire “the view that when all is said and done, the multiple theories comprising a future cognitive science will form a nice hierarchy, each level grading into the other” (Dietrich, 2008, p. 233).

As I mentioned above, I assume that each of these schematics proposes a way to enact the relation between versions of cognition. As much as I assume that ontological unification is one possible goal, it's just one among many possibilities. With cognitive politics I want to propose a way to understand these relations in which the concern for multiple goals is taken

into account and the discussion and confrontation are more relevant than consensus – consensus itself not being a goal. In order to better illustrate this point – and use it as a foil -, in the next section we explore the relationship between inter-theoretic reduction and the meta-scientific reduction as proposed by John Bickle (2008, 2012). In Bickle's words: "A metascientific reductionism derived from its practices should put to rest the tired worry that reductionism eschews higher-level sciences" (2012, p. 104. Emphasis on the original). As we'll see Bickle assumes that a plural approach to cognition is needed, but the final goal is the development of the lowest level of explanation possible, letting no room for discussion, for a political approach. Later in this chapter I look to expand the concept of cognitive politics in three ways: 1) Expliciting the meaning of politics in this context and its implications; 2) Extending this reflection upon other actors, such as instruments, subjects and modes of representation; 3) Bringing cognitive practices beyond psychology, especially the neurosciences, into discussion.

4.1 From reductions and rest to pluralism as politics

When considering the literature of the cross-scientific interface among cognitive sciences, we realize that philosophers and scientists have mainly approached the matter in terms of reduction of higher-level theories to lower-level theories (Bechtel, 1988; Faucher, 2012; Nagel, 1961). Bechtel (1988) describes theory reduction as one of the last legacies of logical positivism, and its contemporary form can traced back to Ernest Nagel (1961). In Nagel's model reduction takes place when the experimental laws and body of theory of a secondary science are shown to be consequences of the theoretical assumptions of a primary science. As positivists treated theories as linguistic structures, where axiomatic laws could be logically related in order to obtain explanations through deduction, they treated scientific relationships in a similar manner: A Theory 1 (T1) is reducible to a Theory 2 (T2) if and only if T1 is derivable from T2. In this case, facts or events that were explained by T1 are now explained by T2. In this models the task of reduction is to show how a higher-level description – e.g. decision making behavior or cell biology – might be logically related to lower level theories – neurophysiology or biochemistry.

One of the key features of Nagel's reduction model is the notion of bridge principles (or bridge laws). Considering that higher level and lower level theories use different terminologies to describe their objects, before a logical relation can be established between both theories, it is essential to connect the terminologies. This requires constructing matching rules that establish connections between characteristic terms of T1 and certain terms or expressions corresponding T2. The rules would be akin to a translation manual for converting the written language of one theory into the statements of the other (Araújo, 2011; Bechtel, 1988). This manual will generate

a set of rules specifying equivalences or identities between the two vocabularies. Reduction, therefore, is a logical relation between statements from different theories – and not between entities, phenomena or specific properties. The ideal goal is explanatory unification - and usually the result of the operation - is the construction of a larger theory, capable of explain a greater number of cases.

Although not necessarily, this explanatory unification might be accompanied by an ontological simplification. The number of entities required to logically deduce explanations is decreased in the process. This is frequently the case with cognition, where mental states are affirmed as identical to brain events. This postulate generates the search for neural correlates of mental states and the reductionist hope that neuroscience will provide us with a taxonomy that could be logically related to the taxonomy of mental states. This is the case of the the most widespread version of theory reduction among cognitive scientists, the Eliminative Materialism (EM) proposed by Patricia and Paul Churchland (1992). Eliminative materialists insist that our causal explanations for behavior in terms of mental contents, like beliefs, perceptions, hopes, desires intentions and the like eventually will be replaced with neuroscientific explanations. We will eliminate mental categories and kinds from our scientific vocabulary in favor of neural processes and brain states. In other words:

We'll conclude that there are no such things as beliefs, desires, perceptions, intentions, wishes and the rest, nor the logic like mental dynamics operating on their contents. There are only the brain states and dynamics being unraveled by neuroscience and predicted by the eliminativist to end up radically incommensurate with folk-psychological kinds (Bickle, 2014, p. 238, original emphasis).

This version of the reduction model doesn't resort to bridge laws or the merge of two theories, but instead suggests that within T2 (in the case, neuroscience) – and using only its laws, properties and elements - an analog theory 1' is constructed. T1', under specified conditions, has all the explanatory properties of T1 (psychology), but not the same concepts nor the same ontology. We can find an exemplary case in the history of physics: during the nineteenth century Newton's mechanics were applied to submicroscopic corpuscles translating what we usually call temperature into the average kinetic energy of gas components. All thermal phenomena began to be explained by statistical regularities of mechanical phenomena. In other words, T1' is not identical to T1, only similar, like a mirror image; the reconstruction displaces the old theory entirely while retaining all its explanatory and predictive power within the old theory's domain. Parts of the old ontology might survive but only in a significantly modified form, supposedly "in favor of a more useful ontology and the more successful laws of the new [theory]" (Churchland and Churchland, 1992, p. 72).

During the 90s philosophy of science gradually lost interest in EM. As consciousness became the new hot topic, the elimination of psychology seemed less likely. Recently, however, EM is making something of a comeback in a philosophical instance that John Bickle (2008; 2012) calls 'Metascientific Reduction'. Instead of appealing to the structure and/or relationship between theories, Bickle argues for a bottom-up philosophy that tries to comprehend reduction as emerging from scientific practice. He proposes that we set aside epistemological or metaphysical assumptions and turn our attention to how reduction is conceived in actual scientific practice.

So, in order to better understand and evaluate the mind-brain reduction, Bickle's strategy is to select a field of investigation that is 'reductionist' par excellence, one that scientists both from inside and outside would characterize as reductionist, and then compare its practice with other scientific fields that investigate related phenomena less 'reductionistically'. His paradigmatic example is Molecular and Cellular Cognition (MCC), a field in neurobiology that focuses on how molecular, intra-cellular and inter-cellular processes modulate cognition. As Bickle (2008) points out, the field itself is 'ruthless reductionist', it establishes causal relations between molecules, like proteins responsible for activities in nerve cells, and cognitive phenomena, such as perceptual representation and long term memory acquisition. So, what does reduction mean in a field in which the main goal is mind-to-molecular pathway reduction? What are the specific practices and experimental approaches that distinguish MCC from less reductionist fields?

Bickle describes four operations existing as a type of experiment or result analysis on MCC that characterize 'real reduction': (1) positive or 2) negative manipulation of cause or mechanism, experimental manipulations that (1) increase or (2) decrease probability, extent, or duration of a cause, and measure the probability, extent, or duration, of a hypothesized effect. (3) non-intervention correlational measures, experiments that measure the correlation of occurrences of causal element or mechanism and hypothesized effect without experimental manipulations. (4) Integration, the examination of results from a number of experiments on mechanism and effect, and on phenomena related to both, of the types (1), (2) and/or (3); to infer the causal structures among the phenomena studied in those experiments.

The author thus extracts from these four principles an understanding of reduction that, unlike classic inter-theoretic reduction, is not foremost a relationship between theories, as it doesn't require an explicit – or complete – set of laws or explanatory statements that characterize reducing or reduced elements in all circumstances and contexts. 'Real Reduction' it is not a step-by-step logical relationship between statements and laws, but the methodological operationalization in terms of measurement in specific behavior protocols for the purpose of

controlled experiments. In other words, instead of logical derivations or generalization of explanations, genuinely reductionistic neuroscientific practice is a matter of intervening causally directly into hypothesized processes at increasing lower levels of biological organization (cellular, intra-cellular molecular, molecular genetic) and tracking the effects of these manipulations in living, behaving organisms using measures accepted as indicative for the cognitive phenomenon being investigated. It's when these manipulations generate evidence for negative or positive alterations (operations 1 and 2 above) - in the light of evidence connecting the hypothesized molecule or mechanism to the behaviors serving as cognitive phenomena - that a reduction is said to have been accomplished.

Although Bickle insists that his analysis is purely an assertive description of how reduction operates in scientific practice, without offering any metaphysics or normative epistemology, he creates a picture of science in which psychological phenomena are explained by going straight down to the molecular level, skipping any intermediary levels between. So, he claims that it's possible to explain all properties of perception or memory in a molecular language, without having to explain them in terms of neuronal relations or information processing. In this picture all the 'real' explanatory work will be done at the molecular level, and other levels (brain, behavior, society, etc.) should be considered heuristic, or background knowledge, for guiding lower-level discoveries or explanations. Once these explanations have been found, there is nothing (worthwhile) left to be explained by other theories, they are rendered 'explanatorily inert' (Faucher, 2012). Behavioral analyses are only worth the effort to the extent they provide probability, extent or duration for molecular mechanisms' correlation, or to establish theoretical plausibility for a proposed molecular mechanism in a psychological phenomenon. Cognitive measures are only useful in the sense that they provide indicators for the cognitive phenomena being investigated. Standard decomposition and localization investigations of cognitive neuroscience are crucial, but only as a way that allow us to know where in the brain to insert our cellular and molecular interventions.

Bickle insists that even the most ruthless reduction requires a form of pluralism, a multiplicity of approaches to be possible. But what his work implicitly suggests is that the accumulation of knowledge about the mind necessarily leads to a consensus among those interested in it. It also suggests that a complete, true and ahistorical description of cognition can be accomplished. The success of each science related to the mind could, thus, be measured in accordance with how much closer it bring us to this goal. And at some point we would finally reach the truth and, so, we could all rest.

I reiterate here that we cannot isolate the objects from the practices that enact them. Which means that we cannot compare or relate these objects isolated from their practices. If we

keep the attachment between objects and practices, it becomes harder to establish a complete alignment of understandings or a well-behaved hierarchy; we are stuck with an ever increasing number of problems and an ever increasing number of versions created to face these problems.

I consider, in a way similar to Rorty (1991), that research about cognition leans towards proliferation instead of convergence, and production of diversity instead of unity. This multiplicity doesn't derives from lack of knowledge of those dealing with research. As mentioned above, each new problem and investigation circumstance set new methodological outlines. This way, the destiny of human activities would not be final rest, but better and more diverse activities.

This position, however, doesn't imply a total relativism on my part. At least not in the sense that 'a belief is as good as any other', meaning 'anything goes'; nor in the sense of an interpretative flexibility that would consider truth a term that can have multiple meanings depending on socio-historical conditions, and therefore has no use value. I look for a pragmatic position, assuming that the truth doesn't mean a univocal correspondence with reality. We can't say a lot more about it beyond the fact that it fulfills our criteria and processes of justification. I mean, we believe to be true a commendable set of well-justified beliefs (Maturana and Varela, 1987).

With the introduction of the concept of cognitive politics, I do not turn to procedures that will lead us to a single, timeless truth, but seek to question how different scientific propositions can coexist without the need to convert them into different 'points of view' of an object that remains unique even though underlying and hidden. As I mentioned at the introduction of this chapter, this idea leads to the possibility that different viewpoints could be merged in the future; as reduction supposes, reaching toward the 'true object' would depend on the skill of the collective involved. I also do not look exclusively, as Bickle does, for a bigger predictive power. What I want is to be able to reflect on what each version allow us to do or to think. How each of them can lead us to produce a more concerned and interesting collective?

4.2 Cognitive concern and politics

To answer this question I refer to the concept of cognitive politics, originally presented by Kastrup (1999) at the end of her book *A invenção de si e do mundo* (The invention of the self and the world). Combining Kastrup's proposal with STS authors, I propose a shift that moves away from the act of comparing theories (functioning and the structure of cognition) in the direction of comparing the practices that shape it. Therefore, it's not my intention that the term cognitive politics describes a theory, at least not if we understand theory as a systematic set of

explanatory statements or a logical and consistent structure which connects causes and its effects. I refer to it as a methodology that has as its object the practices operating on cognition. I also appropriate the term to describe the way I pull away from the pluralist projects that establish a priori the roles that each discipline can play in the production of a homogeneous cognitive science (Bickle, 2012; Edelman, 2008; Hunt, 1999; Von Eckardt, 2001). With this, I question the coexistence and the multiplicity of forms and actors that allow different enactments of cognition, not aiming to eliminate controversies, but investing in the possibility of new compositions of the collective. As I show below, I draw insights from three concepts to better shape this proposition: Matters of concern (Latour, 2005) and Politics (Stengers, 2002).

The shift in focus from explanations and concepts to practices is analogous to the movement proposed by Latour (2005, 2007) from matters of fact to matters of concern. The first refers to the engagement to construct and validate a correspondence between a statement and a situation, expecting that 'the facts' converge to a unique version so any discussion could be closed, not unlike theoretical reduction discussed above. The second turns toward the stress of controversies, the differentiation and contrasts, providing a discussion of the differences.

Matters of facts are related to the recognition of objects with well-defined outlines and properties, determined by laws of causality, truth, efficiency or profitability in which those responsible for the conception, definition or production, like engineers, researchers or managers, become invisible. The practice – be it scientific or technical – stays independent of the object. These 'clean' objects that compose the scientific facts eventually face unexpected effects. These effects are treated as external, characterized as impact. They come from a space or set of elements less defined, which are always described vaguely as 'social factors' or 'political dimensions'. Scientific facts are exterior to this social world that they hit and where the unexpected – or even catastrophic – results are experienced. These consequences, however, have no retroactive effect on the initial definition of the facts, on its outlines or on its ontology. Matters of fact put definition and catastrophes in different planes of existence. If we go back to Bickle's effort, once molecular mechanisms have been described the debate is closed. New experiences, be they from researchers – new measurements or different cognitive theories - or subjects – a trauma, contact with a new technology – have next to no impact on the definition of the mechanism. If some new cognitive theory is developed, it has to take into account the already defined molecular system or be considered less scientific, even unrealistic in some extend.

When we turn to the matters of concern, objects no longer have a precise essence and there's no separation between a hard core and what surrounds it. In the words of Latour: “A matter of concern is what happens to a matter of fact when you add to it its whole scenography,

much like you would do by shifting your attention from the stage to the whole machinery of a theatre" (2008, p. 39). According to him, we should consider in combination with each fact - its leaders, always complicated, controversial, tangled, involved; with their laboratories, workshops and instruments. We must consider that those responsible are also part of the definitions and existence of these objects of concern. Thus, scientific effects are not precisely a matter of impact, as if the scientific statements fell from the outside in a world that is not theirs. These objects of concern, unlike pure facts, have numerous connections. Like tentacles, these connections bind the objects in numerous ways to other beings as imprecise as themselves and, as a consequence do not comprise a different world. Instead of simply being there, ever existing, matters of concern begin to appear distinct, they start to move in all directions, they overflow their borders, they include a complete set of new elements. Instead of "being there whether you like it or not" they still have to be there, but they have to be liked, appreciated, experimented upon, prepared, put to the test. And most importantly, we cannot detach their definition from the consequences, expected or not, they can trigger in the long-term. I consider the enactments of the objects in order to keep together ontology and unexpected effects. The comparison between versions allows us to redefine these same versions involved in the comparison.

I resort to matters of concern in order to explain the way I think about comparison is my way to include in the relation we propose not only scientific effects, such as behavioral measurements and brain activation, but the institutions and social practices that enact them. Unlike Bickle, who also proposes we look at scientific practices, but reserve his pluralism for a combination of effects that enable a lower level description, we do not restrict our consideration to an objective reality beyond our action, but invest in the idea that the best way to decide what to do is to listen to as many suggestions and arguments as you can.

I want to extract from these propositions the possibility to assert that scientists, either soft or hard, still deserve to be heard when it comes to the ways we organize our collective, but without considering Science as privileged space where humanity can come into direct contact with reality. Nor do I want, as the matter of concern also suggests, to resort to the opposition between hard objective facts and something more soft, slippery and uncertain as values. We can appreciate and utilize the capacities for prediction and control of our surroundings that the sciences often provide, but we need not think that such capacities signify anything more than an ability to fulfill those particular human interests that depend upon reliable interaction with our surroundings. We can still allow a concept or a model to still regulate action, they can still be worth fighting for, even if we are aware that they are generated by nothing deeper than contingent historical circumstance.

We do not take as a starting point the relationship between scientific practice and objectivity, but concern instead. Another possible characterization of my proposition is political attention (Stengers, 2000), once I'm not interested in measuring scientific practices from a set of transcendental categories, nor do I have the prerogative, as Bickle does, of deciding which questions are suitable for each science. My position is similar to that of a political analyst – in opposition to that of an epistemologist - in the sense that offering few theories and usually reserving their work to comments on speculative or historical studies, always dependent on the motives and situations raised by history. The political analyst cannot claim for himself an interest or special ability to define what is political, nor can I claim for myself the ability to demarcate what is scientific.

What a political scientist tries to understand is the very political practice of the collective in the sense that it, or should, matter to everyone. But every moment he is preceded by practices which are explicitly political. When placed on a situation in which several actors pose very similar questions, the task of the expert is 'to follow' history. Other actors who “ceaselessly invent the way in which references to legitimacy and authority are discussed and decided, as well as the distribution of rights and duties, and the distinction between those who have the right to speak and the other” (Stengers, 2000, p. 58 [original emphasis]). From a methodological view it's unwise to mistake Science for Politics, these practices aren't entirely interchangeable, but still, they are associated by a common problem: how to recognize a legitimate representative? By which traces do we recognize those who want to speak for more than one or the theory that wants to represent the facts?

It is by following up on these questions that I want to discuss different cognitive politics. The political dimension resists any objective definition because it's correlated with the creation of definitions. The fact that I'm interested in how the problem of representation is stated and arranged does not confer on me the power to judge, but the possibility to track down how each science builds solutions through a unique assemblage between the actors involved.

The concepts of politics and matters of concern share the importance of bringing to light the negotiation and composition processes required for any possibility of (co) existence. We can no longer rely on the certainty of the pure facts, in which the separation between subject and object is clear. We need to live with the uncertainty concerning the relationships whose consequences (some unexpected) constantly threaten the order and our action plans. Thus, the final results, isolated, rarely reveal how the agreement on an action was possible. It is by following the 'due process' (Latour, 2004) that we intend to abstain from the distinction between facts and values and consider how the available propositions can consistently lead us to a particular joint action.

4.3 Some recap

If we keep in mind Mol's (2002) proposition, that ontology or essence do not refer to an a priori order of quality or things or, rather, the ontology of an object is the effect of associations between heterogeneous entities; diverse practices, such as those in the neuroscientific laboratory, the psychological clinic or a language class bring entities together and through these associations, different cognitions come into existence. As described in the last chapter, this is specifically a counterargument to the common idea that cognition is an "natural", underlying, actor that afford different perspectives and one could describe how these perspectives may conflict. We can argue with Mol (1999, 2002) that in such assemblages, cognition is an active actor in the performance. Therefore, cognition itself cannot provide an 'objective' or 'natural' ground for perspectives. Multiplicity is an ontological condition. Unlike the concept of construction, which suggest something that becomes stable and fixed, enaction alludes to the potential fragility of an assemblage. Word recognition in an electroencephalogram (EEG) is enacted as neuronal activation 400msec after word presentation, but means very little for a student trying to answer a language test at the school finals. What the concept of enaction stresses is that ontology is not fixed, but is often transitory and fluid: actors assemble, disassemble and new assemblages form.

In each assemblage (re)formation it is necessary to (re)negotiate the role each entity plays in the enactment and it is in this sense that we can say that there is a constitutive political dimension of the scientific work without reducing it to power games. This is not to oppose the truths constructed by science with a truth of higher power, not even in the form of a priori denial in which all truths would not pass 'a belief as any other'. The produced solutions of each negotiation can be most diverse, but they will always address how to divide, to arrange, define rights and prescribe duties to the actors involved (Stengers, 2000). A political approach allows me to create a problematic space in which the problem of ontology creation can be tracked and traced. Even if a problem is covered by solutions, it does not cease to exist as that which organizes the genesis of these solutions as a horizon of what happens and appears, establishing its meaning (Deleuze, 2000). As the classic theory reduction (Nagel, 1961) extended the linguistic structure it attributed to the sciences to cross-scientific relationships, I extend this political dimension necessary in each enactment to the relation we can establish between them. If the act of comparison produces the relation in each comparison it is necessary to negotiate and distribute the role of each version. This negotiation doesn't need to follow the imperative of objectivity, thus each time we compare different enactments the goal that is established plays an important role.

This point becomes clearer when we compare it to the kind of pluralism proposed by Bickle. His reduction proposes a uniformity, a common reference to all cognitive disciplines. It submits these sciences to the search of the lowest functional level, in this case molecular - at least until biophysics takes over. This operation imposes a standard problem (and, thus a standard solution) to cognitive sciences: What is cognition at a molecular level? The question assumes that nothing really exists outside this level, it presupposes and enacts silence among those involved by making it impossible to object or anyone else to demand the due attention. A silencing power that affects every term involved except the molecules and the ones allowed talk in their name. All relations established are measured by the possibility to activate the molecular level, no other problem (and thus no other solution) is able to claim reality value.

When we move from explanation to practices we are unable to set submission as a goal when comparing sciences. Each practice defines itself by its specific "way of paying due attention; that is, of having thing and situations matter" (Stengers, 2011a, p.59). Each produces it own world, it enacts its own reality. So, divergent explanations could be destroyed by the imposition of a standard ensuring equivalence, preserving disciples only to the extent that they collaborate with an already established solution. But how do we discuss coexistence of practices that resist this kind of submission? My aim is precisely the possibility that we live together with distinct proposition, considering disparate requirements and obligations of these practices. I call for cognitive politics as a way to consider the singularity of each enactment of cognition and still allow them to share something. In other words, I want to consider a relational heterogeneity, I mean situations that relate heterogeneous protagonists without predetermining the hierarchy between the version involved or which question or solution are suitable beforehand.

The kind of pluralism I propose for cognitive sciences, considering that each discipline enacts cognition in its own ways according to its own problems and requirements, resembles what Stengers (2000; 2005; 2011a) describes as an ecology of practices. The core element for ecology as a metaphor is that naturalists cannot define what matters for each of their subjects in general terms. They have to consider specifically how the behaviors, habits, needs and crucial concerns assert themselves positively. Ecology/politics, as a matter of concern/solidarity is meant to not dissociate scientific practices from the way each of them defines its environment, including other practices.

As we strive for relational heterogeneity we should include 'ruthless reduction' as a possible configuration. As we mentioned before, Bickle suggests that a materialist objectivity should be applied to all sciences interested in cognition. Molecular and cellular cognition submit other disciplines to its particular interest. This situation could be addressed as a predator/prey relationship (Stengers, 2011a). As MCC has stronger connections with

materialism it will define others as potential prey, threatening the existence of those who do not set objectivity as a goal.

The use of ecology as metaphor also helps us to take some distance from the ideal of harmony, goodwill and peace that other terms, like solidarity, might suggest. There's no neutral position from which we could access rights and duties, nor is there any transcendent hierarchy from which each entity would have its role assigned as part of a harmonious whole. For each time we assign a standard for comparison – as objectivity in the previous paragraph – we threat en with extinction that which determines what matters for each practice, what make its practitioners act, think and/or resist. In the words of Stengers: “Whatever the pretensions of rationality or (good) governance, the comparative operations they authorize are describable as an ecological catastrophe” (2011a, p. 60).

We recognize in the term politics a reference to an active participation in a heterogeneous community, the establishment of coexistence or associations between different elements and the formation of the context(s) where such associations may occur. That is, we call political the discussion itself of how we can act together. Under what regulations can we live? And how does this or that status modulate our existence? It is our very understanding of 'cognitive politics' as the action of questioning the relationship between multiple practices that puts into operation cognition, that allows us to reflect on the effects produced and the collective convened by these practices, and under what terms we discussed them.

The comparison builds contrasts that help the researcher to establish new connections and relationships between different practices. These associations, however, always have an experimental character, as they are constantly subject to possible resistance of the field and its actors. Thus, we take contrasts as problematic nodes for monitoring heterogeneous processes in different ways of producing cognition. The researcher's role becomes, then, to operate with the contrasts in order to bring out analyzable material, indicating the effects produced by them and thus be able to invent new relations between the actors or between versions.

Returning to learning and pedagogy, Kastrup elected the invention as problematic program. That is, what were the proposals offered by her "candidates" (1999)? How to articulate the collective in an inventive way (Kastrup et al., 2008)? Teaching and learning, however, do not enclose the fields of action in which cognition is modulated. Thus, our proposal is to question the cognitive politics that operate through different contemporary cognition research methodologies. Therefore, we need to question what should be the starting point for drafting the terms of a cohabitation agreement. Coexistence does not necessarily indicate a consensus or pacification, but the possibility of acting together.

5 Ontologias da Consciência de Si

Neste capítulo discutimos os diferentes modos como a autoconsciência é trazida à existência nas práticas de representação das ciências cognitivas. A representação tem sido um dos principais pontos de discussão dos STS, que busca situar ilustrações, gráficos e imagens no interior de atividades contingentes, localizadas e orientadas teóricamente. Estabelecendo o estudo da representação enquanto prática - o estudo do verbo representar - e não do seu produto[20]. Isso não significa sugerir que tais produtos são incapazes de referir, retratar ou representar algo real. Ao contrário, aponta que seus usos e manipulações estabelece o que eles fazem, como eles ganham significado e o que é feito com eles.

Neste capítulo a discussão é feita considerando as proposições a cerca de políticas cognitivas do capítulo anterior e, portanto, compreendendo que a representação pode ser alcançada através de diferentes políticas que distribuem de maneira diversa os atores envolvidos. Distribuições entre a superfície de representação e aquele que representa, entre sujeito de pesquisa e objeto representado. Cabe lembrar, tal como destacamos nos capítulos anteriores que cada prática modifica a composição da realidade com a qual lidamos, que discurso, ação, representação, corpos e tecnologias se entrelaçam na composição do mundo no qual vivemos.

Esse capítulo explora três políticas diferentes para compor, representar, reconhecer um processo cognitivo, a autoconsciência. 1) Uma política de mensuração, performada pela psicologia experimental, principalmente através da aplicação de testes psicológicos; 2) Uma política de simulação, resultado da atuação das neurociências a partir de processos de imageamento cerebral com tecnologias digitais e 3) Um política de metamorfose constituída nas práticas de pesquisa-intervenção[21]. Evitamos qualquer definição abstrata ou teórica de consciência de si, como forma de nos concentramos naquelas definições estabelecidas nos métodos que são alvos de nossa análise, buscando com isso compreender não como cada disciplina define ou conceitua autoconsciência, mas como lida com ela, como ela existe no

20 Para um resumo, em inglês, das discussões contemporâneas envolvendo a representação nos STS ver Hoeppe, 2015. Para um discussão em português sobre o problema da representação em diversas teorias ver Baum et al. (2017).

21 Neuroimagens e testes psicológicos representam as posições hegemônicas nas respectivas ciências. No entanto, uma investigação criteriosa revela em cada uma dessas ciências uma miríade de práticas que não se sobrepõe completamente. A pesquisa-intervenção desenvolvida sobretudo na psicologia social no Brasil desempenha nesse capítulo um dessas posições, assim como a neurociência molecular, discutida no capítulo anterior. Com isso, as políticas formuladas nesse capítulo, não representam exaustivamente o modo de operação nem da psicologia, nem das neurociências, servindo apenas como pontos iniciais de reflexão sobre outras formas de relação.

circuito de ações disponível em cada ciência. A metodologia desse processo segue a sugestão de Mol (2002), e investiga as sessões de métodos, materiais e procedimentos em artigos científicos. Essas sessões são escolhidas por especificarem o tanto quanto possível as práticas de investigação. O que, segundo Mol e Latour, reforça a ideia de que as práticas que permitem aos objetos se manifestar são cruciais para aquilo que pode ser dito deles. Ao dispor a descrição dessas políticas em sucessão, nossa intenção é produzir contrastes que possibilitem evidenciar a forma que determinados atores participam da *composição* de múltiplas realidades. De modo semelhante às controvérsias propostas por Latour (1987), os contrastes permitem tornar visíveis as associações que performam realidades. Porém, ao contrário das controvérsias, que Latour propõe que sigamos em campo, assumimos que os contrastes são produzidos pela própria ação de conhecer do pesquisador.

Se a primeira função desse capítulo é operacionalizar a discussão do capítulo anterior, a segunda função é retomar a questão central da tese, qual seja: é possível, através de nossa proposta de políticas cognitivas, discutir as relações entre psicologia e neurociências evitando uma hierarquia pré-definida? Não se trata de encontrar uma respostas definitiva para esse problema, mas de recolocar o problema de forma a atrair novos interesses. E, principalmente, poder sugerir um modo de argumentação e um espaço de negociação para essa pergunta que não seja pautado na busca de uma única verdade ou fundamentado na materialidade.

5.1 Psicologia experimental - uma política de mensuração

Tabela 1: Escala de Autorreflexão e insight

Variáveis	Média(DP); Variação		
	Grupo Controle	**Grupo Clínico**	**Total**
AR	32,64(7,24) 14-46	28,88(5,43) 13-40	30,58(6,55) 13-46
Ins	21,39(5,75) 9-29	16,33(6,14) 5-29	18,62(6,45) 5-29

Ar = Autorreflexão; Ins = Insight; DP = Desvio Padrão.

A tabela 1 foi construída a partir dos dados apresentados em de Vieira et al. (2013). Ela apresenta a diferença de autoconsciência entre um grupo de quarenta mulheres que recebem tratamento para enxaqueca no Hospital de Clínicas de Porto Alegre e um grupo controle composto por 33 mulheres que frequentaram o mesmo hospital para atendimentos não relacionados à enxaqueca. A autoconsciência é apresentada como a combinação de dois fatores: 1) a autorreflexão, atividade de avaliação de sentimentos, comportamentos e pensamentos próprios; e 2) o insight, o estado de entendimento interno de sentimentos, comportamentos e pensamentos próprios. Os grupos se diferenciam de acordo com score médio de seus

participantes, no caso da autorreflexão 32,64 para o grupo controle e 28,88 para o grupo clínico. Em outras palavras, de acordo com o experimento mulheres com enxaqueca têm uma tendência menor a julgar suas condutas ou atividades mentais. A composição dos números referentes aos fatores, por sua vez, é feita através do preenchimento, por cada uma das 73 mulheres envolvidas, da versão brasileira da Escala da Autorreflexão e Insight (EAI). Um questionário autoaplicável com vinte itens, sendo oito itens referentes à dimensão Insight e 12, à dimensão Autorreflexão. Esses items são respondidos pelos participantes em uma escala Likert de cinco pontos (DaSilveira; DeCastro & Gomes, 2012).

O que quero propor e discutir nesta seção é a autoconsciência performada por uma **política de mensuração**. Como descrição geral, mensurações são obtidas através da atribuição ou associação de números a objetos ou eventos. Essa associação é feita seguindo uma regra específica (Michell, 1999; Humphry, 2013). No caso dos questionários em psicologia o mais recorrente é a cada item do questionário, por exemplo, "Eu não penso muito frequentemente em meus pensamentos" (DaSilveira; DeCastro & Gomes, 2012, p. 160), um número natural que varia entre um (discordo plenamente) e cinco (concordo plenamente) é atribuído. Ao término do preenchimento, o pesquisador soma as notas individuais a fim de configurar a nota final de cada indivíduo. No caso da EAI duas notas são obtidas, uma referente a autorreflexão e outra ao insight. Através dessa política a autoconsciência assume um formato aritmético e é performada como scores individuais e coletivos suscetíveis de algumas operações matemáticas, tal como veremos a seguir.

É importante destacar a princípio que o tipo de atribuição numérica produzida pela EAI difere de outras numerações típicas na prática psicológica, como a medição de frequências, seja de um determinado comportamento em determinada situação ou de sucessos em uma dada tarefa. Isso porque a autoconsciência não se apresenta como unidades discretas[22] no cotidiano do sujeito de pesquisa, passíveis de serem agregadas, como possuir seis maçãs em uma sexta. Poderíamos dizer que a autoconsciência é um objeto materialmente vago, que não possui limites claros e, portanto, não sendo discernível enquanto conjunto de unidades, não é quantificável.

Ainda assim, o que chamo aqui de política de mensuração - é possível reconhecer através de metodologias de composição e aplicação de testes psicológicos - articula objetos que não possuem existência discreta à numerais[23]. Ao assinalar cada resposta em uma escala de um

22 Unidades discretas são aquelas desprovidas de continuidade. Os números naturais (1, 2, 3...), por exemplo, formado pelos números inteiros positivos, possui apenas unidades discretas. Por outro lado, os números reais são formados por unidades contínuas que podem dividir infinitamente. Por exemplo: Nos números naturais existe um "abismo" e o número "1" e o número "2", nos números entre ambos existe uma infinidade de números (1,5; 1,75; 1,855….).

23 A distinção contínuo-discreto, bem como a possibilidade de atribuir numeração à qualidades ou características psicológicas é uma das grandes fontes de controvérsia na estudos em psicologias contemporâneos. Nessa seção, seguimos os atores que permitem essa enumeração. Para uma posição contrária ver, Maul, 2013.

a cinco, o sujeito[24] que responde a escala atribui uma forma aritmética a partir da relação que estabele com cada afirmação. Essa articulação é possibilitada pela mediação de um ator: a Escala Likert. Desenvolvida entre as décadas de 1920 e 1930 e com respostas simples variando de 1 a 5, onde o 5 sempre corresponde ao mais positivo, a Escala Likert permite a conversão de uma infinidade de respostas qualitativas em unidades numéricas distribuídas linearmente de acordo com sua dispersão estatística em relação a média (desvio padrão). A despeito da simplicidade (que tornava cético de início o próprio Likert) a escala proporciona uma grande consistência, isto é, itens que deveriam variar conjuntamente mantém uma alta correlação mesmo quando comparados com variações mais complexas de respostas. Em outras palavras, a amplitude da escala é grande o suficiente para distinguir respostas e simples o suficiente para que de análises estatísticas sofisticadas mesmo na ausência de computadores digitais[25].

Essa articulação reconfigura a existência da autoconsciência e do pesquisador nela interessado e, inserido nessa política, o número resultante dessa articulação possui características híbridas, não sendo nem completamente objetivo, nem completamente subjetivo. Como propõe Latour (2005) todo o processo de cálculo necessita simultaneamente da externalização de alguns elementos e da internalização de outros. Externalização ocorre na ação de atribuir forma (informar), como vimos acima, a Escala Likert faz a mediação desse processo de atribuição de forma aritmética. A internalização, por sua vez, ocorre no mesmo ato. Quando me defronto com a tarefa de atribuir, de uma a cinco, o quanto "Eu normalmente estou ciente de meus pensamentos." (DaSilveira; DeCastro & Gomes, 2012, p. 160), preciso considerar, preciso estabelecer uma relação comigo mesmo, de forma a atribuir um número. Latour (2005, p. 229) faz um curioso jogo de palavras onde calcular, *to account*, é considerar, *take into account*. A atribuição de forma é, com isso, um dos principais processo de tradução[26], uma vez que ele permite o deslocamento daquilo que é traduzido, seja de dentro para fora ou de uma local ao outro A autoconsciência que cotidianamente possui uma existência invisível e dispersa em um espaço indiferenciável ganha novos atributos a partir dessa forma aritmética. Como consequência desse processo, quais as características que esse ontologia aritmética da autoconsciência assume?

Se voltamos a Tabela 1, percebemos que o insight (médio) do grupo controle é 21,39. Como referimos acima, esse número não é resultado de uma contagem, mas de uma atribuição. Com isso, 21,39 isolado, não fornece todos os elementos para sua compreensão. O número 21,39 existe e pode ser compreendido apenas em relação a outra composição de números da mesma célula: 9-29. Essa composição, chamada de variação (range) refere-se ao total de

24 Sobre o sujeito participante da pesquisa veja cap. 06 dessa tese.
25 Para um breve histórico do desenvolvimento da Escala Likert veja Young, 2014.
26 Sobre o conceito de tradução e suas operações veja cap. 2.

multiplicidade de respostas dos 8 items referentes a essa categoria. Ou seja, entre oito respostas, variando entre um e cinco, ao menos um membro do grupo marcou 9 pontos (sete respostas 1 e uma resposta 2), enquanto ao menos um membro marcou 29 pontos, referindo-se a seu próprio insight. A relação entre 21,39 e 9-29 se assemelha a relação entre numerador e denominador. A variação constitui um coletivo, um espaço ou espectro de participação, a média por sua vez um ponto ideal situado no centro desse espaço a partir do qual todos os demais scores podem ser situados. O resultado da EAI não produz, portanto, a quantificação da autoconsciência, mas sua ordenação, distribuição ou hierarquização.

Os scores são a materialização de relações através do estabelecimento de proporções e razões. Embora cotidianamente tratemos quantificar e mensurar como sinônimos. Enumerar é apenas uma das formas de estabelecer relações. Podemos distinguir essa atividade quanto exploramos a história da mensuração. Em sua origem conceitual, esse tipo de relação não era estabelecida através de números, mas de notações e analogias geométricas. Por exemplo f:f' (a diferença entre força no tempo um e força no tempo dois) ou ainda f:f' :: a:a', em que a notação "::" significa "é proporcional a". É só no século XVII que a notação algébrica para relações surge, e gradualmente se populariza na física. Contudo, ela funciona como um atalho ou conveniência, não representando uma substituição das relações empíricas entre entidades (Humphry, 2013).

Fora da física, esse atalho algébrico sobre as relações de pertencimento e distribuição produz uma interferência específica, o próprio número passa a possuir uma outra existência. Verran (2013), recorre às categorias semióticas de Pierce para discutir os diferentes modos de existência dos números. E descreve os números que possuem função ordinal e não podem ser referidos a nenhuma unidade manipulável ou distinguível empiricamente como ícone. Em um número icônico, a diferença entre valor e categoria não é distinguível, ele expressa apenas uma ordem. As analogias podem ser pensadas como um traço de grafite que é, simultaneamente, uma marca no papel e um linha geométrica; ou ainda em práticas religiosas em que a imagem de uma entidade é tratada como a própria entidade. Em outras palavras, o número não é mais representativo, mas constitutivo de si mesmo (Verran, 2010). Não registra a relação entre unidade e pluralidade, mas entre semelhança e diferença. O numero incorpora a relação. Ele não está em uma relação, ele é relação (Verran, 2013) e seu sentido se encontra na distribuição que ele permite.

Com isso, a autoconciência, em uma política de mensuração assume uma forma numérica, mas só existe enquanto comparação enquanto com com outras autoconsciências que se concretizaram do mesmo jeito. Por assumir um número ordinal, não podemos podemos produzir outras operações matemáticas sobre ela. Ela não é passível de ser somada ou subtraída

e sua relação com a média é apenas situacional, no sentido que permite estabelecer uma posição em relação aos outros; mas não é absoluta, ou seja, a diferença entre um score 22 e 23 não tem nenhum valor em si mesmo para além da posição que eles estabelecem.

5.2 Neurociência - Uma política da simulação

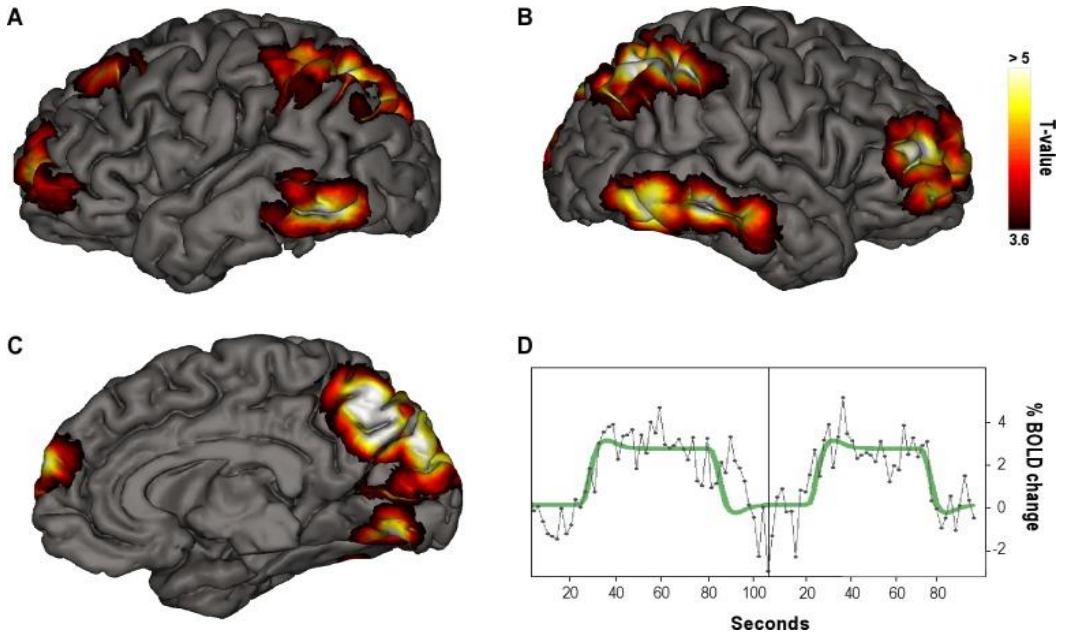

Figura 1 - Atividade neuronal relacionada a sonhos lúcidos. Clusters codificados por cores representam areas significantemente ativadas em períodos de lucidez em sono REM. (pFDR <0,005): hemisfério esquerdo (A), hemisfério direito (B), vista na linha média (C). **Fonte:** Dresler *et al.* (2012).

A figura 1 foi produzida através da técnica ressonância magnética funcional (fMRI, do inglês *Functional Magnetic Ressonance Image*) ao rastrear as atividades de um cérebro enquanto um sujeito, que permanece deitado em um scanner, sinaliza - através de movimentos específicos[27], a consciência de que está em um sonho. Os experimentos envolvendo esse tipo de técnica requerem, da parte da equipe de pesquisadores, a normalização e calibração do aparelho, bem como o desenvolvimento de tarefas capazes de isolar componentes particulares do processo mental (Beaulieu, 2002). Do lado do sujeito, no caso de Dresden e Cols (2012), a tarefa é realizada em um sonho lúcido na tentativa de isolar a autoconsciência. O design da pesquisa segue o paradigma da subtração (Roepstorff, 2007). Ou seja, funcionamento cerebral do sujeito de pesquisa é mapeado em três estados diferentes: Acordado, acordado de olhos fechados e

27 Os sinais desse experimento eram mover os olhos, para esquerda, direita, esquerda, direito; esperar dez segundos; repetir o movimento ocular e então apertar as mãos em punho por quanto tempo for possível (Dresden *et al.*, 2012).

dormindo em sono REM. Por fim, registra-se o período em que o sujeito deu sinais de estar passando por um sonho lúcido. Como a diferença na experiência entre um sonho comum e um sonho lúcido é a consciência da condição de sonhador e o controle volitivo parcial, considera-se que a diferença entre a atividade do sonho lúcido e a atividade do sono REM[28] corresponde a atividade de estar autoconsciente. Em nosso caso, os resultados desses experimentos são predominantemente apresentados como mapas visuais do cérebro em ação, como fotografias do pensamento ou imagens da mente trabalhando (Beaulieu, 2002). Elas, portanto, parecem fornecer provas visuais do substrato material de funções mentais.

Com isso, se olhamos ingenuamente para a imagem acima, temos a impressão de que vemos através de uma abertura que nos permite observar diretamente a atividade neuronal de um indivíduo. Não é difícil imaginar que técnicas de projeção, seguindo regras geométricas, convertessem neurônios de um corpo humano, com volume tridimensional, para uma superfície bidimensional. Em técnicas de desenho, esse procedimento é realizado a partir do ponto de fuga, que constitui, através das regras de perspectiva, a possibilidade de projeção da imagem sem a perda de suas proporções. Esse ponto é justamente aquilo que permite uma visualização coerente da imagem, mas, que no entanto, encontra sua origem fora dessa imagem. O ponto de fuga é produzido em paralelo a outro ponto matemático situado no local do observador. Essa é a política que Law e Benschop (1997), chamam de narrativa euclidiana. Essa distribuição separa sujeito e objeto, o primeiro torna-se um ponto matemático, externo ao objeto, mas a partir do qual toda a compreensão se organiza. O objeto, por sua vez, possui uma existência e continuidade independente do sujeito que observa e aguarda apenas sua representação. Nessa política, soma-se ao processo geométrico, uma narrativa, externa a representação, necessária afim de iluminar as condições, deslocamentos e manipulações do objeto (que poderíamos atribuir a legenda da imagem, por exemplo). Essa política tornaria a representação do cérebro ilustrativa, pois o mundo - o cérebro - e suas narrativas existem de forma independente da representação. “They pre-exist their depiction. The stories are as it were out there, in reality. Depictions illustrate that world—a world apart” (Law e Benschop, 1997, p. 162). O resultado seria uma reprodução fiel do cérebro que compreende o ponto de vista do observador como um olho que observa através de uma janela imaginária. Essa política pode ser distinguida no Renascimento italiano e em concepções modernas de fotografia.

Entretanto, quando exploramos os processos de produção dessa imagem percebemos que diversas das suposições a respeito da objetividade mecânica, relacionadas com a projeção renascentista ou o realismo fotográfico, não se aplicam às imagens cerebrais. Por exemplo, não

28 A despeito de diversas tentativas, não é possível distinguir apenas através de fMRI, ou outra tecnologia de imageamento cerebral, a diferença entre um sono REM com e sem sonho (Langlitz, 2015).

podemos nos apoiar em uma cadeia de causalidade física que se estabelece por partículas de luz que após tocar um objeto movem-se para uma chapa fotográfica (Beaulieu e De Rijcke, 2014). Com isso em mente, nos voltamos para os detalhes da técnica de imageamento do cérebro com o objetivo de melhor descrever a política que podemos extrair dessa metodologia.

Como referi anteriormente, a técnica utilizada nesse estudo neurocognitivo é chamada de Ressonância Magnética funcional Dependente do nível do sangue oxigenado (em inglês *Blood Oxygen Level Dependent Functional Magnetic Resonance Imaging* oou BOLD-fMRI). Nessa técnica o scanner gera um forte campo magnético capaz de magnetizar protons que giram ao redor de um núcleo causando um alinhamento; uma vez desligado, os prótons "relaxam" voltando a seu estado original. O tempo entre o alinhamento e o relaxamento dos prótons varia de substância para substância e pode ser detectado e mensurado. Os detectores são calibrados para gerar um indicador da quantidade de hemoglobina oxigenada. O princípio subjacente é que quando há um aumento de atividade em uma região do cérebro, o sistema vascular envia uma quantidade maior de sangue para aquela região - o que acarreta no aumento da concentração sangue na mesma. Existe ainda uma segunda vantagem para o uso dessa tecnica: As hemoglobinas oxigenadas e desoxigenadas possuem diferentes susceptibilidades magnéticas, tornando possível rastrear pontos de desoxigenação e, por tanto, consumo de energia. (Roepstorff, 2007; Rose, 2013). O consenso é que tanto o acúmulo de sangue quanto o consumo energético são indicativos da atividade cerebral.

A oscilação dos prótons é medida algumas dezenas de vezes por minuto e uma quantidade massiva de dados brutos é processada. Processado nesse contexto significa uma sequências ações computacionais, obscurecidas sob programas chamados de *scan suits.* Estas *suits* de tecnologias incluem imagens digitais, modelos de dados, bancos de dados, monitores de interface e redes eletrônicas que operam sobre esses dados tornando-os comparáveis e integráveis em uma visualização, Dresden *et al.* (2012), por exemplo, recorreram ao software Brainvisa (brainvisa.info), uma plataforma modular de código aberto para reconstrução de superfície cerebral e compartilhamento de dados. O software conduz dois tipos de operação sobre os dados: a primeira é a eliminação de dados considerados irrelevantes para a compreensão do funcionamento cognitivo. Esse primeiro passo pode ser lido como eliminação de diferenças, uma vez que o tipo de dados é que apagado corresponde principalmente a variações em anatomia e tamanho do cérebro, assim como diferença entre posição dos receptores do scanner, entre scanners diferentes ou, quando necessário, entre sessões de escaneamento. A segunda tarefa é o registro das diferenças que importam. Isso é feito através do estabelecimento de um banco de dados que cataloga, além das posições relativas de avaliação, outros dados do sujeito como lateralidade manual, bilinguismo, sex, etc. Os

algoritmos que manipulam esses dados formam o que Beaulieu e De Rijcke (2014) chamam "encanamento digital" que garantiria que todo o metadado considerado relevante seja catalogado e todas as informações irrelevantes sejam excluídas, sem contudo a interferência subjetiva dos pesquisadores.

A parte final do processamento dos dados é feita através da inserção, comparação e ajuste dos dados em um atlas cerebral. Esse atlas é constituído através da padronização de tamanhos relativos de áreas cerebrais e a quantificação e xadrezamento do espaço cerebral. Combinando voxels[29] e coordenadas digitais o banco de dados de dados obtido no scanner é assim convertido em coordenadas espaciais pré-fixadas (Beaulieu e De Rijcke, 2014). Em outras palavras, o scanner opera uma série de quantificações, que são armazenadas em bancos de dados, constituindo mapas estatísticos. Como destaca Beaulieu (2002), para diversos neurocientistas esses dados numéricos são os verdadeiros resultados de pesquisa. As informações produzidas a partir de cada indivíduo são então deformadas, esticadas, espremidas ou suavizadas até caberem em um modelo de espaço anatômico padrão pré-estabelecido. Esse processo transforma informações estatísticas em imagens que podem ser exploradas espacialmente.

Essa não é, contudo, a imagem que podemos ver acima. Após passar por essa caixa-preta algorítmica que o encanamento digital representa, o neurocientista pode mais uma vez interagir com a imagem. Baseado nas tarefas executas e na fenomenologia apresentada, o pesquisador constrói um modelo estatístico do experimento. O computador, então, constrói um mapa estatístico paramétrico, ou seja uma modelo de inferência a partir de uma distribuição probabilística. Sobrepondo a imagem de um cérebro padrão com uma codificação de cores que descreve o quão bem o modelo se adequa aos dados obtidos. O experimentador trabalha, por fim, para tornar os dados apresentáveis, escolhendo limiares de ativação, ou seja, definindo o quão bem os dados devem ajustar-se ao modelo. A metáfora de Roepstorff (2007, p. 194) é bastante ilustrativa. Ele compara a manipulação dos níveis desses limiares com a elevação e depressão dos níveis de água em um arquipélago. Em um certo nível de água nada aparece sobre a superfície. Conforme o nível vai diminuindo, ilhas isoladas vão aparecendo; e quando a água retrai picos isolados tornam-se parte de uma massa de terra contínua. Isso quer dizer que a modelação das mesmas informações podem ser apresentadas de modos bastante diferentes. Um dos critérios para tornar a imagem interessante é buscar um equilíbrio entre nenhuma atividade e atividade em todo o cérebro. Como resume Beaulieu (2002, p. 59), "if these pictures are

29 Voxel é um neologismo que combina as palavras volume e pixel. Ele se refere a unidades tridimensionais que compõe imagens digitais. De acordo com Rose (2013) em estudos neurocientíficos um voxel possui entre 9 e 16mm quadrados e por volta de 7mm de espessura; o que seria suficiente para conter, em média, 5,5 milhões de neurônios.

pictures of anything, they are pictures of numbers". Ou representações coloridas de valores estatísticos.

Dessa forma, a distribuição de papéis entre os atores que produzem essa imagem não é bem descrita pela Narrativa Euclidiana, o que proponho é que essa política é melhor compreendida como uma **política de simulação**. Com isso quero dizer que as imagens não são fotografias realistas do cérebro, mas gráficos complexos, resultados de manipulações matemáticas, que podem ser realizadas de diversas maneiras. O trabalho dos pesquisadores, portanto, não é o capturar uma boa imagem, mas, mas o de recolher, catalogar e relacionar quantificações (Beaulieu, 2002; Roepstorff, 2007). Essa comparação é produzida a partir da definição de como esses dados devem agir em conjunto, numa forma que é a do "se… então…" temporal e narrativa. E depois acompanhar que tipo de desenvolvimento essa matriz narrativa é capaz de originar (Stengers, 2000). Os casos se definem não pelo controle de variáveis que os colocam em uma situação experimental, mas apenas pelas formalizações das relações que são estabelecidas posteriormente (Stengers, 2011b).

Na descrição de Roepstorff (2007) o acúmulo de experiências cria gradativamente uma "semântica" a respeito das regiões do cérebro. A qualidade do argumento científico (e da imagem produzida) é proporcional à capacidade do pesquisador entrelaçar seus dados com essa semântica anterior, ou seja, transformar um padrão de atividades neurais em um narrativa. A imagem é, por tanto, o amálgama dessa narrativa. Do mesmo modo como descreve Stengers (2011b), o objetivo da simulação está mais ligada a relacionar uma situação a um campo problemático do que representá-la do modo mais fidedigno possível. A simulação não é relevante para uma universalidade, mas para um modo específico de compreender uma dada situação.

A política da simulação não se difere apenas da Narrativa Euclidiana, diferencia-se também da política experimental tradicional, estabelecendo um novo contato entre experimentação, descrição e explicação. Na organização estabelecida na física, a experimentação permite a descrição do fenômeno a partir do controle de variáveis prévio, sem necessariamente explicá-lo ou atribuir-lhe sentido. Essa tradição se repeta na aplicação dos testes psicológicos, particularmente através da seleção de participantes. No exemplo da sessão anterior, a enxaqueca figura figura como a variável independente, enquanto o gênero, por exemplo, aparece como variável controlada, ficando de fora do estudo pessoas do gênero masculino. A coloração da superfície de cérebro, por sua vez só é atingida a partir da conexão com um sentido ou narrativa estabelecidos. Não se trata de tornar aquilo que foi visto em conhecimento, mas de tornar um certo conhecimento visualizável. O que parece particular da simulação é que a cada narrativa transforma, recoloca um esquema de relações aos dados

originais. Isso não é o mesmo que dizer que as imagens produzidas não são verdadeiras, confiáveis ou relevantes. Mas de que é preciso compreender como elas tornaram-se relevantes. Elas não descrevem desinteressadamente uma situação controlada, mas ilustram um problema colocado pelo cientista àquela situação.

5.3 Pesquisa-intervenção - um polítical da metamorfose

> As entrevistas de explicitação, cujo objetivo era trazer ao plano consciente experiências cognitivas e gestos atencionais realizados num nível pré-reflexivo, acabaram por produzir falas que ultrapassavam em muito a investigação do funcionamento cognitivo *stritu-sensu*. A insistência e a força de tais relatos não puderam ser atribuídas a um problema meramente técnico, relativo ao manejo da técnica da entrevista de explicitação. Ao contrário, tais relatos ampliaram o escopo da investigação e revelaram o entrelaçamento do problema do funcionamento da atenção na oficina de cerâmica com aqueles da experiência com a cegueira e dos processos de produção de subjetividade na oficina. (...) Nessa orientação, o exame do funcionamento da atenção incluiu a atenção voltada para o domínio tátil na lida com o barro, a atenção às pessoas que freqüentavam o espaço da oficina e, enfim, a atenção a si mesmo durante o processo de criação. Nesse sentido, ocorreu a modulação do problema, que impôs a investigação não apenas do funcionamento da atenção durante o processo de criação na oficina de cerâmica mas também da forma como a atividade de criação aciona processos de produção de subjetividade através da mobilização de uma certa atenção a si mesmo (Kastrup, 2008a, p. 188-189).

O relato acima é extraído do artigo intitulado “O Lado de Dentro da Experiência: Atenção a Si mesmo e Produção de Subjetividade numa Oficina de Cerâmica para Pessoas com Deficiência Visual Adquirida” (Kastrup, 2008a) e refere-se aos desdobramentos de uma pesquisa-intervenção (PI) com 17 pessoas cegas e quatro pessoas de baixa visão, homens e mulheres de classes sociais diversas. A pesquisa foi realizada em um centro de referência para questões de deficiência visual, denominado Benjamin Constant, na cidade do Rio de Janeiro. Com o intuito de pesquisar a atenção de pessoas com deficiência visual, dois procedimentos foram organizados: 1) uma oficina com cerâmica, onde participantes moldavam argila ora em um trabalho único - como moldar máscaras ou bustos - ora em tarefas individuais livres. 2) Em sessão separada das oficinas foi realizada uma entrevista de explicitação, técnica fenomenológica que busca auxiliar o entrevistado a trazer à consciência aspectos da experiência cognitiva e de gestos atencionais que, de outra forma, são executados em um nível pré-reflexivo. Na hipótese original, o trabalho com a argila permitiria ao oficinante uma aprendizagem do uso da atenção, deslocando-a dos olhos para as pontas dos dedos. A experiência, contudo, tal como narrada no trecho acima, revelou uma operação diferente: o que os entrevistadores constatam é uma atenção, que embora seja de fato aprendida ao longo da oficina, não é focada nos dedos, mas capaz de circular entre os participantes, a argila e, como

destaca o título do texto, sobre o próprio participante, enquanto artista. Ou seja, a constituição de uma consciência de si, que não se limitava ao foco da atenção. Uma parte relevante para a compreensão desse processo de pesquisa, em relação aos descritos anteriormente, é que a diferença entre a proposta original e a atenção constituída é tratada como uma intervenção no processo de pesquisa. A aprendizagem da atenção e a constituição de uma nova consciência de si não se dá apenas nos sujeitos de pesquisa (Kastrup, 2008a), mas também nos pesquisadores (Kastrup, 2007). Em outras palavras a intervenção que produz uma nova consciência de si se dá no coletivo que é constituído por pesquisadores videntes, participantes cegos ou com baixa visão, argila, forno, esculturas etc (Kastrup, 2008b).

Ao longo do texto a autoconsciência é apresentada em relatos tal como:

> Eu não percebo o tempo passar. Não tem tempo pra mim. Não tenho a mínima noção do tempo. Eu posso estar há quatro horas com uma peça e achar que estou há dez minutos. Quando eu estou construindo alguma peça, trabalhando com a argila, o tempo pra mim não existe. (...) Se eu estou sentada, eu me curvo e me aproximo. Às vezes, a menos de um palmo da peça, meu rosto fica em cima da peça, e eu tô ali trabalhando e eu tô assim, como se tivesse vendo. E, às vezes, quem tá vendo é só a minha mão (P4 apud Kastrup, 2008a, p. 192).

Desse modo, a autoconsciência assume uma materialidade através de padrões de comportamento, verbais e não-verbais, produzidos a partir da interferência, da mediação, do pesquisador; mas também da mediação da argila e dos outros participantes da oficina. A autoconsciência, como comportamento, não é revelada como algo que existia anteriormente no interior do sujeito, mas é narrada como uma construção inventiva composta pela interferência mútua dos atores heterogêneos envolvidos.

A PI o assume, eu proponho, uma **política de metamorfose**, em que a performance do objeto, em nosso caso a autoconsciência, se dá na composição ou recomposição bem sucedida de uma nova rede de atuação. Consideramos uma composição bem sucedida, quando os atores tornam-se gradualmente disponíveis - ou poderíamos dizer afinados - um para o outro. De modo que ambas as partes tornam-se mais interessantes uma para a outra (Despret, 2004). Como nas palavras de um dos participantes da oficina:

> (...) argila, ela tem um poder, sim. (...) Não é uma coisa que você domine ela, ela tenta dominar você de uma maneira. E isso, qualquer pessoa que esteja fazendo um trabalho, se prestar atenção, pode prestar atenção que a argila, ela tem uma ligação com você, ela querendo dominar você por um lado. (...) Quase toda hora (P7 apud Kastrup, 2008a, p. 191).

Resultado dessa rede bem sucedida, são atores mais abertos à supresas, mais inventivos[30]. Tornam-se parceiros que aprenderam a ser afetados, que se tornaram disponíveis aos acontecimentos, em uma relação que revela perplexidade (Despret, 2004). Pesquisadores e pesquisados devem aprendem a prestar atenção um no outro, de uma maneira que muda o que ambos podem ser conjuntamente. Tal como destaca Kastrup (2008a; 2008b) em alguns de seus relatos, não é apenas a atenção a si dos sujeito de pesquisa que se transforma, mas a dos pesquisadores, assim como a estrutura da própria pesquisa que se reconfigura com o estabelecimento de novos vínculos.

Essa política busca, assim, ativamente constituir o que Haraway (2008) chama de zonas de contato. Inspirada no conceito linguístico conhecido como linguagem de contato usado para referir-se a linguagens improvisadas desenvolvidas por falantes de línguas nativas diferentes que necessitam desenvolver uma comunicação consistente[31]. A ideia de zona de contato busca destacar o caracter interativo e improvisado de alguns encontros. Me refiro a esse conceito para marcar a diferença desses tipo de encontro, daquele promovidos por situações experimentais em que as interações possíveis são previstas e controladas.

A partir da zona de contato os participantes, humanos ou não, vão progressivamente constituindo entrelaçamentos em espaços de intersecção. Essas interações sucessivas vão redistribuindo a capacidade de ação dos atores envolvidos. Descrever uma pesquisa como uma zona de contato significa enfatizar as relações produzidas na pesquisa em termos de co-presença, interação e entrelaçamento de práticas e compreensões.

Com a ênfase na metamorfose dos atores que entram em contato, essa política se destaca, das que descrevi anteriormente, por não possuir um ator que desempenha o papel de móvel imutável (Latour, 2001). Isto é, não existe a materialização da autoconsciência como signo ou traço que pode ser manipulado, superposto ou combinado com outros signos do mesmo tipo, tal como o número na política experimental ou a imagem nas neurociências. Nessa política, não podemos fazer referência a autoconsciência como unidade fixa e nesse mesmo texto, cada vez que me refiro a ela preciso endereçar uma descrição particular do texto. A ausência da confecção de móvel imutável impede seu transporte para fora da rede de produção, enquanto as imagens e números circulam em nosso cotidiano permitindo que a autoconsciência interaja em outras redes, como ilustrando uma capa de revista, ou fazendo parte de diferentes tabelas ou gráficos, as transformações produzidas pela zona de contato permanece encarnada nos atores humanos, pesquisadores e sujeitos de pesquisa, que participaram dessa rede. Em outras

30 Vínculos bem sucedidos são a condição para o estabelecimento de qualquer pesquisa (Latour,2001; cap. 2). Como veremos em mais detalhes no próximo capítulo, todas as políticas produzem os sujeitos aos quais se referem, o que diferencia essa terceira política das anteriores é eleger construção como objeto e objetivo.

31 Esse conceito é comumente utilizado para referir-se a situações coloniais e pós-coloniais.

palavras, a autoconsciência produzida pela PI permanece incorporada aos participantes sem nenhuma pretensão ou ‘capacidade de transportá-la nem no tempo, nem no espaço sem a perda, corrupção ou distorção. Os relatos de pesquisa não desempenham o papel de representar a transformação da autoconsciência, mas de descrever o processo de construção do coletivo, ou seja, da disposição dos vínculos que se efetivaram. Eles não veiculam as características que a consciência de si de cada participante assumiu, mas apontam para a possibilidade de transformação.

Uma política de metamorfose age como uma rede psicogênica (Latour, 2013), uma rede para produção de interioridade, mas que possui materialidades, solidez e rastreabilidade tal qual as redes que produzem objetividade. Na sua esteira, tais redes deixam interioridades a partir de uma certa exterioridade, ao contrários daquelas que geram móveis imutáveis, que criam referências, ou seja, uma certa exterioridade a partir de uma interioridade.

Adotei o nome de política de metamorfose - ao invés de psicogênica, ou de transformação, por exemplo - pois a PI tem como principal alvo a constituição de um tipo de objeto que atende as especificações que Latour (2013) designou de seres de metamorfose. Um tipo de objeto invisível, capaz de “se apossar” de outros seres. Que só pode ser percebido pelas modificações ou transformações que produz em outros atores, que permitem a atores humanos[32] fazer coisas que não pensavam serem capazes de fazer. “This is why the word ‘metamorphosis’ designates at one and the same time what happens to these beings,[and] what happens to humans who turn out to be attached to them” (Latour, 2013, p. 201).

Em outras palavras a PI performa a autoconsciência como um objeto que, apesar de invisível e não material, pode ser rastreado pelo modo que nos transforma, por nos permitir ser diferente do que somos, por inventar novos modos de estar com aquilo que nos cerca. Ao contrário das técnicas anteriores, que centravam-se na representação do objeto, na produção de uma referência circulante, seja através de um número ou uma imagem, ou a produção de dados que podem ser traduzidos ou transportados sem transformações. A PI não está centrada na produção de dados; mas, ao contrário, em assegurar que a produção de zonas de contato transforme os objetos em interação, em permitir que esses seres de metamorfose circulem. Nas seções anteriores dividir, colorir, ordenar e calcular eram as ações que constituam e davam forma à autoconsciência ao qual os pesquisadores poderiam referir-se. A pesquisa intervenção só reconhece seu objeto enquanto transformação.

Quando nos referimos a transformação em pesquisa-intervenção, não se trata de alinhar ou comparar dois estados diferentes em que um mesmo objeto estaria subjacente. Mas a

32 A restrição a humanos é feita aqui apenas em referência ao coletivo alvo da análise. Sugerindo, portanto, que apesar da argila e das ferramentas serem indispensáveis pelo processo de circulação desses seres invisíveis, eles parecem apenas trafegar entre os humanos.

constituição de um novo objeto, uma nova consciência de si através da articulação de novos coletivos de atuação. Ao invés de isolar o sujeito, a PI busca oportunidades de narrar diferentes objetos de acordo com diferentes organizações coletivas. Mas sempre com o intuito de atuar a cognição como um objeto capaz de nos desviar de nossa trajetória,de inventar, de nos tornamos outros.

5.4 Constituição de repertório

O principal argumento das análises - e dessa tese - é que mensuração, simulação e metamorfose não correspondem à formas de responder a um mundo povoado com objetos pré-existentes, mas em primeiro lugar, são modos de organizar as atividades que trazem à existência aspectos desse mundo. A política de mensuração mobiliza a escala Likert, questionários, um hospital, fichas médicas, pacientes com ou sem enxaqueca, um programa de manipulação estatística e números. A política de simulação por sua vez, convoca um pesado hardware, uma cadeia de softwares, átomos de oxigênio, teorias físicas e biológicas, prótons, hemoglobina, bem como a composição de imagens digitais como forma de apresentação. A política de metamorfose, recorre a entrevistas, argila, pessoas cegas ou com baixa visão, lixas, forno e esculturas. Em cada políticas o atores são reunidos e seus papéis distribuídos de modo a fazer existir a consciência de uma forma específica. Números, imagem e mudança nos sujeitos.

A partir dessas diferenças, gostaria de destacar que, em conjunto, essas políticas constituem um repertório com o qual podemos pensar, compreender, ordenar e organizar a cognição de diferentes modos, em diferentes momentos, em diferentes situações. Com esse princípio, tal como sugeri no capítulo anterior, o importante não é nos empenharmos em desenvolver homogeneizações, mas que possamos lançar mão, nos utilizarmos desse repertório de acordo com as questões que se colocam em nosso coletivo. Ou seja, é possível pensar através de medidas e mensurações que nos ajudem a ordenar e distribuir, mas também é possível transformar e reconfigurar a cognição com a qual lidamos, desde que tenhamos a nossa disposição as tecnologias, ou as políticas necessárias para isso.

Com essa proposta, perde o sentido a ideia de uma organização ou regra geral que decida, *a priori*, qual a relação que esses repertórios vão estabelecer entre si. Cada situação ou cada questão, reencena a negociação necessária para estabelecer que elementos permaneceram no palco e como eles serão distribuídos. Eles podem ser alinhados ou coordenados, mas podem também ser excluídos e confrontados. Não se pode emitir um julgamento de antemão sobre como serão organizados os elementos ou argumento necessário para a solução do problema, ou mesmo onde eles serão encontrados, seja linguística ou na inteligência artificial, seja na

psicologia ou neurociência. Cada nova relação proposta aumenta o repertório da discussão, amplia os modos de relação possíveis.

É nesse sentido que nos afastamos de propostas de interdisciplinaridade como as de Von Eckardt (2001) que propõe um sistema de atribuição de papéis entre as disciplinas e metodologias de pesquisa, buscando equivaler em relevância as pesquisas que utilizam um ou mais métodos para interrogar a cognição, contando que se entenda por cognição o processamento de informação. Apesar de reconhecer a necessidade de um grau de independência teórica e metodológica, a independência ontológica continua barrada e no horizonte desse sistema permanece a necessidade de uma unificação em que os níveis mais baixos explicariam os mais altos por algum mecanismo ainda não descoberto. O sistema de Von Eckardt apoia-se em uma hierarquia pré-definida, onde as ciências biológicas têm um privilégio ontológico sobre as ciências humanas e qualquer coordenação ou alinhamento possível deve partir dessa hierarquia estabelecida. Mais uma vez, tal como busquei afirmar nesse trabalho, a autora reconhece a possibilidade de uma diversidade de linguagens para descrevermos e explicarmos aquilo que acontece em diferentes recortes do funcionamento cognitivo, buscando garantir que ciências diferentes como antropologia, psicologia e neurologia desenvolvam-se independentemente, cada uma investigando a cognição com suas ferramentas. Contudo, exclui da discussão todas as propostas que não enderecem a cognição como captação e processamento de informação. Von Eckardt (2001) destaca ainda a necessidade de gradualmente criarmos metodologias que testem relações mecânicas (de causa-efeito) entre as diferentes disciplinas, sugerindo, portanto, que o nível biológico deve causar explicitamente todas os conceitos mentais, bem como os mentais devem causar os culturais.

A mesma posição é ainda mais evidente na interdisciplinaridade proposta por Bickle (2008), tal como exploramos no capítulo anterior. As relações se estabelecem sobre a mesma hierarquia, mas Bickle propõe que as explicações moleculares sobrepõe as demais explicações tornando-as curiosidades com pouco ou nenhum valor de uso. O que quero propor, ao contrário, é que se nos focamos naquilo que cada política produz, na realidade que cada uma delas convoca e nos programas de ações que elas sugerem essa hierarquia pré-estabelecida perde valor de uso e as prioridades devem ser estabelecidas a partir a partir dos problemas e respostas que buscamos desenvolver. Isso não impede possíveis alinhamentos, por exemplo, através a tentativa de mapar a atividade neuronal de pessoas cegas em uma oficina de argila; mas torna esse alinhamento, mais um caso ou problema entre outros possíveis de serem interpelados.

Mas se as respostas gerais perderam o sentido, as soluções locais nos foram igualmente barradas. Se fui capaz de eleger e traçar essas políticas é porque elas possuem a capacidade de se difundir, de se propagar, de contaminar outras práticas. Elas constituem manuais, elas são

ensinadas em cursos de graduação e pós-graduação, discutidas em simpósios, seminário e congressos. Ela são conduzidas por artigos em periódicos. Elas se estendem por uma rede global sem nunca serem capazes de ser universais.

As performances e soluções que elas sugerem possuem uma escala que não pode ser definida de antemão, mas que pode ser acompanhada na medida que conexões são estabelecidas ou elementos são excluídos. Assim, se a oficina proposta por Kastrup (2008) aparece como uma solução situada em um instituto do Rio de Janeiro, ela só pode ser realizada com a argila vinda do Espírito Santo, ferramentas vinda de casa, técnicas de entrevista trazidas da França. De forma análoga, ao aproximar psicologia e neurociência é preciso acompanhar qual a rede que se desenha para acomodar os objetos que essas ciências trazem à discussão. Elas podem estabelecer conexões sem formar um todo homogêneo. Elas constituem uma rede que nunca se torna universal.

Se as diversas políticas compõe um repertório para a solução de problemas de relação entre psicologia cognitiva e neurociências cognitivas, consideramos que um repertório amplo permite soluções mais complexas, permite variações maiores na composição dessas soluções.

6 The multiplicity of subjects

> "Discipline 'makes' individuals; it is the specific technique of a power that regards individuals both as objects and as instruments of its exercise" (Foucault, 1977, p. 170)

Inspired by the work of Karen Barad (2007), this chapter is an exercise of diffraction on the concept of discipline proposed by Foucault and the cognitive politics described on the previous chapter. Barad suggests diffraction as an alternative metaphor for reflection. As both are optical phenomena, reflection is an usual and pervasive trope for knowing that implies themes of mirroring and sameness, as it is the physical effect that causes echoes and reversion of light rays. By contrast, diffraction refers to the phenomena which occur when waves of light pass through an opening or encounter an object and break apart and spread rays in multiple directions. So, while, reflection runs the risk of displacing the same elsewhere, in a more or less distorted form, diffraction is about creation of heterogeneous histories, about amplifying the modes of interface an interference between concepts.

As described by the epigraph, with the concept of disciplinary power Foucault (1977) seeks to account for the simultaneous exercise of power and subjectification. By educating subjects to think and behave in certain ways, and so becoming the principle for their own management of conduct. This way people are governed through means of correct training, moving across different practices that subjectify them in different ways. "Within these different practices, persons are addressed as different sorts of human being, presupposed to be different sorts of human being, acted upon as if they were different sorts of human being" (Rose,1998: 35). These exercises of power are materialized in the creation of institutions and technologies that represent and intervene, know and act, rendering the subject in an epistemic, historical and technological process.

In what follows I explore the differences and reverberations produced at the encounter of discipline and the three cognitive politics described in the previous chapter: 1) a politics of simulations that results from neurosciences' technology of imaging; 2) a politics of measurement, performed through psychological test in experimental psychology and 3) a politics of metamorphosis from intervention-research processes. With these analyses I suggest that for the subject, these distinct research practices can also provide multiple conditions for experiencing itself.

This argument joins Savransky's (2013) calls for a complexification of the relations between governmentality and subjetification in order to not reduce subjects to epiphenomena of their vectors of production and to encounter in our researches more than governable subjects.

This is my way of discussing the action of the subject in these institutions of power, looking for ways to ask new questions and thereby potentially resulting in novel forms of subjectivity.

While Savransky focuses on the way we can explore agency as resistance to regimes of subjectification, I turn my attention to the underpinning assumptions that the production of subjects always needs to be understood as the correlate of prevailing forms of governmental rationality. As the idea of diffraction implies, I look for less homogeneous or coherent ways to think about this process while simultaneously explore the agency of the subject.

Much like chapter five, in order to keep track of how each of these practices perform a distinct type of subject, I follow Mol (2002), and investigate the materials and methods sections of scientific articles. Supposedly these sections specify as much as possible about the practices of investigation. They support the recognition that the practices that allow an object to speak are crucial to what may be said about it. The description, however, takes a different turn. I construct narratives based on the method used by Foucault (1979) in *The life of infamous men*. In this essay, the author produces what he calls an "anthology of existences", based on documents from the internment archives of the 17th and 18th centuries in France. In a similar fashion, based on the methodology, participants and procedures described by each article, I rebuild scenes that discuss the subject's experience which are part real, part fictional.

As we'll see at the end of the chapter this is not an effort to "overcome Foucault" in any sense. Cognitive subjects are the product of a multiplicity of relations among entities and the task of this chapter will be to attend to what that 'production' actually entails, that is, to ask how such relationships are constructed and transformed.

6.1 Becoming aware (and part machine)

Our first scene takes place in a laboratory. The research objective is to detect brain activity related to self-awareness. A technician straps a cap containing electrodes for an electroencephalogram (EEG) in the scalp of our subject, who is sitting on a chair. The electrodes are disposed carefully, following a standard developed around fifty-five years ago (Jasper, 1958) called the 10-20 electrode system. The circumference of her head was measured between the depression between the eyes, the nasion, and the inion, a small projection of bone at the rear of the skull. The measurement obtained is divided in five areas. The first electrode is placed on 10% of the distance of the nasion. The subsequent ones are placed at a 20% distance of the total measurement. It`s worth noting that with this distribution the third is at the middle of the circumference (50%) and the last one, like the first, is at a 10% distance of the inion. The measurement process is repeated three more times. Two lateral measurements between the nasion and the inion, one on each side of the head, and a last one from ear to ear, distributing

the electrodes at the same proportion. This standard electrode placement was devised to provide adequate coverage of all parts of the head (Cantor, 1999). With the cap in place, a last electrode is added close to the chin. This one will serve as a control input and will be used to reduce the "noise" signals and eliminate false signals or artefacts - in laboratory jargon. With the EEG done, three more electrodes are added - one in each outer side of the eyes and a third one over the left eyebrow. Those are for an electrooculography (EOG), that will register her eye movements. Over twenty entwined cables connect the head of our subject to a filter and an amplifier in the next room from where she will be observed by a small group of people. The analog filter reduces very low frequencies coming from bioelectric flowing potentials like breathing, minor body movements and/or sweating. The amplifier, like its stereo analogue, amplifies the electric signs to make them compatible with display and recording devices while rejecting superimposed noise and interference signals. From the amplifier, her electric signals will be sent to a computer that will register these signals in its hard drive and help with the data analysis.

All set, at the appointed hour our subject starts her task: She slowly lays down on a bed, closes her eyes and concentrates on trying to sleep.

We are in a sleep laboratory to investigate self-awareness - an experience close connected to being awake and conscious - during sleep. This research, actually, is connected to a well established tradition of investigating conscious aspects of dream activity. More specifically, we are trying to correlate or associate lucid dreaming with some brain activity[33]. In these cases, lucid dreams provide test cases for theories of consciousness (LaBerge, 2000; Langlitz, 2015). Lucid dreaming can be characterized as the phenomenon in which a dreamer becomes aware that he or she is dreaming and can potentially exercise control over the dream. This awareness, commonly associated with waking consciousness, occurs while one remains deeply asleep and experiencing a dream that is often nearly indistinguishable from the "real world". It's now a common claim that lucid dreams represent an intermediate state between dreaming and wakefulness (Payne, 2014; Tranquillo, 2014).

To record lucid dream activity, however, is not an easy task to achieve. Just around 20% of the general population can be considered frequent lucid dreamers (frequency equal to or higher than once per month) (Schredl & Erlacher, 2011). To make our research possible, our subjects were submitted to weekly lucidity training sessions during four months. In the training sessions subjects are instructed to test their state of mind during the day. This consists of asking yourself during the day "am I dreaming?" or "am I awake?" and then, before answering the

33 This narrative was based on the methodology described by Stumbrys, Erlacher & Schredl (2013) and Voss *et al*. (2009; 2014).

question, you should check your surroundings for clues. One example would be, while reading a book, to look away from it and then read it again. If the text changes your are dreaming. Following this state assessment, the trainees learn two kinds of autosuggestion: 1) During the day imagine him/herself in a typical dream situation, like flying, or a previously known dream situation and finish this fantasy with the suggestion "Next time I am dreaming, I will remember to recognize that I am dreaming." 2) While lying down and preparing to sleep repeatedly express aloud: "Tonight I will have a lucid dream." Once the participants have acquired some experience with autosuggestion, the final part consists in once they are able to recognize themselves in a dream, produce a specific behavior (Paulsson & Parker, 2006). In our case it was a simple task that could be recognized by the EOG, a pattern of sequential horizontal eye movements (L - R - L). In a group of 20 initial participants, six at the end claimed to be lucid in their dreams more than 3 times per week, so they were invited for EEG screening.

Our current subject arrived two hours ago - it`s her second night - to be relaxed and prepared for sleep. While she lies down on the bed, for control purposes we ask her to repeat the eye movement sequence and record the EEG and EOG of wake with eyes closed (WEC). Some time after that she falls asleep and we wait.

Close to morning during her Rapid Eye Movement (REM) sleep we can visually detect alterations in the EOG graph on the monitor. 1… 2… 3 sequences of eye movement - the recurrency is important so we can discard false positives - and then nothing. One minute after the last signal we wake her up with a ring sound and ask if she can recall that she was dreaming. She confirms and we record the description of her dream. We serve her a small breakfast, her task is complete.

Conducting the EEG record of a specific neural activity is a carefully coordinated performance without much room to improvise. Only a precise alignment allows each actor to play its part. First we must speak about a set of material alignments. Two dozen electrodes are connected to very specific points of our subject`s head. This standard placement is said to be ideal to detect the electric activity of the neurons. Our subject has to lay down. Not in her bed, where her sleep would be much better, but in a strange place like the sleep laboratory where she is constantly observed. The various components of the EEG and EOG devices are aligned. The wires are attached to the electrodes, and these are subsequently connected to the amplifier and the computer which records the data. The alignment of these objects brings about a material assemblage that enacts the subject in a specific way and thus makes the brain readable. The careful placement of these elements regulates which other elements, or effects, will be included in the assemblage. Anything that might cause deviations, any source of variation or disturbance has to be reduced or eliminated. For that matter, the instruments have to be calibrated to each

subject. Control readings and extra electrodes will allow computer programs to account for all undesired signals and variations from the subject's body or behavior.

But if the instruments have to be attuned to the subject, the reverse is also true. The subject has to be trained to assume his/her role, to be a recurrent lucid dreamer. This training has the same preparatory functions of the instrument alignment. It ensures that no unwanted, unpredictable, or unaccounted objects have an effect on the assemblage. It takes four months to train a recurrent lucid dreamer and even after that the subject has to keep the practice of constantly checking the reality and auto suggesting herself. Like the maintenance of and instrument, the training must continue until the subject's performance falls within a narrow range of variation. Access to self-awareness in dreams is only possible by properly arranged experiments and supported by a certain amount of regularity outside the context of experimental practice. For the outcomes of trials to count as experimental data, both instruments and persons have to be finely tuned to their tasks[34]. Usually three nights in the laboratory are needed, the first one serves as an adaptation night, during which the participants are screened for sleep disorders (sleep apnea and periodic limb movements during sleep) and for sensitivity (to light or sound), and the subject gets used to sleeping attached to the instruments.

From the subject part, precision emerge when he or she is able to bring a well-trained mind to the experimental situation, the result of practice and discipline. As a means of producing matters of fact about the brain activity and self-awareness, the subject becomes part and parcel of the material technology. A 'good' subject therefore has to be a highly specific type of individual, not easily found. From the 20 students of psychology who started the training, only six were selected and, among those, only three generated significant data. Apart from achieving success in the training and maintaining discipline, almost everything might be a reason to be eliminated. You cannot take medications, be sensitive to light or sound, move too much in your sleep and so on.

Producing readings of self-awareness and its brain activity is only possible if the subject is correctly inserted into the chain of instruments. To fall asleep, in this case, plays the same role of controlling electrodes and filters: a matter of removing any signal that might interfere with the registering of electrical impulses by the electrodes. During REM sleep, as opposed to during wakefulness, consciousness has no control access to attention or memory. In lucid dreams, some conscious control coexists with normal REM sleep, enabling the sleeper to become aware of the fact that he is dreaming while the dream continues. So, self-awareness, being the element that's activated during lucid dreams, should be registered as the difference

34 For a historical perspective on the calibration of psychological instruments and subjects, see Benschop & Draaisma (2000).

between regular REM sleep and lucid dream. Every other brain activity involved in being awake interferes with the capacity of the EEG to detect self-awareness activity, producing an incomprehensible or misleading result. Putting the subject to sleep is also a way to align her with the other elements and protect against noise; it is an attempt to silence as much complexity as possible and allow only the formation of those associations that enable the production of an intelligible signal from the neurons. The EEG record as a performance is a means of ensuring that certain entities within the body, the electrical impulses neurons involved in self-awareness, can be deciphered or read, while many other entities are left silent through their deliberate or unintentional but necessary exclusion.

6.2 Becoming able to calculate oneself

Our second scene starts at a very unremarkable room in the psychology building. An undergraduate student - who received extra credits for her collaboration - sits on an office chair in front of a computer. She typed her gender and age and in few instants she will fill in the Situational Self-Awareness Scale (SSAS).

Before this, however, our subject solved a simple priming task. This common research technique is concerned with how the current context affects, in a passive and hidden way, an individual's information processing and responses. The intention of the task was to activate a specific mental representation in one context so that it exerts an unwitting influence on the subsequent task, filling in the SSAS (Bargh & Chartrand, 2000). To accomplish this hidden influence the student was deceived with a simple lie. She was told that the first task is for another, unrelated, study; that it is a relaxation task or that they are trying to measure something different from the real research objective. The task is quick and simple, like finding grammatical errors in a paragraph, solving a word search puzzle or ranking a list of adjectives based on a prime criteria, and it exposes the subject to a set of words related to a specific concept. The participants are divided in two groups, the control group is exposed to a neutral or contrary set of words and the prime group is exposed to the intended concept[35]. The overall research objective is, thus, to measure the impact of the activation of a specific concept on self-awareness of the subject without her knowledge.

35 This narrative was based on the procedures and methodologies described by Gervais & Norenzayan (2012), Steidle & Werth (2014) and Sheldon & Fishbach (2015). These concepts can vary greatly, ranging God, light and darkness to specific professions like teacher or football players.

The SSAS, unlike the EEG, requires our subject to be fully awake and aware of what she's doing[36]. At the very beginning she can read: ''Please respond to each statement based on how you feel RIGHT NOW, AT THIS INSTANT — not how you feel in general, or at this point in your life. Place an 'X' on the line above the number that corresponds to your answer. There are no 'right' or 'wrong' answers — just be honest (Govern & Marsch, 2001: 368)''. The scale is composed of nine questions, three questions related to each factor: public and private self-awareness, and awareness of the immediate surroundings. The highly transitory character of situational self-awareness hinders a longer instrument. If participants had to respond to many self-related items, the instrument itself could serve to induce (even more) self-awareness. Each statement[37] is accompanied by a 7-point scale, which ranges from 1 (strongly disagree) to 7 (strongly agree) in an equal-interval rate, starting from the highest at the left and going down. First developed in the 1930s, the widely known Likert-type scale was specifically created for attitude measurement and is an answer distribution technology comparable to the 10-20 electrode system from the EEG: it was build in order to convert what it was a potentially infinite range o answers in a manageable number while still retains great consistency, that is, items that should vary together maintains a high correlation even when compared to more complex variations of responses.While 10-20 system from the EEG concern is cover the space, the Likert scale addresses the degree of pertinence of a question or assertion in a given time/moment.

After quickly filling in the scale, our subject is debriefed. The real research objective is explained, she is allowed to pose questions and describe her experience more freely. One of the concerns at this point is if the subject was able to consciously relates her first - priming - task with the scale filling. If she did, her data are discarded. A conscious relation would bias the responses. Otherwise, she receives a card with the telephone number and email address of the leading researcher in case she wants to know the results of her test or the outcome of the study. She is done for the day.

The relative isolation of the test situation, where the subject is kept in the dark in relation to the researcher's objectives and can resort only to a list of questions assigning numerical values to her feelings and perceptions, is designed as an arrangement to allow 'qualculation' (Callon & Muniesa, 2003; Law & Callon, 2005) i.e., it establishes a continuum between qualitative judgement and quantitative - or numeric - calculation creating a mediating situation where the subject is enabled to value characteristics of him/herself.

---

36 About test administration see also Derksen, M. (2001).

37 "Right now, I am aware of my innermost thoughts"; "Right now, I am self-conscious about the way I look"; or "Right now, I am keenly aware of everything in my environment", for some examples.

This qualculability requires material and human effort in order to produce practices appropriate to it. Callon and Muniesa (2003) suggest this assembling is accomplished in a three-stage process: 1) The relevant entities are sorted, detached and displayed in a single space. 2) Those entities are manipulated and transformed. 3) A result is obtained. We focus, here, on the first and second steps, considering them more relevant to the subject's experience, leaving the third one for a future analysis.

First, to be capable of calculation, a finite number of entities have to be moved, arranged and ordered in a single space. In our case, this single space is the answer form of the SSAS projected on the computer screen. We can follow the composition of this space in the paper describing the development and validation of the SSAS (Govern & Marsch, 2001). Based on the self-awareness theory, 31 items were constructed. After testing with 213 students, these items were divided in three factors labeled "public self-awareness", "private self-awareness", and "awareness of immediate surroundings". The three items that weighted the most on each factor - and did not interfere with any other factor - were selected to form one 9-item scale. A second test was done to assure that these 9 new items can still perform the three factors structure of the previous test. Later a third and fourth test would attest whether this scale format interacts with situations as expected in the literature. That is, situations where self-awareness is expected to be higher, like answering the test in front of a mirror or video camera, should raise the score in the test.

This process of isolating objects from their original context, grouping them in the same frame, testing the relations between them and classifying them in psychological assessment is called validation and has a long tradition (Clark & Watson, 1995; Cronbach & Meehl, 1955; DeVellis, 2012). While Callon and Muniesa (2003) proposition has a slightly different emphasis on calculation power, meaning the large number of relation among the entities involved and the variety of these relation, test validity focuses on how well these detached objects refer to a theoretical framework. As the same phenomenon will vary with the theoretical perspective, there's no limit to the number of psychological constructs that can be operationalized as different scales. It`s important to notice that validity in a psychological test doesn't refer to the reality of the measured object but to the consistence between the test questions and the theory. Despite the distinct emphasis test validation attend all the requirements introduced by quaculation.

The importance of accompanying this first stage lies in emphasizing the crucial role of material devices without which no calculation would be possible. It also points out to the diversity of possible configurations. As we mentioned before, a long questionnaire would interact with that which we would like to measure. But the reduction in the number of items

could jeopardize the three factors structure previously intended. At the same time, detached and displaced from theory, the declarative sentences risk not expressing the theory[38]. This detachment and composition process is so risky that several tests are needed to be considered valid.

The same can be said about the likert scale related with the assertions. While commonly described as restricting the - possibly infinite - variation of answers to the test, the Likert-scale can also be understood as a tool for translations: it is an abstract ruler that measures the distance between a feeling or a subjective state and a statement in the form. As much as the question itself, the form of the scale presentation has a direct impact on the result of the test[39]. For example, even number scales have no midpoint, or neutral answer, forcing respondents to make a choice (Garland, 1991). Also, scales that start with the highest number on the left have significantly higher scores than the ones with the lowest score on the left (Hartley & Betts, 2010). In a similar way, providing more response alternatives (e.g., a 9-point rather than a 5-point scale) does not improve reliability or validity. In fact, increasing the number of alternatives could reduce validity: "if respondents are unable to make the more subtle distinctions that are required. That is, having too many alternatives can introduce an element of random responding that renders scores less valid" (Clark & Watson, 1995: 313).

As a result of this first stage, a small number of statements have been removed from their original context, associated with one another, grouped together and combined with a Likert scale. This arrangement enables the respondent to judge and calculate his/her self-awareness in a given instant, which leads us to our second stage.

Once they have been sorted out, the entities considered are associated with one another and subjected to manipulations. On the Callon and Muniesa (2003) article, this step has a very material sense: movements to the left or the right, up or down, superimpositions or juxtapositions. The classical example would be applying a mathematical rule or using a mechanical calculator. In the SSAS these operations could be better described as articulations (Latour, 1999; 2005), an occasion to make contact allowed by different entities. This occasion allows an entity to modify its settings in the course of an event. The reading and answering of each statement in the test form allows self-awareness and its measure to be composed.

---

38 It should be noted that, more often than not, psychological tests are used in studies as the only source of information. This use is frequently based on the assumption that the measure is a full and accurate representation of the assessed phenomenon, as if the score in the test is believed to be the "Platonic true score" of an individual's characteristic with almost no error. We follow Ziv and Hotam (2015) suggesting that the test procedure should be considered a measure of a few aspects of a wider phenomenon.

39 For a review and a more complete discussion over the impact of Likert-scale format see Hartley & Betts, 2010; 2013.

That is to say that it's not a matter of correspondence between a statement like “Right now, I am conscious of my inner feelings” and a supposedly externally unobservable experience, or a matter of the possibility of a properly quantitative measure of a qualitative, psychological attribute. In the act of assigning a number to its self-awareness, our subject is affected by the question and has the opportunity to access and negotiate her own self-awareness. The question is no longer whether or not statements refer to a state of affairs, but only whether or not the entities involved are well articulated. If a number refers to the self-awareness of the subject, it's not because they are the same thing, but because they were modified, composed in the same process, the same event[40].

It is important to notice that the assertions of the test don't have the power to determine the answer or result, but they mediate a translation, they offer an occasion for the respondent to differ and simultaneously compose the result. But they can only act as such to the extent that they are manipulated and, thus, incorporated in the action of filling the inquiry. If the question is left blank, no articulation was possible. So, measurement depends on an opening for negotiation. The actively measuring awareness merges with its measurement instrument.

The crucial point is that our subject is only able to sustain the cognitive competence of calculating her self-awareness as long as she has some connection with this instrument. In this sense, I do not support Rose (1989) when he proposes that test scores are a reduction of a person to essential elements devised to discipline the person. I`d suggest that the production of test scores could also be understood as small intellectual technologies that instead of limiting or constraining subjectivity offer the possibility of subjectification, connecting the respondent with different entities that build or modify his/her subjectivity. If we treat the the SSAS as a mediator that offers an occasion for the next agent, the responding subject, to behave as a mediator - producing difference in a network - there's no restriction or reduction but an increase in attachments. As mediators do not cause nor force action, the more articulation we have, the more we are able to act.

To sum up, there is no ‘pure’ calculative process that could be reduced to what happens inside the human subject. Qualculation is composed of a network of methods of displacement and material arrangements. Each combination allows or prevents this qualculation to be accomplished. If the list is too long or not properly formulated, the manipulations might require unavailable resources, or it cannot be performed within the imposed timeframe. This way, the score in the test is not best described as the result of a subject-object encounter, external to both, but as a process of attachment which, through the qualification and requalification of self-

40 About events see chapter 2.

awareness with each answer, leads to the singularization of self-awareness itself and the test score. The answer in the test and the behavior of the subject are not mutually external or exclusive, but co-emergent, which does not prevent them from being either real or singular.

6.3 Becoming another

The last scene is an interview conducted as part of an Intervention-Research (IR) study with people with acquired blindness in an institute on matters relating to visual impairment in Brazil. IR can be understood as a variation on the Action-Research (AR) developed by Lewin in the 1930's. IR takes the combination of investigation and action in the social field proposed by AR, but moves away from its focus on the identification of mistakes or malfunction in the social groups investigated. In AR, the researcher's goals are, in many cases, to analyze the organizational or social function of resources to ensure that they perform adequately. With a more political agenda, IR seeks to involve the researchers and the participants in a community's reality changes. For the purpose of this article/chapter, I`d like to highlight two key elements of the method: 1) The research goals always include starting and tracking changes in a given collective. 2) Researchers include the participants as much as possible in the definition of the research problem, the actions taken and the research directions[41].

Our case interview is conducted in a center on matters relating to visual impairment that has as tradition and main goal to ensure to the visually handicapped the right to citizenship. The person interviewed is part of a group of 18 adults who have total or partial loss of vision, caused by sudden events (automobile accident, gunshot) or ill health (diabetes, retinitis pigmentosa). This group weekly attends a pottery workshop at the center. The research group's main interest was attention, more specifically if the loss of sight would provide a displacement of attention from vision to touch. Under this hypothesis, they proposed and followed the workshop activities for a few months, assuming the pottery would help in this attention displacement and render it 'visible' for the researchers. Looking for a better description of the concentration of the subjects over pottery practices, the researchers are now conducting explicitation interviews.

The explicitation interview (Froese, 2013; Petitmengin, 2006; Petitmengin *et al.*, 2013), according to its proponents, is a technique developed to help a subject leave the level of representations and beliefs in order to become aware of the way he really carries out a given activity. This awareness should help the subject to describe the activity with precision and help

41 For a comprehensive review of IR in english see Maraschin et al, 2015. For reviews in portuguese see Rocha & Aguiar, 2003 and Rocha, 2006.

researchers to better understand how a given cognitive process is carried on. So, the method's aim is, through specific prompts and questions, to help a subject become aware of the unrecognized, or pre-reflexive, parts of the practice being described.

In our case, the interviewee was asked to bring with him some of the art pieces he sculpted at the workshop. Together, the interlocutors pick out one piece - a man on one knee and a woman sitting on his lap. While the subject holds the sculpture in his hands, they start to talk about when the piece was made. The objective at this point is to help the subject retrieve the memory of a particular occurrence, a certain task, precisely situated in space and time. While he narrates the sculpting, each time he moves from the description of the experience to justifications, explanations or beliefs about sculpting - moving thus to interpreting rather than describing it - the interviewer tries to bring him back, helping him to keep focus.

With the sculpture in hand, our subject easily goes back to the day and time of the workshop, remembering his classmates, tutor and the proposed activity. Gradually, the interviewer guides the participant from the general situation to the conception of the piece. This is done, usually, by asking questions about some specific sensation associated with the process, like "what did you hear?" or "what did you feel at that moment?". From then on he describes his original intentions and how, through the handling of the clay, it was necessary to compromise on some points in order to get the work done. At this point he starts to show the signs of evoking the original memory, that the past situation gradually becomes more present for him than the present situation is: He shifts the direction of the eyes, losing focus and losing eye contact with the interviewer, looking into the empty space; the flow of speech slows down and an alternation between words and periods of silence takes place; the description is now accompanied by co-verbal gestures. With these clues, the interviewer can verify that the 'evocation state' is sufficiently intense and stabilised that he can enable the interviewee, with the help of the right inquiring, to turn his attention towards his inner, cognitive, processes and describe them.

At this point we start the last phase of the interview, in which the expert guides the subject in shifting his attention from 'what' he did to 'how' he did it, in other words, to redirect his focus from the content of his cognitive activity to its process. The question is not about what he was sculpting, but how he concentrated himself while he did it. Where were his focus and how did he keep it. At this stage, the researcher wants to capture two dimensions of the processes, a diachronic dimension corresponding to the phases of its unfolding in time -- the succession of actions, perceptions and inner states which are lived -- and a synchronic dimension corresponding to the particular type of attention and sensory modalities which are mobilized in a given moment. The overall structure of the interview consisted in bringing the

participant several times to an evocation state and guiding him towards the synchronic mesh, which is finer each time, until the required level of detail is reached.

Nevertheless, each time the evocation state was achieved and the participant was guided towards the description of his sensory movements, they never get a description of how he kept focus, or how concentrated he was. What appears in its place is a description of self-awareness. A description of someone who is able to create art, keep track of the piece's position without being able to see it, or just someone who is more capable than expected. While describing the concentration effort, he realizes : I am not aware of the passing of time. There is no time for me. I have no track of time". Or while describing the movement necessary to give shape to the clay the attention was as much on the finger as on the realization "I can be an artist". At other moments, the description of the shaping of the clay would become confused with a shape of the self. The attention generated by the workshop wasn't concentrated on the hand as expected, but distributed, opened; not just on the changes of the clay, but on the changes of the subject who shapes it.

If this were an isolated case we could blame our subject, stating that he was unable to describe his action with precision, the same way some people are unable to have lucid dreams in laboratories and others can't quite figure out how much - from 1 to 7 - they are aware of their surroundings. We could also conceive it as a technical problem, a lack in the explicitation handling of the researcher. The recurrance of the problem, however, indicated that the problem in principle laid to be solved by the research, needed to be replaced, reframed. The interviews indicated an entanglement of the problem of attention in the creative process of people with visual impairment and the problem of self-awareness in the same process. Considering this, the problem of self-awareness during the process of creation was included in the research and its investigation eventually gave way to a text that specifically addressed this issue.

During the interview, subject, researcher and sculpture assemble the relations necessary to stage the attention movement's experience. In this scene the questions and alerts from the interviewer play a foreground role in this moment of self-awareness. They force us to recognize a collective character in this experience, in which, through recursive interaction, one supports the other in recalling and re-experiencing self-awareness. We should be careful, though, not to minimize the importance that the art piece plays in this enactment. It is not sufficient to describe it as a cue to memory or a simple gateway to the past. The affordances or propensities of the object are an integral part of the contingent and situated manner in which they are encountered in acts of remembering (Brown, Reavey & Brookfield, 2012). Prompts, question and objects form potential trajectories along which the process of enacting self-awareness unfolds and the boundaries between past and present can be negotiated.

As we have illustrated, the result of this discussion was the reconfiguration of the research. Instead of obstacle, the emergence of self-awareness in art creation reshaped and reframed the research and the way it was reported, but first and foremost reconfigured the research participants. Through the holding and feeling the art piece, the questions and directions of the interviewer and the answers given, each participant is gradually enabled to pay attention particular entities that may have been previously just part of an indiscernible mess, an ignorable background to their activities. These entities are now considered part of the self.

6.4 Refracting biopolitics

Biopolitics permeates the corpus of the population, using strategies and tactics to produce subjects, seeking a correct way to dispose of things to better conduct them; To conduct the conduct of subjects in favor of certain ways of governing themselves and others. In the medical-scientific domain, this is commonly exercised through the establishment of norms and standards that establish an episteme, that is, a logically coherent body of knowledge. This coherent set of norms imposes an ordering, unique organization to the set of relations between the sciences of a given epoch, which in turn composes a certain epistemic formation - as in the analysis of the medical discourse, which we find in "Birth of the Clinic" (Foucault, 1974).

In a different direction, this chapter tries to highlight the contrast among the subjects performed in each scientific methodology: At the lucid dreaming recording, the subject is educated and trained during several weeks until it's able to reproduce a very specific set of behaviors under a particular condition; at Intervention-research a greater number of weeks are needed in order to establish efficient connection between subjects, clay and tools, but subject that emerge from these associations is considered even -and some would say especially - if they fall far from the predicted. Questionnaire fulfillment, in its turn, doesn't require subject training but demands a long time of preparation in order to allow people to give a manageable number of answers and still be able to connect with the questions, too many or too few option and the qualculability is lost. This cannot be reduced to sentimental concerns or moral issues. It`s first and foremost a matter of rising more interesting questions that enable us more articulated answers, and therefore more articulated experiences.

In a more Foucauldian analyses, I could describe this heterogeneous performances as competitive regimes of subjectification simultaneously at work. On a slightly change of focus, I highlighted the different connections people are allow to establish and the multiple experiences one can have with its own self awareness. It is no easy task to be so constantly attentive to the point of realizing whether we are dreaming or awake; it, indeed, requires

discipline (in the traditional and foucauldian terms) to accomplish, but this relationship to itself does not doesn't and with the recording of the neural activity it changes the one relates to its own dream for a long time. The same can be said about the "awareness of being an artist" provoked by the intervention research which change what one is able to do once has lost sight.

The ethical suggestion that has been put forth throughout this chapter (and thesis) could be summed up thus: if we are going to provide conditions for the creation of new forms of subjectivity, then one way to do it is to remain skeptic about what subjects can do and what they may become. It is in this sense that I recurrently return to Stengers' ecological metaphor, specifically, recognizing an interdependence between actor and technology intertwined in the production of cognitive subjects. As Stengers argues, ecology is about "the production of new relations that are added to a situation already produced by a multiplicity of relations" (2010 p. 33). This focus in intended to multiply the questions at stake and also to consider the consequences that allowing for certain questions might have upon a certain milieu of interrogation and intervention.

7 Conclusões: A ética da Diplomacia

Ao longo da tese explorei as ciências cognitivas como uma ecologia de práticas que constitui múltiplas ontologias da cognição, disponibilizando em nosso coletivo um repertório sempre crescente de formas para produzir, ordenar, distribuir e questionar a cognição. Ao distinguir diferentes políticas cognitivas nosso propósito não foi a revelação ou representação de uma verdadeira cognição, tampouco a unificação de diferentes versões. O que buscamos foi produzir, através de conceitos como os de multiplicidade ontológica e políticas cognitivas e performance, condições de viabilidade para uma possível negociação, articulações locais, entre diferentes proposições. Essa negociação conecta mundos distintos e autoriza os sujeitos a dizerem algo mais sobre suas versões.

No presente trabalho realizei o exercício de desvincular as relações entre psicologia e neurociência da hierarquia e da causalidade mecânica. No segundo capítulo busquei superar duas noções temporais recorrentes em história e filosofia das ciências: progresso e revolução. O progresso compreende a passagem do tempo na ciência como um constante processo de rompimento com o passado, o que torna o que antecedeu obsoleto e as afirmações científicas como desconectadas do que as tornaram possíveis. No lugar do rompimento, sugeri a figura da bifurcação das relações que produzem outros atores e coletivos que podem seguir caminhos diversos; os novos conhecimentos surgem como um processo de tempo-duração no qual o passado se atualiza no presente. O surgimento do novo não invalida o que se produziu até ali, mas rearranja antigos atores em novos papéis e configurações. Nessa perspectiva, novos conceitos ou metodologias não são mais avançados do aqueles que os precederam, não estão mais próximos da verdade, mas expandem uma rede sociotécnica em direções diferentes.

A revolução, por sua vez, confere um carácter bélico ao percurso científico, propondo que a única forma de algo novo surgir é através do conflito, da derrota ou da derrubada daquilo que antecedeu. Pesquisadores travam batalhas através de experimentos e descobertas, criando a imagem do general-cientista cujo sucesso depende do fim a todas as desavenças, um heróis-cientista, capaz de sacrificar tudo pelo progresso da ciência. Nesse ponto, recorri ao conceito de acontecimento como forma de pensar o desenvolvimento científico como a produção e o deslocamento de questões e interesses. Quando transportamos as respostas sugeridas pelo conceito de informação, originalmente desenvolvido para o problema do ruído e compreensão de mensagens enviadas durante a guerra, para a problemática da memória e das variações da percepção, uma série de novos interesses são atraídos para a discussão, como por exemplo, o quanto o conhecimento prévio ou expectativas do receptor sobre a informação beneficia a compreensão. Esses novos interesses alteram a trajetória das práticas ao redor da informação

de um modo que não poderia ser previsto. É nesse sentido que o conceito de acontecimento pode ser pensado como a possibilidade de propor soluções vindas de campos ou momentos diferentes para problemas para os quais elas não foram pensadas e podem acompanhar o refletir sobre o desenrolar desse deslocamento.

É possível traduzir os movimentos históricos para o da ecologia de práticas, ou seja, o que proponho é pensar uma ética da relação entre ciências onde o sucesso de uma não implica a desqualificação, ruína ou derrota da outra. Em que podemos celebrar os avanços da neurociência, sem que isso obscureça outras ciências. Com isso, não interessa produzir relações de causalidade entre psicologia e neurociência, mas sim um modo de encontro no qual ambas sejam fonte de incertezas uma para a outra, oportunizando a criação de novos interesses. Não se trata de sobrepor ou superar outros conhecimentos mas de possibilitar a diferenciação e diversidade de possibilidades, ampliando assim a viabilidade de interfaces.

Tal modo de encontro possui ressonâncias com o princípio do movimento cognitivo. Foi nesse sentido que propus uma relação complementar entre fatiche e performance, buscando destacar a necessidade de manutenção constante dos objetos com os quais lidamos na ciência. A análise do relatório à Fundação Sloan sugere que desde o princípio o alinhamento entre diversas ciências era uma questão marginal para o coletivo de cientistas, as tentativas de alinhamento, geraram novos subcampos (como neuropsicologia ou psicolinguística) mais específicos e diferenciados, sem a necessidade de se sobrepor aos seus campos de origem ou fundir eficientemente duas ou mais ciências maiores. O que reforça a proposta de que como coletivo as ciências cognitivas foram desde muito cedo fonte de acontecimento - de novos questionamentos e produções de novas ontologias, não resultando na supressão ou no abandono de teorias. O que confronta abertamente a ideia de uma necessidade de homogeneização das ciências da mente ou projeto de unificação. Uma vez que podemos nos beneficiar da multiplicidade de atores (cientistas, objetos e sujeitos) criados para compor com o coletivo ao qual pertencemos.

Como encontrar as bases conceituais para esse espaço de diálogo e composição? Ao estabelecer uma centralidade nas políticas, performances e multiplicidade da cognição, esperamos poder explorar a diferença entre disciplinas e as diferentes "encenações" da cognição. As formas como cada uma das ciências "põe em cena" a cognição através de seus métodos de pesquisa. Não se trata de aumentar o volume das escolhas entre as possíveis teorias, onde cada uma seria mais apropriada de acordo com a situação. Trata-se de poder colocar uma questão que não versa nem sobre a verdade (ou falsidade), nem sobre a adequação de uma teoria, mas sobre "o que nós podemos fazer"? Quando nos perguntamos pela ação, não podemos facilmente resolver o questionamento com um conjunto de fatos ou com a adequação dos

argumentos. “O que fazer?” é uma pergunta que gera uma constante tensão cuja resposta só pode ser estabelecida a cada caso. O que podemos, psicólogos e neurocientistas, em conjunto constituindo problemas locais? Essa pergunta só pode ser colocada uma vez que a disputa pela tocha da verdade for posta de lado. “O que fazer?” se torna, dessa forma, uma questão ética e o objetivo desta tese não é o de encontrar umas resposta, mas o de sugerir que essa é a pergunta que deve sempre ser recolocada.

Quando Kastrup (1999) colocou o problema das políticas cognitivas, há mais de 15 anos atrás, sua discussão concentrava-se nas práticas pedagógicas e de aprendizado (Kastrup, 2005), sugerindo duas políticas distintas operando nesse campo: uma recognitiva, centrada nos resultados e na solução de problemas, que busca assegurar um domínio do mundo. A segunda política possível seria uma política inventiva que promoveria a continuidade da cognição no campo da multiplicidade e do agenciamento. Essa política busca uma constante abertura da cognição para o novo e um movimento incessante de diferenciação, mantendo qualquer regra de funcionamento como temporária e passível de reinvenção.

Ao longo dos anos diversos autores (Dias, 2010; Kastrup et al., 2008; Rocha; Pinheiro, 2011) retomam a expressão sem, contudo, discutir a divisão original. Quando voltamos o problema para novas práticas, como as que se desenvolvem ao redor da consciência de si, delineiam, sem nenhuma pretensão de esgotamento, novas políticas que podem ser trazidas à discussão. Essas novas políticas também ilustram o trabalho necessário para composição das discussão do fazer em conjunto, de que forma diferentes versões da cognição podem ser colocadas em jogo e algumas das ações que essas não encerrar qualquer debate. A análise dessas composições não suprime possíveis críticas a cada uma delas, mas distribue a capacidade de questionar, mantendo possíveis rupturas ou fricções. Minha aposta é que a diversidade política não deveria ser eliminada uma vez que as desavenças permitem um pensamento mais rico, mais versátil e mais apto a enfrentar novos problemas ou novas situações.

A questão que se coloca a partir dessa proposta ética é, assim, como mantemos um repertório intelectual diverso? Como evitar, como sugeri no primeiro capítulo, colapsar todas as práticas envolvendo a cognição em um campo biológico ou, tal como na proposta de Bickle tornar toda a relação entre práticas uma redução à menor escala molecular possível. Inspirado por uma fala de Mol (2015), gostaria de propor duas condições que tornariam favoráveis à manutenção e/ou ampliação dessa diversidade: 1) Um hiato espaço-temporal para que elas desenvolvam-se em separado; 2) Um modo de endereçar a diferença que implique mais diplomacia e menos julgamento.

7.1 Espaço e tempo para circular

A primeira condição refere-se a necessidade de que antes entrar em contato com outra política cognitiva, cada organização precisa, em separado, constituir sua própria rede de sustentação; compostas, tal como sugere Latour (2001), de quatro processos distintos, mas relacionados: 1) Nenhuma política se efetiva sem mobilizar uma parte do mundo. Sem os instrumentos necessários, sem alunos e estagiários disponíveis, sem salas de reunião, mesas de conferência ou sujeitos de pesquisa, não existe negociação possível. 2) É preciso formar alianças; seja convencendo as empresas que testes psicológicos são úteis para selecionar melhor seus funcionários (Danziger, 1994), seja ensinando neurologistas a compreender imagens digitais do cérebro (Dumit, 1999), é preciso que, além do cientista, outros atores sejam convencidos a atuar em favor daquela política. Não se trata de fatores externos que pervertem uma suposta pureza científica, mas de viabilizar uma rede de ação, de fazer circular propostas e atrair interesses. 3) O terceiro processo que estabiliza a rede de uma política cognitiva é a representação pública, quando variações de testes psicológicos aparecem em sites na internet e coloridas imagens do processamento cerebral estampam capas de revista; eles gradualmente aumentam a confiança dos atores em sua eficiência, passam a fazer parte da 'epistemologia cultural' de um certo coletivo. Com isso, a política se estabelece como membro de um processo científico, assim como uma resposta possível para questões sobre as quais o mesmo coletivo deveria estar interessado 4) Por fim, é preciso um processo de distinção de outras práticas já estabelecidas. É preciso autonomia. A autonomização se refere ao modo como uma disciplina se diferencia de outras e desenvolve seus próprios critérios de validação e relevância. Ela diz respeito a existência de colegas capazes de utilizar o resultado dos experimentos, mas também daquele capazes de criticá-lo. Demarcando assim aqueles a favor e aqueles a quem combater. Ou como sugere Latour (2005), os grupos e os anti-grupos.

Nenhum desses processos acontece em separado, e em conjunto eles estabelecem as condições a partir das quais as performances da cognição podem se estabilizar. É importante perceber que quando comparamos diferentes políticas da cognição nessa tese, nosso esforço foi o de argumentar por uma independência onto-epistemológica entre os objetos que elas performam e demonstrar uma possibilidade de simetria ao aproximar esses objetos, buscando afastar essa relação de propostas que consideram apenas uma redução (Bickle, 2008) ou derivação mecânica do psicológico a partir do biológico (Von Eckardt, 2001). No entanto, como outras análises demonstram (Beaulieu, 2002; Dumit, 1999), é possível relacionar a ascensão das neuroimagens, não por sua possibilidade de explicar ou condensar os resultado de outras ciências cognitivas, mas por sua capacidade de circulação, arguição e convencimento. Com isso, não se pode negar a hierarquia que se estabelece no cotidiano com uma política capaz de

arregimentar atores do Estado, jornalistas, advogados e juízes, etc, ou seja espalha-se pelas mais diferentes práticas, interessando os mais diferentes atores. Qualquer política que busca estabelecer um diálogo com as neurociências sem ser sobrepujada pela mesma, precisa uma rede estável o suficiente para resistir aos choques iniciais sem se desfazer ou ser consumida, como um "caso particular" em uma teoria com maior alcance explicativo.

7.2 Do julgamento à diplomacia

A segunda condição refere ao desenvolvimento de um *ethos* para endereçar as relações entre práticas científicas que especificamente permita a consideração de uma multiplicidade ontológica. Tal como referimos no capítulo introdutório, tradicionalmente a crítica se estabelece como um julgamento a partir de uma posição e ontologias definidas *a priori*, quase sempre a partir de conceitos advindos das ciências sociais.

Nao é incomum a acusação àqueles que trabalham com neuroimagens ou testes psicológicos de reducionistas, que deixariam escapar da localização cerebral e dos scores a humanidade de seus sujeitos, essa por sua vez, permaneceria como uma qualidade oculta no interior do sujeito, cercada de romantismo e mistério, que se expressa na poesia ou na música, mas não na matemática ou física. Seguimos, na direção inversa, a sugestão de Latour (2005) ao propor que a produção de números ou imagens não esqueceu uma dimensão humana ou a experiência concreta, essas representações não são nem frias nem sem coração, pois atribuir forma não é o mesmo que abstrair, cada valor, cada imagem, só mantém o seu sentido atrelado a prática que os produziu. Em resumo, não se trata de mal intencionados categorizadores que injustamente reduzem outras pessoas, cuja indescritível interioridade é ignorada e mutilada. Se trata de um ativo processo de tornar-se gradualmente e parcialmente comparável e comensurável, o que é - em alguma medida - parte do que significa tornar-se humano. A questão não é, portanto, lutar contra as categorias, mas questionar que categorias nos subjetificam e como nos subjetificam. Enquanto o trabalho de localização da atividade neural permite o desenvolvimento intervenções complexas, como a estimulação elétrica de neurônios para provocar sonhos lúcidos, essas tecnologias só são possíveis através do treinamento rigoroso de sujeitos que tornam-se capazes de torram-se parte de um complexo maquinário de cartografia cerebral. Por outro lados os questionários que parecem reduzir sujeitos a números frios e desalmados podem ser oportunidades para o sujeito conectar-se de outro modo com as próprias experiências. Como sugeri ao fim do capítulo anterior, se trata menos de um julgamento moral sobre as formas de sujetivação e mais o reconhecimento de que não existe subjetivação possível fora desses dispositivos. Sendo assim, não se trata de nos desligarmos de todas os mecanismos

que modulam a cognição, mas de garantir uma diversidade de conexões possíveis bem como refletir (ou difratar) sobre os efeitos de cada política, bem como suas possíveis associações.

Para isso, como sugeri em outro momento (Baum et al., 2014), a figura do diplomata, como uma função ou posição ética, que agrega diversas das características que evitam o julgamento e deslocam o interesse para como relacionar distintos repertórios e conjugar diferentes interesses sobre um mesmo problema. O trabalho do diplomata não é o procurar a verdade sobre um problema, mas o de traduzir as perguntas e respostas que lhe são dadas buscando manter na tradução a singularidade do conhecimento do outro enquanto torna-o compartilhável com aqueles que não falam a mesma língua. Essa tradução não ocorre através de uma passagem de um vocabulário a outro por correspondência direta de palavras, mas tal como nas zonas de contato propostas por Haraway (2008) indica o estabelecimento de um vínculo que modifica a todos os envolvidos. Essa tradução, portanto, ultrapassa a passagem de um linguagem para a outra e se efetiva como a criação de uma nova versão daquilo que precisa ser narrado.

Ao discutir a relação intercientífica, a diplomacia parece como uma operação que permite negociar a criação de um mundo que possa ser compartilhado, inventando novos modos de relacionamento entre as disciplinas envolvidas, novos modos de questioná-las e de conhecê-las. Cada tradução é encarada como um problema a ser construído e não como uma solução que encerra a discussão. A tradução do diplomata carrega a necessidade de que a nova versão do problema proposto permita que todos os atores envolvidos se reconheçam. A partir dessa postura a relação entre psicologia e neurociência deveria permitir que novas questões fossem feitas nos dois campos de pesquisa, reconfigurando a possibilidade de ação de ambas.

Essa posição contrasta drasticamente com aquela de Carnot, o general-cientista capaz de derrotar seus oponentes na matemática e no campo de batalha. Esse modo de fazer pesquisa não se impõe pela submissão de outras ontologias a uma maior e mais verdadeira, mas busca evidenciar as práticas que buscam interessar os interlocutores, em um movimento que promove a multiplicidade. E é sob essas condições que os papéis (às vezes provisórios) podem ser atribuídos aos atores de modo que eles possam "permutar competências, oferecendo um ao outro, novas possibilidades, novos objetivos, novas funções" (Despret, 2002 p. 210).

E nesse sentido se é necessário um espaço-tempo para que diferentes políticas possam se estabilizar, um espaço análogo mas de menor escala seria necessário para a instalação de uma conduta diplomática. Espaços na formação de pesquisadores em programas de mestrado e doutorado, seja na forma de disciplinas, congressos ou seminários sobre as diferentes possibilidades de produzir cognição. Não me refiro aqui à seiminários multidisciplinares sobre os resultados em diferentes áreas de pesquisa, esses já existentes há muito tempo. Mas

seminários sobre ética e procedimentos de pesquisa abertos a multiplicidade da própria experiência de pesquisar. Com isso, segue em aberto algumas questões dessa tese. Em particular, a possibilidade de atuar tais espaço de ensino.

Bibliografia

Abraham, T. H. (2012). Transcending disciplines: Scientific styles in studies of the brain in mid-twentieth century America. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*, *43*(2), 552-568.

Araújo, S. (2011). O Materialismo Eliminativo e o Problema Ontológico da Psicologia. *Revista Ética e Filosofia Política*, 14(1), 36-45.

Azambuja, M. A. (2012) Da alma para o corpo e do corpo para o cérebro: os rumos da psicologia com as neurociências. Tese de Doutorado, Pontifício Universidade Católica do Rio Grande do Sul, Programa de Pós-Graduação em Psicologia, Porto Aelgre.

Baars, B. J. (1986). *The cognitive revolution in psychology*. Guilford Press.

Bargh, J. A., & Chartrand, T. L. (2000).The mind in the middle. In: Reis, H. T., & Judd, C. M. *Handbook of research methods in social and personality psychology*. Cambridge University Press.

Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press.

Baum, C. (2016). Stabilizing cognition: An STS approach to the Sloan Foundation Report. *Theory & Psychology*, 0959354316672739.

Baum, C.; Cardoso Filho, C.; Maraschin, C.; Costa, L. A.; Gavillon, P.; Kroeff, R. (2017). Políticas da Representação na Filosofia da Diferença, Enação e Teoria Ator-Rede. Oficinando Com *Jogos Digitais: Experiências de aprendizagem inventiva*. Curitiba: Editora CRV.

Baum, C., Derksen, M. & Cardoso Filho, C. (In press). From Cognitive Revolution to Information Event - Temporality in the history of the cognitive sciences. History of Human Sciences.

Baum, C., dos Reis, C., Rodrigues, L., & Goulart, L. A. (2014). A Invenção do método: diplomacia como ética de pesquisa/The invention of the method: diplomacy as research ethics. *Revista Polis e Psique*, *4*(2), 155-172.

Beaulieu, A. (2002). Images are not the (only) truth: Brain mapping, visual knowledge, and iconoclasm. *Science, Technology & Human Values*, *27*(1), 53-86.

Benschop, R., & Draaisma, D. (2000). In pursuit of precision: The calibration of minds and machines in late nineteenth-century psychology. *Annals of Science*, *57*(1), 1-25.

Bensaude-Vincent (1995) Lavoisier: A scientific revolution In: Serres, M. (Ed.). (1995). *A History of Scientific Thought: Elements of a History of Science*. Blackwell Pub.

Bickle, J. (2008). Real reduction in real neuroscience: Metascience, not philosophy of science (and certainly not metaphysics!). *Being reduced: New essays on reduction, explanation, and causation*, 34-51.

Bickle, J. (2012). A Brief History of Neuroscience's Actual Influences on Mind-Brain Reductionism. *New Perspectives on Type Identity Theory*, 88-109.

Bigo, V., & Negru, I. (2008). From fragmentation to ontologically reflexive pluralism. Journal of Philosophical Economics, 1(2), 127-150.

Boden, M. (2008). *Mind as machine: A history of cognitive science*. Oxford University Press.Bamber, R. T., & Boice, R. (1972). The labyrinth method of comparing wild and domestic rats: Origins of animal psychology revisited. *Psychonomic Science,* 29(3), 161-163.

Brown, S.D., Reavey, P. & Brookfield, H. (2012) Spectral objects: Material links to difficult pasts for adoptive parents. *Objects and materials: A Routledge companion*. London: Routledge.

Callon, M. (1986). Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St. Brieuc Bay. *Power, action, and belief: A new sociology of knowledge*, *32*, 196-223.

Callon, M., & Law, J. (2005). On qualculation, agency, and otherness. *Environment and Planning D: Society and Space*, *23*(5), 717-733.

Callon, M., & Muniesa, F. (2003). Les marchés économiques comme dispositifs collectifs de calcul. *Réseaux*, 122(6), 189-233.

Cantor, D. (1999). An overview of Quantitative EEG and its application to neurofeedback. In: Evans, J. R., & Abarbanel, A. (Eds.). *Introduction to quantitative EEG and neurofeedback*. Elsevier.

Churchland, P. M., & Churchland, P. S. (1992). Intertheoretic reduction: A neuroscientist's field guide. In *Neurophilosophy and Alzheimer's Disease* (pp. 18-29). Springer Berlin Heidelberg.

Choudhury, S., & Slaby, J. (Eds.). (2012). *Critical neuroscience: a handbook of the social and cultural contexts of neuroscience*. John Wiley & Sons.

Choudhury, S., Nagel, S. K., & Slaby, J. (2009). Critical neuroscience: Linking neuroscience and society through critical practice. *BioSocieties*, *4*(1), 61-77.

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological assessment*, *7*(3), 309.

Cohen, I. B. (1985). *Revolution in science*. Harvard University Press.

Collins, A. (2007). From H=log s n to conceptual framework: A short history of information. *History of psychology*, *10*(1), 44.

Collins, H. M.(1987). Expert systems and the science of knowledge. *The social construction of technological systems: New directions in the sociology and history of technology*, p. 329-348.

Costanza, R., & Atkins, P. (2014). Toward an integrated science and sociotecture of intentional change. *Behavioral and Brain Sciences*, *37*(04), 421-422.

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological bulletin*, *52*(4), 281.

Dale, R., Dietrich, E., & Chemero, A. (2009). Explanatory pluralism in cognitive science. *Cognitive science*, *33*(5), 739-742.

Damásio, A. R. (2000). *O mistério da consciência*. São Paulo: Companhia das Letras.

Damásio, A. R. (2009). *O erro de Descartes: emação, razão e o cérebro humano*. Editora Companhia das Letras.

Danziger, K. (1994). *Constructing the subject: Historical origins of psychological research*. Cambridge University Press.

Danziger, K (2008) *Marking the mind: A history of memory.* Cambridge University Press.

Danziger, K (2013) Psychology and its history. *Theory & Psychology*, *23*(6), 829-839.

DaSilveira, A. C., DeCastro, T. G., & Gomes, W. B. (2012). Escala de Autorreflexão e Insight: nova medida de autoconsciência adaptada e validada para adultos brasileiros. *Psico*, *43*(2).

Deleuze, G., & Guattari, F. (1988). *A thousand plateaus: Capitalism and schizophrenia*. Bloomsbury Publishing.

Dember, W. N. (1974). Motivation and the cognitive revolution. *American Psychologist*, *29*(3), 161.

Derksen, M. (2001). Discipline, subjectivity and personality: an analysis of the manuals of four psychological tests. *History of the Human Sciences*, 14(1), 25–47.

Despret, V. (2004). The body we care for: Figures of anthropo-zoo-genesis. *Body & Society*, *10*(2-3), 111-134.

Despret, V. (2002). *Our emotional makeup: Ethnopsychology and selfhood*. Other Press, LLC.

DeVellis, R. F. (2012). *Scale development: Theory and applications*. Sage publications.

Dias, R. O. (2009). Formação inventiva de professores e políticas de cognição. Informática na Educação: teoria e prática, Porto Alegre, v. 12, n. 2, p. 164-174.

Dresler, M., Wehrle, R., Spoormaker, V. I., Koch, S. P., Holsboer, F., Steiger, A., ... & Czisch, M. (2012). Neural correlates of dream lucidity obtained from contrasting lucid versus non-lucid REM sleep: a combined EEG/fMRI case study. *Sleep*, *35*(7), 1017-1020.

Dugdale, A. (1999). Materiality: juggling sameness and difference. *The Sociological Review*, *47*(S1), 113-135

Dumit, J. (1999). Objective brains, prejudicial images.*Science in Context*, *12*(01), 173-201.

Dupuy, J. P. (2000). *The mechanization of the mind: on the origins of cognitive science*. Princeton: Princeton University Press.

Epp, J. R., Barker, J. M., & Galea, L. A. M. (2009). Running wild: Neurogenesis in the hippocampus across the lifespan in wild and laboratory-bred Norway rats. *Hippocampus*, 19(10), 1040-1049.

Faucher, L. (2012). Unity of science and pluralism: Cognitive neurosciences of racial prejudice as a case study. In *Special sciences and the unity of science* (pp. 177-204). Springer Netherlands.

Fitzgerald, D., & Callard, F. (2014). Social science and neuroscience beyond interdisciplinarity: experimental entanglements. *Theory, Culture & Society*, *32*(1), 3-32.

Fraser, M 2010. Facts, Ethics, and Event. In: Casper Bruun Jensen & Kjetil Rje (eds.) *Deleuzian Intersections: Science, Technology, Anthropology*. New York & Oxford: BerghahnBooks.

Foucault, M. (1973). *The Birth of the Clinic*. London: Tavistock.

Foucault, M. (1977). *Discipline and punish*. New York: Pantheon.

Foucault, M. (1979). The life of infamous men. *Michel Foucault: Power, Truth, Strategy*, 76-91.

Froese, T. (2013). Interactively guided introspection is getting science closer to an effective consciousness meter. *Consciousness and cognition*, *22*(2), 672-676.

Gad, C., & Jensen, C. B. (2010). On the consequences of post-ANT.*Science, Technology & Human Values*, *35*(1), 55-80.

Gad, C., & Jensen, C. B. (2014). The promises of practice. *The Sociological Review*, *62*(4), 698-718.

Galison, P (2012). The McCulloch Connections: Preface to ISR Special Issue edited by Tara Abraham. *Interdisciplinary Science Reviews*, *37*(3), 201-202.

Gardner, H. (1985). *The mind's new science: A history of the cognitive revolution*. Basic books.

Garland, R. (1991). The mid-point on a rating scale: Is it desirable. *Marketing bulletin*, *2*(1), 66-70.

Gazzaniga, M. S. (2006) *Neurociência cognitiva: a biologia da mente*. Porto Alegre: Artmed.

Gefter, A. (2015). The Man Who Tried to Redeem the World with Logic. *Nautilus*, 21. Available in: . Last access: 4 of January 2016.

Gervais, W. M., & Norenzayan, A. (2012). Like a camera in the sky? Thinking about God increases public self-awareness and socially desirable responding. *Journal of Experimental Social Psychology*, *48*(1), 298-302.

Gold, I., & Stoljar, D. (1999). A neuron doctrine in the philosophy of neuroscience. *Behavioral and Brain Sciences*, *22*(05), 809-830.

Govern, J. M., & Marsch, L. A. (2001). Development and validation of the situational self-awareness scale. *Consciousness and cognition*, *10*(3), 366-378.

Greenwood, J. D. (1999). Understanding the "cognitive revolution" in psychology. *Journal of the History of the Behavioral Sciences*, *35*(1), 1-22.

Haraway, D. (2008). *When species meet.* Minneapolis: University of Minnesota Press.

Hartley, J., & Betts, L. R. (2010). Four layouts and a finding: the effects of changes in the order of the verbal labels and numerical values on Likert-type scales. *International Journal of Social Research Methodology*, *13*(1), 17-27.

Hartley, J., & Betts, L. (2013). Let's be positive: The effects of the position of positive and negative values and labels on responses to Likert-type scales. *Chinese Journal of Psychology*, 55, 291-299.

Hatfield, G. (2002). Psychology, philosophy, and cognitive science: Reflections on the history and philosophy of experimental psychology. *Mind & language*, 17(3), 207-232.

Hayles, NK (1999) *How we became posthuman: Virtual bodies in cybernetics, literature, and informatics*. University of Chicago Press.

Hobbs, S., & Chiesa, M. (2011). The myth of the cognitive revolution. *European Journal of Behaviour Analysis*, 12(2), 385-394.

Hobbs, S & Burman, J (2009) Looking back: Is the 'cognitive revolution' a myth?. *The Psychologist* 22: pp. 812-815.

Hobbs, S., & Chiesa, M. (2011). The myth of the cognitive revolution. *European Journal of Behaviour Analysis*, 12(2), 385-394.

Humphry, S. (2013). Understanding measurement in light of its origins.*Frontiers in psychology*, *4*, 113.

Hutchins, E. (1995). How a cockpit remembers its speeds. *Cognitive science*, 19(3), 265-288.

Jasper, H. H. (1958). The ten twenty electrode system of the international federation. *Electroencephalography and clinical neurophysiology*, *10*, 371-375.

Kay, LE (2001) From logical neurons to poetic embodiments of mind: Warren S. McCulloch's project in neuroscience. *Science in Context*, 14(04): 591-614.

Kastrup, V. (1999). A invenção de si e do mundo. *A invenção de si e do mundo*. Campinas: Papirus.

Kastrup, V. (2007). O funcionamento da atenção no trabalho do cartógrafo. *Psicologia & Sociedade*, *19*(1), 15-22.

Kastrup, V. (2008a). O lado de dentro da experiência: atenção a si mesmo e produção de subjetividade numa oficina de cerâmica para pessoas com deficiência visual adquirida. *Psicologia: ciência e profissão*, *28*(1), 186-199.

Kastrup, V. (2008b). O método da cartografia e os quatro níveis da pesquisa-intervenção. *Pesquisa-intervenção na infância e juventude*, *1*, 465-489.

Kastrup, V.; Tedesco, S. & Passos, E. (2008). *Políticas da cognição*. Porto Alegre: Sulina.

Keyser, S. J., Miller, G. A., & Walker, E. (1978). Cognitive Science, 1978: Report of the state of the art committee to the advisors of the Alfred P. *Sloan Foundation*.

Klaus, F., & Amrein, I. (2012). Running in laboratory and wild rodents: differences in context sensitivity and plasticity of hippocampal neurogenesis. *Behavioural brain research*, 227(2), 363-370.

Kline, R (2009) Where are the Cyborgs in Cybernetics?. *Social Studies of Science*, 39(3): 331-362.

Kline, R (2011) Cybernetics, automata studies, and the Dartmouth conference on artificial intelligence. *IEEE Annals of the History of Computing*, *33*(4), 5-16.

Kramnick, J. (2011). Against Literary Darwinism.*Critical inquiry*, *37*(2), 315-347.

LaBerge, S. (2000). Lucid dreaming: Evidence and methodology. *Behavioral and Brain Sciences*, *23*(06), 962-964.

Langlitz, N. (2015). On a not so chance encounter of neurophilosophy and science studies in a sleep laboratory. History of the Human Sciences, 28(4), 3-24.

Lashley, K. S. (1951). *The problem of serial order in behavior*. Bobbs-Merrill.

Latour, B. (1988).*The pasteurization of France*. Harvard University Press.

Latour, B. (1993). *We have never been modern*. Harvard University Press.

Latour, B. (1999). On recalling ANT. In: Law, J., & Hassard, J. (1999). *Actor network theory and after*. Blackwell Publishers

Latour, B. (2001). Pandora's hope: essays on the reality of science studies. Harvard University Press.

Latour, B. (2005). *Reassembling the social*. Hampshire: Oxford University Press.

Latour, B. (2008). *What is the style of matters of concern?: two lectures in empirical Philosophy*. Booklet of the Department of Philosophy Amsterdam.

Latour, B. (2010). *On the modern cult of the factish gods*. Durham: Duke University Press.

Latour, B. (2013). *An inquiry into modes of existence*. Harvard University Press.

Law, J. (1984). On the methods of long-distance control: vessels, navigation and the Portuguese route to India. *The Sociological Review*, *32*(S1), 234-263.

Law, J. (1999). After ANT: complexity, naming and topology. In: Law, J., & Hassard, J. (1999). *Actor network theory and after*. Blackwell Publishers

Law, J. (2002). Objects and spaces. *Theory, culture & society*, 19(5-6), 91-105.

Law, J., & Benschop, R. (1997). Resisting pictures: representation, distribution and ontological politics. *The Sociological Review*, *45*(S1), 158-182.

Leahey, T. H. (1992). *The mythical revolutions of American psychology*, Vol. 47(2), 308.

Lévy, P. (1993). As tecnologias da inteligência: o futuro do pensamento na era da informática. Rio de Janeiro: Editora 34.

Mandler, G. (2002). Origins of the cognitive (r) evolution. *Journal of the History of the Behavioral Sciences*, *38*(4), 339-353.

Maraschin, C., da Rocha, M. L., & Kastrup, V. (2015) ICT Intervention-Research in a mental health clinic in Brazil. *Revista Polis e Psique*, *5*(3), 94-118.

Marois, R., & Ivanoff, J. (2005). Capacity limits of information processing in the brain. Trends in cognitive sciences, 9(6), 296-305.

Maturana, H. R., & Varela, F. J. (1987).*The tree of knowledge: The biological roots of human understanding*. New Science Library/Shambhala Publications.

Maul, A. (2013). On the ontology of psychological attributes. *Theory & Psychology*, *23*(6), 752-769.

Miller, G. A. (1956). The magical number seven, plus or minus two: some limits on our capacity for processing information. *Psychological review*, *63*(2), 81-97.

Michell, J. (1999). *Measurement in psychology: A critical history of a methodological concept*. Cambridge University Press.

Miller, G. A. (2003). The cognitive revolution: a historical perspective. *Trends in cognitive sciences*, *7*(3), 141-144.

Mol, A. (2002). *The body multiple: Ontology in medical practice*. Duke University Press.

Mol, A. (2015). Natures in tensions. Philosophers' dialog on natures. Comunicação oral.

Morin, A. (2006). Levels of consciousness and self-awareness: A comparison and integration of various neurocognitive views. *Consciousness and cognition*, *15*(2), 358-371.

Morin, A. (2011). Self-awareness part 1: Definition, measures, effects, functions, and antecedents. *Social and personality psychology compass*,*5*(10), 807-823.

Nagel, E. (1961). *The structure of science*. New York: Hartcourt, Brace and World.

Ortega, F. (2006). O corpo transparente: visualização médica e cultura popular no século XX. *História, Ciências, Saúde – Manguinhos*, Rio de Janeiro, 13 (supl.), 89-107

Ortega, F. & Bezerra, B. J. (2006). O Sujeito Cerebral. Mente e Cérebro. (Ed. 162, Jul). Último acesso: Nov. 2016 http://www2.uol.com.br/vivermente/artigos/o_sujeito_cerebral.html.

O'Donohue, W., Ferguson, K. E., & Naugle, A. E. (2003). The structure of the cognitive revolution: An examination from the philosophy of science. *The Behavior Analyst*, *26*(1), 85.

Papoulias, C., & Callard, F. (2010). Biology's gift: Interrogating the turn to affect. *Body & Society*, *16*(1), 29-56.

Petitmengin, C. (2006). Describing one's subjective experience in the second person: An interview method for the science of consciousness. *Phenomenology and the Cognitive sciences*, *5*(3-4), 229-269.

Petitmengin, C., Remillieux, A., Cahour, B., & Carter-Thomas, S. (2013). A gap in Nisbett and Wilson's findings? A first-person access to our cognitive processes. *Consciousness and cognition*, *22*(2), 654-669.

Paulsson, T., & Parker, A. (2006). The effects of a two-week reflection-intention training program on lucid dream recall. *Dreaming*, *16*(1), 22.

Payne, J. D. (2014). The (gamma) power to control our dreams. *Nature neuroscience*, *17*(6), 753-755.

Pickering, A (2010) *The cybernetic brain: Sketches of another future*. University of Chicago Press.

Rocha, M. L. (2006). Psicologia e as práticas institucionais: a pesquisa-intervenção em movimento. *Psico*, *37*(2).

Rocha, M. L. & Aguiar, K. F. D. (2003). Pesquisa-intervenção e a produção de novas análises. *Psicologia: ciência e profissão*, *23*(4), 64-73.

Rocha, T. & Pinheiro, F. (2011). Políticas cognitivas da psicologia comunitária: a meio caminho entre a recognição ea invenção. *Psicologia & Sociedade*, v. 23, n. 3, p. 486-495.

Roepstorff, A. (2007). Navigating the brainscape: When knowing becomes seeing. *Skilled visions: Between apprenticeship and standards*, 191.

Rose, N. (2011). *Inventando nossos selfs: psicologia, poder e subjetividade.*Petrópolis: Vozes.

Rouse, J. (2003). From Realism or Anti-Realism to Science as Solidarity. In C. B. Guignon & D. R. Hiley (Eds.), *Richard Rorty* (pp. 81-104). Cambridge: Cambridge University Press.

Rorty, R. (1998). Against unity. *The Wilson Quarterly*, 22, 28–39.

Schredl, M., & Erlacher, D. (2011). Frequency of lucid dreaming in a representative german sample. *Perceptual and motor skills*,*112*(1), 104-108.

Serres, M. (1995a). Introduction. In: Serres, M. (Ed.). (1995). *A History of Scientific Thought: Elements of a History of Science*. Blackwell Pub.

Serres, M. (1995b). Paris 1800. In: Serres, M. (Ed.). (1995). *A History of Scientific Thought: Elements of a History of Science*. Blackwell Pub.

Suchman, L. A. (1988). Representing practice in cognitive science. *Human Studies*, v. 11, n. 2-3, p. 305-325.

Sheldon, O. J., & Fishbach, A. (2015). Anticipating and Resisting the Temptation to Behave Unethically. *Personality and Social Psychology Bulletin*, 41(7), 1-14

Smith, B. H. (2006). *Scandalous knowledge: Science, truth and the human*. Edinburgh University Press.

Smith, R (1992) *Inhibition: History and meaning in the sciences of mind and brain*. University of California Press.

Steidle, A., & Werth, L. (2014). In the spotlight: Brightness increases self-awareness and reflective self-regulation. *Journal of Environmental Psychology*, *39*, 40-50.

Stengers, I (2000) *The invention of modern science*. University of Minnesota Press.

Stengers, I (2005) Events and histories of knowledge. *Review* (Fernand Braudel Center) 28(2):143-159.

Stengers, I (2010) *Cosmopolitics* (Vol. 1). Minneapolis: University of Minnesota Press.

Stengers, I. (2011a). Comparison as a matter of concern. *Common Knowledge*, *17*(1), 48-63.

Stengers, I. (2011b). *Cosmopolitics II*. Minneapolis: University of Minnesota Press.

Stumbrys, T., Erlacher, D., & Schredl, M. (2013). Testing the involvement of the prefrontal cortex in lucid dreaming: a tDCS study. *Consciousness and cognition*, *22*(4), 1214-1222.

Timberlake, W. (2002). Niche-related learning in laboratory paradigms: the case of maze behavior in Norway rats. *Behavioural Brain Research*, 134(1), 355-374.

Thagard, P. (2014). Being interdisciplinary: Trading zones in cognitive science. Derry, S. J.; Schunn, C. D.; Gernbacher, M. A. (Eds.) *Interdisciplinary collaboration: An emerging cognitive science*, 317-339.

Tolman, E. C. (1948). Cognitive maps in rats and men. *Psychological review*, *55*(4), 189.

Tranquillo, N. (Ed.). (2014). *Dream Consciousness: Allan Hobson's New Approach to the Brain and Its Mind* (Vol. 3). Springer.

Varela, F. (1990). *Conhecer. Ciências cognitivas: tendências e perspectivas.* Lisboa: Instituto Piaget.

Varela, F. T., & Thompson, E. E. and Rosch, E.(1991) *The Embodied Mind. Cognitive Science and Human Experience.* Cambridge, Massachusetts: The MIT Press.

Verran, H. (2010). Number as an inventive frontier in knowing and working Australia's water resources. *Anthropological Theory*, *10*(1-2), 171-178.

Verran, H. (2013). Numbers performing nature in quantitative valuing. *Nature Cultures*, *2*, 23-37.

Von Eckardt, B (1995) *What is cognitive science?*. MIT press.

Von Eckardt, B (2001) Multidisciplinarity and cognitive science. *Cognitive Science*, v. 25, n. 3, p. 453-470.

Voss, U., Holzmann, R., Hobson, A., Paulus, W., Koppehele-Gossel, J., Klimke, A., & Nitsche, M. A. (2014). Induction of self awareness in dreams through frontal low current stimulation of gamma activity. *Nature neuroscience*, *17*(6), 810-812.

Voss, U., Holzmann, R., Tuin, I., & Hobson, J. A. (2009). Lucid dreaming: a state of consciousness with features of both waking and non-lucid dreaming.*Sleep*, *32*(9), 1191.

Vieira, R. V., Vieira, D. C., Gomes, W. B., & Gauer, G. (2013). Alexithymia and its impact on quality of life in a group of Brazilian women with migraine without aura. *The journal of headache and pain*, *14*(1), 1.

Young, J. L. (2014). *When Psychologists Were Naturalists: Questionnaires and Collecting Practices in Early American Psychology, 1880-1932* (Doctoral dissertation, YORK UNIVERSITY TORONTO).

Watson, J. B., & Watson, R. A. R. (1928). *Psychological care of infant and child*. New York: W.W. Norton & Co.

Whishaw, I. Q., & Tomie, J. A. (1996). Of mice and mazes: similarities between mice and rats on dry land but not water mazes. *Physiology & behavior*, 60(5), 1191-1197.

Wilson, D. S., Hayes, S. C., Biglan, A., & Embry, D. D. (2014). Evolving the future: Toward a science of intentional change. *Behavioral and Brain Sciences*, *37*(04), 395-416.

Woolgar, S. (1985) Why not a sociology of machines? The case of sociology and artificial intelligence. *Sociology*, 19(4), p. 557-572.

Ziv, Y., & Hotam, Y. (2015). Theory and measure in the psychological field: The case of attachment theory and the strange situation procedure. *Theory & Psychology*, 25(3), 274 – 291. DOI: 0959354315577970.