Contribution to the Forum : «Beyond the horizon. A new era for the rights of children rights » Rome April 7-8 2022 .

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I am honoured to participate in this event. I am only a neurophysiologist and specialist of Cognitive Neuroscience and I am not competent in the field of law. What I can do in the time allowed here for this presentation is to list a few areas of the digital and numerical world in which brain and cognitive sciences may fruitfully cooperate with other disciplines on the topic of this forum.

I will successively mention a few non exhaustive examples of use of artificial intelligence or other modern digital and numerical technologies which may represent threats and lead to criminal, or at least devian,t behaviours in relation with brain processes. Recent reports shoudl be considered for this question, for instance a report from OCDE[1]

The list below concerns BOTH adults and children. It is very important to understand that these technologies are often thought to concern only adults but there is an increasing development of all of them for children and each requires particular attention as to the human rights questions which they raise. The **adult /child relation** is a crucial component of the problem.

METAVERSE AND VIRTUAL OR AUGMENTED REALITY

One important AI area is **virtual and augmented reality**. Mark Zuckenberg recently announced his intention to spent Billions and billions of dollars to totaly immerge humanity in virtual worlds creating, for each person, a potential multiplicity of lives in a variety of virtual environments. In these environments in which we would interact with human or animal **Avatars. The metaverse** concept is not new . It appeared in 1992 in the science fiction « Snow crash » from Neal Stephenson. It coinsists in creating virtual 3D and probably multisensory virtual worlds in which people will act and perceive, think and talk through their avatars.

This has recently been reviewed and some limitations formulated including dangers for childlren[2]. I have been personnaly involved in such a project recently with the virtual embodiement of two artists, Claire Sistac and Soizic Samson (« Dual bodies ») who immerged themselves in « Second life » for 2 weeks and created two avatars who imitated, through a software the actions of the other creating a gemelity in the virtual world . These two ladies became twins in the virtual world ! Already a large number of such virtual environments exist and are used world wide by children and adults. Millions of persons over the planet spend millions of hours in these worlds not only in video games but in many kinds of applications of virtual and augmented reality aimed at education, health and even indiustry. The problem is

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[1] OCDE (2021), *OECD Digital Education Outlook 2021 : Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots*, Éditions OCDE, Paris, https://doi.org/10.1787/589b283f-en.

[2] Educational applications of metaverse possibilities and limitations .Bokyung Kye1*, Nara Han1, Eunji Kim1, Yeonjeong Park2*, Soyoung JoJ Educ Eval Health Prof 2021;18:32https://doi.org/10.3352/jeehp.2021.18.32. www.jeehp.org See also Prentzas Jim. Artificial intelligencemethods in early childhood education. In XS Yang Ed. Artificial Intelligence . Vol 427 pp169-199 Springer Verkag 2013

that **our brain gives us the capacity to completely identify ourselves with these virtual creatures**. It can therefore be used, in many ways to manipulate children or adolecents and is being used to day by fanatics to induce intolerance and fake believes leading to terrorist or violent behaviours by so called « radicalisation ». It has already be used by Daesh in this purpose.

I have personnaly proposed a specific **international juridical effort to protect children at an age between 8 to 12 years of age, t**o protect their capacity of tolerance , empathy and plurality of opinion. (This has been discussed in a book produced by the College de France to which Pr Emmanuel Decaux has contributed[3]). I believe that this age, often chosen by terrorist to engage children in terrorist actions, is what we call in neuroscience, a « **critical period » when the brain can acquire the capacity of viewpoint change and terefore acquire a crucial capacity for tolerance. My proposal is that if at this age range the child is deprived from the capacity to be confronted to many opinions and points of view he may be limited to a very narrow opinions of others and this is a basic mechanism for fanatism. This age has been used over history for this purpose for Hitler young soldiers, and Children soldiers even to day, in Angola and in many recent fanatic groups .**

Another dramatic effect of Metaverse and all virtual reality worlds is the **loss of contact with Nature. At a time when we are trying to solve the planet and convince politicians to return to a closer link with nature, this development of artificial worlds will even increase the distance of the child with nature even if he, or she, is shown all the wonders of nature in these worlds.**

A recent report of the French Academy of Sciences which will be attached to my presentation has reviewed the risks for very young children but more systematic research has to be done on ADOLESCENTS THE AGE OF ALL RISKS. At a time where it is essential to reinforce the link of children with nature this dissociation between reality and nature is a threat which should be urgently discussed in a multidisciplinary approach.

One should also pay a particular attention to the **MOST FRAGILE OR VULNERABLE CHILDREN** However this label of **« fragility** » or **« vulnerability** » should be carefully documented because it does not only concerns the classical notion of physical handicap but also mental fragility due to many personal and social factors. The Syrian war and the Ukrain war are recent examples of stuations in which millions of healthy children can be considered as fragile and could become victims of the use of artificial intelligence manipulations and abuse through numerical technologies.

However virtual reality is not the only field using artificial intelligence.

Education

[3] BERTHOZ, A., OSSOLA C., STOCK, B. (DIR.)(2010) : « La pluralité interprétative » (« Conférences »), en ligne, mis en ligne le 24 juin 2010. URL : http://conferences-cdf.revues.org/154.

To day a large part of educational programs will used computer stored knowledge and the young children use extensively with self consultations outside of the control of educational institutions the digital knowledge. This is an infinite soruce of potential manipulations and bsaaes and I cannot deal with this question which is currently at the core of the conflicts with GAFA technologies and social networks. Serge Tisseron who leads studies in this field has proposed several measures to protect children again « **Chatbots** »[4].The important contribution of S. Tisseron is to have proposed measures **that consider different ages groups** This **developmental approach** is very important also for the humanb rights dimension of the problem and justifies the work with pediatric specialists

But AI is involved also in other aeras related, for instance to **health**, in which children will be involved increasingly in the future.

Neuroprotthesis (« The bionic man or the **bionic child**») is a widely expanding field. It deals with artificiel substitutes to **audition** (cochlear implants , **vision by** substitutes , computer chips implanted in the retina, **vestibular** implants, **haptic visual substitues** (simulation of the skin from vidoe- camera images to replace vision) etc..

These devices use the remarkable capacity of the brain to reconstruct reality even with a restricted amount of information, but they challenge a number of ethical and social and human rights questions that are, in my opinion, not adressed enough. For example the question of **self ownership**,**identity**, **fiability of the information** received, **responsability** of accidents due to the limited or **modifiable information** etc.

All these approaches use intensely to day artifical intelligence and digital technologies. A main question is the adequation of the « language » of these softwares and processes and « natural languages of the brain » and therefore the capacity of human beings to understand and accept or refuse what is going on in these devices and their control systems.

Exoskeletons are also developping rapidly . They consist of addition of robotics devices which help te eoperation of limbs for instance.They are usefull for patients, including children, with

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[4] Après avoir proposé en 2008 les repères « 3/6/9/12 pour apprivoiser les écrans et grandir », j'ai en effet proposé en 2020 **les repères « 3/6/9/12 pour protéger nos enfants des chatbots ».**Ce sont des mesures qui devraient être imposées aux fabricants de jouets numériques dans leurs publicités avec mise en garde des parents : · **Pas d'outil numérique avant trois ans**. Ou seulement dans un but de « visio-conférence », pour parler aux parents ou aux amis éloignés, ou bien en usage accompagné, sur des périodes courtes, et pour le seul plaisir de jouer ensemble. **Pas d'enceinte connectée avant six ans**. .Avant cet âge, l'enfant risque de traiter de la même manière ce que disent son père, sa mère ou son enceinte, et en plus, il n'est pas capable de comprendre la logique de la capture des propos qu'il tient à la machine.· **Pas de robots conversationnels avant neuf ans**.Il donnerait toujours raison à votre enfant et entraverait chez lui l'apprentissage des règles du jeu social. En effet, apprendre du désaccord est ce qu'il y a de plus formateur à cet âge. En revanche, les simples « robots jouets », type robots à programmer pour enfants, qui n'ont pas ce côté « conversationnel » ou compagnon, sont les bienvenus pour apprendre aux enfants à programmer. · **Pas de robots de compagnie avant 12 ans**.La machine serait capable de prendre pour votre enfant la place d'un compagnon. Ce serait une catastrophe car leur programme est conçu pour construire un double de leur utilisateur, de telle façon que celui-ci risque de tourner rapidement en rond sans même s'en apercevoir, en parlant à une machine qui lui renvoie ce qu'il lui a dit précédemment, et qu'il a évidemment oublié !

deficits in the motor system but they tend also to be used for increasing the capacity of humans to generate forces (in heavy duty tasks or military endeavours using heavy equipment but willalso be used in chidlren for compensation of disabilities). Here again these devices use extensive digital information processing and their use and abuse represent important risks of use for various kind of abuses on chidlen rights that still have to be specified. .

More generally the explosive use of robots not only in industrial processes but also in health or for criminal projects and in children is a challenge to be met. An emerging areas is the design of humanoid robots or « co-bots» which are increasingly used . Human-robots interactions is therefore an area which may be worth considering. They use all aspects of digital and numerical technologies and their design is often inspired by brain mechanism for perception action , decision making etc. What the robot will do induces a shared responsability bewteen the machine, its languages and the intentions of the human operator.

Small humanoïd robots are now used with children also for teacching and for rehabilitation of some psychiatric edisease s (like autism). One should consider in detail the risk of manipulation of these new pedagocic methods . But other links between digital technologies and the brain should be mentioned here

Brain computer interfaces is a rapidly developping field. It consists in implanting electrodes in the brain to directly control actions. There is here a potential risk of manipulation of the individual mind/brain of patients through an influence on the softwares which either treat incoming infromation or controling the robotic devices by a external controlof brain activity. Another complex question is the fact that some patients tend to feel that they are not anymore the authors of their actions and some have asked that he device be removes from theur brain. A quasi schizophrenic feeling of being manipulated by ex tetnal powers. Also if these devices induce criminal or a-social behaviour. The question of the responsability between the patient or the device ans its software programs will come up. A recent report from the French Academy of Medicine and Académy of Technologies is available on this question.

We are now also at the frontiers **of implanting directely in the brain chips for** improving memory for instance and already large consortia are created between neuroscience and A I technology in this direction. Here the digital world wil be present **inside the brain** and one can imagine the number of questions that will arise.

I am sorry that this list is only limited but **I strongly suggest that there are special workshops and projects where specialists of neuroscience and jurists can meet and initiate supported progress to avoid or rule potential criminal or deviant uses of these modern technologies**. I believe that there is **not enough cooperation between neuroscientist and jurists** and I hope that the few and too brief examples I gave will trigger some interest and this interdisciplinary cooperation which was wished by my great uncle, René Cassin, to improve a fruitfull future for human rights.

I believe that the modern discoveries of neuroscience concerning the developping brain of the chidl may bring very important arguments and suggest actions fo the question of human rights in children For this the contribution of leaders in the field of Pediatry, Neuropediatry, Pedo

Psychiatry etc.. is essential . I suggest that a small TASK FORCE is created to think about this. In the frame of the Italian initiative. I suggest a RESEARCH PROGRAMIS BUILT TOGETHER BY **JURISTS** AND NEUROSCIENTIST , CHILD PSYCHIATRIST and specialists of **cybertherapies**[5] ETC.. I attach a list of persons know[6]. All these specialists have a very wide view on these questions. They could propose concrete data and knowldge and potential RESEARCH themes because a lot has to be learned !

Thank you

Alain Berthoz

[5] S Tisseron. F. Tordo (eds) Pratiquer les cyberthérapies . Jeu vidéo. Réalité virtuelle. Robots. Dunod 2021 .

[6] I suggest that Pr Giovanni Cioni Scientific Director of Stella Maris Hospital is asked to lead such a task force and bring together a group of European specialists. In France Pr David Cohen Chief of Pedo-Psychitary department in Hospital Salpétrière could be aproached , Pr Michel Botbol former Chief fo Pedo Psyhchiatry in Brest and Pr Bruno Falissard Chief of Pedopsychiatry in INSERM and Hospîtal Beaudelocque. Pr Sylvie Tordjman from Rennes Hospital also .In the field of Psychology Pr Olivier Houdé from Paris V University . Pr Maurizion Sibilo in Salerno could be asked to contribute to this question. S. Tisseron Psychchiatrist specialist in cybertherapies. Pr Catherine Barthelemy Psychiatre specialist of autism. Also from the Jurist side Pr Emmanuel Decaux Presidnet of the Insttute of Human Rights in Strasbourg and Pr Sebastien Touzé Directeur of this Institute vice president of the comitte for torture of United Nations.

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