

# ARBITRATION AND NEUROSCIENCE IN THE CONTEXT OF ARBITRAL DECISION-MAKING. AND MORE?

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**Resumen:** Los árbitros internacionales deben ser imparciales e independientes. Mientras la independencia se refiere a la falta de relaciones con una parte que pueda influir en la decisión de un árbitro, la imparcialidad se refiere específicamente a la ausencia de sesgo o predisposición hacia una de las partes. Sin embargo, los resultados obtenidos de forma experimental muestran que los árbitros internacionales tienden a tomar decisiones que a menudo son predominantemente intuitivas e influenciadas por ilusiones cognitivas pasadas. Parece haber, en particular, límites sustanciales implícitos de naturaleza inconsciente, cognitiva y cultural que condicionan su acción; según algunos estudiosos, la toma de decisiones de los árbitros sería igualmente propensa a verse afectada por prejuicios subconscientes que podrían tener un efecto distorsionador en la toma de decisiones que por prejuicios conscientes. Estos límites son extremadamente difíciles de probar empíricamente y, por lo tanto,

**Abstract:** International arbitrators should be impartial and independent. While independence relates to the lack of relations with a party that might influence an arbitrator's decision, impartiality specifically concerns the absence of a bias or predisposition toward one of the parties. However, results achieved on an experimental basis show that international arbitrators tend to make decisions that are often predominantly intuitive and influenced by past cognitive illusions. There seem to be, in particular, implicit substantial limits of an unconscious, cognitive and cultural nature that condition their action; according to some scholars, arbitrators' decision-making would be equally prone to being affected by subconscious bias that might have a distorting effect in decision-making as by conscious bias. These limits are extremely difficult to prove empirically and, therefore, evade detection when investigated with common methodologies. Now, thanks to the most recent studies in the field

eluden la detección cuando se investigan con metodologías comunes. Ahora, gracias a los estudios más recientes en el campo de la neurociencia cognitiva –que han comenzado a proporcionar a los académicos datos significativos con respecto a una comprensión de la toma de decisiones humana basada en el cerebro– y al uso de herramientas como la resonancia magnética funcional (IRMf), ha llegado el momento de preguntarnos no solo si el concepto mismo de sesgo en el campo del arbitraje internacional debe ser revisado, sino también si existe una evaluación "objetivamente" imparcial desde un punto de vista neurocognitivo.

of cognitive neuroscience –which have started to provide scholars with significant data with regards to a brain-based understanding of human decision-making– and the use of tools such as the Functional magnetic resonance imaging (fMRI), the time has come to ask ourselves not only whether the concept itself of bias in the field of international arbitration needs to be revisited, but also if an "objectively" impartial evaluation actually exists from a neurocognitive point of view.

SUMARIO: I. IMPARTIALITY OF INTERNATIONAL ARBITRATORS: COGNITIVE, CULTURAL AND IMPLICIT BIAS AND THEIR ROLE IN SHAPING THE DECISION OF ARBITRAL CASES. II. IN THE MIND OF ARBITRATORS: RATIONALITY OR INTUITION? III. NEUROSCIENCE AND INTERNATIONAL ARBITRATION: «FMRI» AND «BRAIN-FINGERPRINTING» BETWEEN WITNESS EVIDENCE AND MEMORY. IV. CONCLUSIVE REMARKS.

## I. IMPARTIALITY OF INTERNATIONAL ARBITRATORS: COGNITIVE, CULTURAL AND IMPLICIT BIAS AND THEIR ROLE IN SHAPING THE DECISION OF ARBITRAL CASES

While, in most instances, international arbitrators are appointed directly by the parties involved in the case, they do not act as representatives of the appointing party and should be neutral. Even in the United States<sup>1</sup>, where –despite having to analyze the evidence and issues submitted to their decision in a fair manner and having to judge in the interest of justice– party-appointed arbitrators were considered non-neutral until a few years ago, things have radically changed since the entry into force, on 1 March 2004, of the new Code of Ethics for Arbitrators in Commercial Disputes<sup>2</sup> of the American Bar Association and the American Arbitration Association<sup>3</sup>.

1. For a comprehensive analysis of international arbitration law and practice in the United States of America, see the recent volume of Shore, L., Cheng, T. H., La Chuisa, J. E., Schaner, L., Senn, M. V., & Tan, L. Y., *International Arbitration in the United States*, Alphen aan den Rijn: Wolters Kluwer, 2018.
2. The digital version of the Code can be found at the following website: [https://adr.org/sites/default/files/document\\_repository/Commercial\\_Code\\_of\\_Ethics\\_for\\_Arbitrators\\_2010\\_10\\_14.pdf](https://adr.org/sites/default/files/document_repository/Commercial_Code_of_Ethics_for_Arbitrators_2010_10_14.pdf).
3. See, on this issue, Schurtman, W., *Trends in International Arbitration and Mediation*, in Alibekova, A., Carrow, R. (eds.), *International Arbitration and Mediation. From the Professional's Perspective*, Salzburg: Yorkhill Law Publishing, p. 31 and ff., who underlines the substantial contradiction of the previous approach. In fact, as pointed out by Byrne, O.K., «A New

The International Bar Association (IBA) Guidelines on Conflicts of Interest in International Arbitration<sup>4</sup> provide for important indications concerning, specifically, the «impartiality» and «independence» of international arbitrators.

General Standard 2 states, in particular, that: «a) An arbitrator shall decline to accept an appointment or, if the arbitration has already been commenced, refuse to continue to act as an arbitrator, if he or she has any doubt as to his or her ability to be impartial or independent. b) The same principle applies if facts or circumstances exist, or have arisen since the appointment, which, from the point of view of a reasonable third person having knowledge of the relevant facts and circumstances, would give rise to justifiable doubts as to the arbitrator's impartiality or independence, unless the parties have accepted the arbitrator in accordance with the requirements set out in General Standard 4. c) Doubts are justifiable if a reasonable third person, having knowledge of the relevant facts and circumstances, would reach the conclusion that there is a likelihood that the arbitrator may be influenced by factors other than the merits of the case as presented by the parties in reaching his or her decision. d) Justifiable doubts necessarily exist

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Code of Ethics for Commercial Arbitrators: The Neutrality of Party-Appointed Arbitrators on a Tripartite Panel», in *Fordham Urban Law Journal*, vol. 30, 6 (2003), pp. 1826-1827, the previous Code, originally proposed in 1977 by a joint committee consisting of a special committee of the American Arbitration Association and a special committee of the American Bar Association, «recognized the ethical obligations of the neutral arbitrator on a tripartite panel separately from those of the two party-appointees, who were presumed to be acting as non-neutrals unless the parties agreed otherwise. It provided no guidance, however, for the situation in which arbitrators are party-appointed and also act as neutrals. International practice, on the other hand, generally mandates a strict standard that all arbitrators, no matter how they are appointed, must be neutral. Since commercial disputes have become increasingly transnational in nature and may not fit as precisely into the category of either domestic or international arbitration, the international constituents of the ABA urged the drafters to conform the Code of Ethics to fundamental international norms. The SILP also advised the drafters to reassess disclosure requirements as well as the use of non-neutrals. The goal was to devise an ethics code that would apply to domestic and international commercial arbitrations without distinction. Carol Emory, Chair of the ABA Dispute Resolution Section, formed the Ethics Task Force ('Task Force') to take on this new issue of neutrality. The Task Force began to draft a new code in order to completely reassess the role of party-appointed arbitrators. The largest contribution of the Task Force was a change in the presumption of neutrality in situations where the parties either do not agree or do not specify whether party-appointees will be neutral or non-neutral. Under the 1977 Code of Ethics, the presumption is that party-appointees are non-neutral. Canon VII states that, 'party-appointed arbitrators should be considered non-neutrals unless both parties inform the arbitrators that all three arbitrators are to be neutral or unless the contract, the applicable arbitration rules, or any governing law requires that all three arbitrators be neutral'. The revisers changed this default rule by reversing the presumption in favor of neutrality». See also Buechel, H.M., *The Independence of International Arbitrators*, in Shetreet, S., Forsyth C. (eds.), *The Culture of Judicial Independence*, Leiden, Brill, 2011, pp. 243-250 (specifically p. 245 and ff.).

4. See the *International Bar Association Guidelines on Conflicts of Interest in International Arbitration*, adopted by resolution of the IBA Council on Thursday 23 October 2014, updated 10 August 2015.

as to the arbitrator's impartiality or independence in any of the situations described in the Non-Waivable Red List».

The wording «impartial or independent» and «impartiality or independence», set out also in Article 12<sup>5</sup> of the UNCITRAL Model Law<sup>6</sup> and specifically adopted in the Guidelines in order to follow such expression and avoid possible confusion, does not represent a hendiadys; in fact, despite a certain overlap between the concepts of arbitrators' «impartiality» and «independence», the terms «impartial/impartiality» and «independent/independence», though strongly connected, must be seen as distinct<sup>7</sup>.

The exact nature of the distinction between these two extremely important

5. Where it is stated that «When a person is approached in connection with his possible appointment as an arbitrator, he shall disclose any circumstances likely to give rise to justifiable doubts as to his impartiality or independence. An arbitrator, from the time of his appointment and throughout the arbitral proceedings, shall without delay disclose any such circumstances to the parties unless they have already been informed of them by him. An arbitrator may be challenged only if circumstances exist that give rise to justifiable doubts as to his impartiality or independence, or if he does not possess qualifications agreed to by the parties. A party may challenge an arbitrator appointed by him, or in whose appointment he has participated, only for reasons of which he becomes aware after the appointment has been made». The concept of «justifiable doubts» as to the arbitrators' impartiality and independence is adopted, *inter alia*, by the 2020 Arbitration Rules of the Madrid International Arbitration Center: «1. All arbitrators must be and remain independent and impartial throughout the arbitration, and cannot maintain any personal, professional or commercial relationship with the parties. 2. Before being appointed, prospective arbitrators must confirm their availability. They must also sign a statement of independence and impartiality vis-à-vis the parties and, if applicable, with respect to any third party providing financing or funding. Prospective arbitrators must also disclose to the Centre, in writing, any circumstances that may be relevant for their appointment, and particularly any circumstances that may give rise to justifiable doubts by the parties as to the prospective arbitrator's impartiality or independence. Within ten days from receipt of the arbitrator's statement, the parties will be entitled to submit comments or objections» (art. 10 «Independence and Impartiality»).
6. As has been underlined, in accordance with «Article 12(1) of the Model Law, the arbitrator has to disclose all circumstances that may go along with his/her arbitral task and give rise to 'justifiable doubts' as to his impartiality or independence. The arbitrator should have special attributes as imposed by the nature of the arbitrator assignment or experience upon which he/she has been selected as an arbitrator. Such professional attributes or ethics include the arbitrator's commitment to impartiality or independence, whatever the dispute is or is going to be» (see in this respect Al-Hawamdeh, A. M., Dabbas, N. A., Al-Sharariri, Q. E., «The Effects of Arbitrator's Lack of Impartiality and Independence on the Arbitration Proceedings and the Task of Arbitrators under the UNCITRAL Model Law», in *Journal of Politics and Law*, vol. 11, 3 (2018), p. 66).
7. *Ibid.*, p. 65, «There are various legal standards on which arbitrators' independence and impartiality are based. The English jurisdiction for example uses the 'real danger of bias standard'. The American jurisdiction on the other hand uses the standard of 'an arbitrator not only has to be impartial but also appear to be impartial'. However, the Model Law uses the 'justifiable doubts' standard, which has been adopted by several jurisdictions».

concepts<sup>8</sup> is not always easy to grasp<sup>9</sup>. As clarified in the *Decision on the Proposal for the Disqualification of a Member of the Arbitral Tribunal* rendered in the international investment arbitration cases *Suez, Sociedad General de Aguas de Barcelona S.A. and InterAguas Servicios Integrales del Agua S.A. v. Argentine Republic* (ICSID case no. ARB/03/17) and *Suez, Sociedad General de Aguas de Barcelona S.A. and Vivendi Universal S.A. v. Argentine Republic* (ICSID case no. ARB/03/19), «independence relates to the lack of relations with a party that might influence an arbitrator's decision», while, on the other hand, impartiality «concerns the absence of a bias or predisposition toward one of the parties. Thus Webster's Unabridged Dictionary defines impartiality' as 'freedom from favoritism, not biased in favor of one party more than another'... Thus it is possible in certain situations for a judge or arbitrator to be independent of the parties but not impartial»<sup>10</sup> (par. 29).

Independence is, in this respect, «more in the nature of a means to achieve the final goal of impartiality», referring to «the absence of connections between an arbitrator and a party of such intensity as to give rise to a concern that the arbitrator may favour that party in the decision-making process»<sup>11</sup>.

It is exactly the concept of arbitrators' impartiality on which this paper focuses.

There is a traditional distinction between «objective» and «subjective» impartiality: «objective» impartiality is a concept very close to that of «independence»<sup>12</sup>: it seeks to prevent that an arbitrator might have bias

8. The 2019 Code of Good Practices (Código de Buenas Prácticas) of the Spanish Arbitration Club (Club Español del Arbitraje), which seeks to ensure that all subjects involved in arbitration proceedings abide by the increasingly demanding standards of transparency, professional conduct and, especially, impartiality and independence, states that: «El Código de 2005 tuvo innegables efectos positivos. Supuso un paso adelante. Pero han surgido nuevas situaciones y nuevos retos que en 2005 no podían ser previstos. Además, la experiencia internacional muestra que los usuarios del arbitraje aspiran a que todos los participantes en el proceso arbitral se atengan a estándares de independencia, imparcialidad, transparencia y profesionalidad cada vez más exigentes. Este C.BB.PP, sensible a esas nuevas exigencias, pretende elevar a partir de ahora, todavía más, los estándares de comportamiento, para así consolidar definitivamente la confianza de la sociedad en el arbitraje».
9. See Poudret, J. F., & Besson, S. *Comparative Law of International Arbitration* (translated by S.V. Berti & A. Ponti), London: Sweet & Maxwell, 2007, p. 348.
10. *Suez, Sociedad General de Aguas de Barcelona S.A. and InterAguas Servicios Integrales del Agua S.A. v. Argentine Republic* (ICSID case no. ARB/03/17) and *Suez, Sociedad General de Aguas de Barcelona S.A. and Vivendi Universal S.A. v. Argentine Republic* (ICSID case no. ARB/03/19), *Decision on the Proposal for the Disqualification of a Member of the Arbitral Tribunal* (Oct. 22, 2007: <https://www.italaw.com/sites/default/files/case-documents/ita0824.pdf>), par. 29.
11. See Kaufmann-Kohler, G., Rigozzi, A., *International Arbitration, Law and Practice in Switzerland*, Oxford: Oxford University Press, 2015, p. 188.
12. «... no strict distinction is drawn between the concepts of independence and impartiality, to the extent that this would be possible at all in arbitration; the first concept appears to

connected to objective criteria such as any specific relationship to the arbitration case, the relevant parties or their counsel, i.e. ascertainable facts which might raise legitimate doubts as to the arbitrator's impartiality. As has been underlined, examples «of this lack of objective impartiality or objective independence are where the appointed arbitrator is a person who is or was a member of the governing or other body of a participant in the proceedings, a bankruptcy administrator, legal representative or agent designated to represent a party, regardless of whether the subject of such an agency relationship is an issue or range of operations in any way related to the subject of the dispute in arbitration. The same applies to a person who is the legal representative or other agent of an entity – the owner of a business which has been transferred to a transferee other than a party or, conversely, whose transferee is now a party to the proceedings if the legal acts delegated to the appointed arbitrator in the past related to a business or part of a business now operated by a party»<sup>13</sup>.

be included in the second, which is broader, by way of objective impartiality as opposed to subjective impartiality (with regard to the distinction between the two types of impartiality see the judgments quoted at 3.2.1 in fine). Moreover and above all, case law makes no distinction between the position of an arbitrator and that of the Chairman of the arbitral tribunal (see among others judgment 4A\_458/2009 of June 10, 2010 at 3.2 and 3.3), thus implicitly rejecting the idea of such a distinction. The same must be done expressly herein. It must accordingly be held that the independence and the impartiality demanded from the members of an arbitral tribunal extend to the party-appointed arbitrators as well as to the Chairman of the arbitral tribunal. While affirming this principle, the Federal Tribunal is admittedly aware that absolute independence by all arbitrators is an ideal which will only rarely correspond to reality» (see *Alejandro Valverde Belmonte v. 1. Comitato Olimpico Nazionale Italiano (INOC), 2. World Anti-Doping Agency (WADA), 3. International Cycling Union (ICU)*, 4A\_234/2010, Judgment of October 29, 2010, where the Federal Supreme Court of Switzerland (First Civil Law Court) discusses the requirements of independence and impartiality of arbitrators and, specifically, whether or not party-appointed arbitrators should have the same degree of independence and impartiality as that to be demanded from the Chairman or from a sole arbitrator ( <http://www.swissarbitrationdecisions.com/independence-and-impartiality-of-a-party-appointed-arbitrator-in> ). For the original version of the judgment in French, see [http://relevancy.bger.ch/php/aza/http/index.php?lang=fr&type=highlight\\_simple\\_query&page=1&from\\_date=&to\\_date=&sort=relevance&insertion\\_date=&top\\_subcollection\\_aza=all&query\\_words=4A\\_234/2010&rank=1&azaclir=aza&highlight\\_docid=aza%3A/29-10-2010-4A\\_234-2010&number\\_of\\_ranks=5](http://relevancy.bger.ch/php/aza/http/index.php?lang=fr&type=highlight_simple_query&page=1&from_date=&to_date=&sort=relevance&insertion_date=&top_subcollection_aza=all&query_words=4A_234/2010&rank=1&azaclir=aza&highlight_docid=aza%3A/29-10-2010-4A_234-2010&number_of_ranks=5) ).

13. See Bělohávek, A. J., «Subjective and Objective Impartiality of Arbitrators and Appointing Authorities as a Part of Procedural Public Policy (Ordre Public) in Arbitration», in *CYArb – Czech (& Central European) Yearbook of Arbitration: Independence and Impartiality of Arbitrators*, vol. 4 (2014), pp. 47-73 (citation at p. 58). Of particular interest is the case law of the European Court of Human Rights with respect to subjective and objective impartiality: see, in particular, *Morice vs. France* (11 July 2013) and *Di Giovanni vs. Italy* (9 July 2013), recalled by the Italian Supreme Court of Cassation in the judgment no. 27813/2013, commented by Guerini, I., *Astensione, ricusazione ed imparzialità soggettiva del giudice: la Cassazione traccia il confine tra la manifestazione di un parere sull'oggetto del procedimento e la manifestazione del proprio convincimento sui fatti oggetto dell'imputazione*. Commento a Cass., Sez. II, ud. 11 giugno 2013, dep. 25 giugno 2013, n. 27813, Pres. Esposito, Rel. Beltrami, imp. De Donno, <https://archivioodpc.dirittopenaleuomo.org/d/2473-astensione-ricusazione-ed-imparzialita-soggettiva-del-giudice-la-cassazione->

Subjective impartiality guarantees that one's case will be adjudicated without personal considerations and relates to the arbitrator's actual state of mind, so that subjective impartiality is *de facto* presumed until disproved by the externalization of specific thoughts or by behaviors showing bias towards the case or the subjects involved therein: «*Independence and impartiality are states of mind. Neither the Respondent, the two members of this tribunal, or any another body is capable of probing the inner workings of any arbitrator's mind to determine with perfect accuracy whether that person is independent or impartial. Such state of mind can only be inferred from conduct either by the arbitrator in question or persons connected to him or her. It is for that reason that Article 57 requires a showing by a challenging party of any fact indicating a manifest lack of impartiality or independence*»<sup>14</sup>.

In «*Systemic Bias and the Institution of International Arbitration: A New Approach to Arbitral Decision-Making*», a marvelous article that was awarded the 2014 Rusty Park Prize of the *Journal of International Dispute Settlement (JIDS)*<sup>15</sup>, Stavros Brekoulakis effectively emphasized that there seem to be implicit substantial limits of an unconscious, cognitive and cultural nature that condition the action of the arbitrators, and such limits are difficult to prove empirically and therefore evade detection when investigated with common methodologies: «*arbitration law and practice have focused only on apparent bias. Implicit bias, such as subconscious, cognitive or cultural bias, is extremely difficult to prove, and therefore not of law's concern. As the English Court of Appeal characteristically noted in Locabail 'the law does not countenance the questioning of a judge about extraneous influences affecting his mind'. National courts in various jurisdictions have repeatedly held that in order to accept bias 'a reasonable third person would have to conclude that an arbitrator was partial to one party to the arbitration'. Such rulings essentially prescribe an objective standard for observing and assessing bias in arbitral decision-making which seems to exclude any prejudice or predilection originating from subconscious, semi-conscious or cognitive bias which are extremely difficult to objectively quantify*

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*traccia-il-confine-tra: «tra imparzialità soggettiva ed oggettiva non esiste una netta linea di demarcazione, in quanto la condotta di un giudice può suscitare dubbi oggettivamente giustificati in un osservatore esterno ed al tempo stesso mettere in discussione le convinzioni personali del magistrato nel caso sottoposto al suo giudizio, come evidenza, tra le altre, C. eur., 15 dicembre 2005, Kyprianou c. Cipro».*

14. Suez, Sociedad General de Aguas de Barcelona S.A. and InterAguas Servicios Integrales del Agua S.A. v. Argentine Republic (ICSID case no. ARB/03/17) and Suez, Sociedad General de Aguas de Barcelona S.A. and Vivendi Universal S.A. v. Argentine Republic (ICSID case no. ARB/03/19), Decision on the Proposal for the Disqualification of a Member of the Arbitral Tribunal (Oct. 22, 2007: <https://www.italaw.com/sites/default/files/case-documents/ita0824.pdf>), par. 30.
15. The Rusty Park Prize is awarded not more than once a year to outstanding arbitration articles published in the *Journal of International Dispute Settlement* on an *ad hoc* basis.

or indeed observe. Equally, the International Bar Association (IBA) Guidelines on Conflicts of Interest in International Arbitration provide that the doubts about an arbitrator's impartiality must be in the mind of a 'reasonable and informed third party'. Accordingly, all the specific situations, which according to the Red List of the IBA Guidelines warrant disqualification of an arbitrator, refer to examples that give rise to bias that can be identified with a certain degree of objectivity. These situations include, for example, the case 'where the arbitrator is a manager, director or member of the supervisory board in one of the parties', or the case where 'the arbitrator has a close family relationship with one of the parties'<sup>16</sup>.

Yet, the concept itself of bias<sup>17</sup> in the field of international arbitration would need to be revisited, considering that arbitrators' decision-making<sup>18</sup> seems equally prone to being affected by subconscious<sup>19</sup> bias of a cognitive,

16. Brekoulakis, S., «Systemic Bias and the Institution of International Arbitration: A New Approach to Arbitral Decision-Making», in *Journal of International Dispute Settlement*, vol. 4, 3 (2013), pp. 553-585 (on this issue at pp. 561-562).
17. As explained by Spain Bradley, A., «The Disruptive Neuroscience of Judicial Choice», in *University of California Irvine Law Review*, 9 (2018), p. 27, «in generic terms, a bias is a preference for or aversion against something. We can be aware of such preferences or explicit bias, and we can have them unknowingly as implicit bias. This includes the so-called cognitive biases such as confirmation bias, anchoring, and hindsight bias. These biases are often identified and evidenced through behavioral science observations about how people behave under specific conditions». As regards judges, the Author observes that biases relating to racism, sexism, homophobia, and other forms of discrimination are particularly difficult to acknowledge, considering that «judges take an oath to perform their judicial function impartially. Therefore, acknowledging that one's decision-making is prone to bias based on race, gender, sexual orientation, and other aspects of identity conflicts with the notion of judicial impartiality». See also the interesting considerations of Jost, J. T., Rudman, L., Blair, I. V., Carney, D. R., Dasgupta, N., Glaser, J., & Hardin, C., «The Existence of Implicit Bias is Beyond Reasonable Doubt: A Refutation of Ideological and Methodological Objections and Executive Summary of Ten Studies that No Manager Should Ignore», in *Research in Organizational Behavior*, vol. 29 (2009), pp. 39-69, and Levinson, J. D., Young, D., «Different Shades of Bias: Skin Tone, Implicit Racial Bias, and Judgments of Ambiguous Evidence», in *West Virginia Law Review*, vol. 112 (2010), pp. 319-326.
18. As recalled by Sussman, E., «Arbitrator Decision Making: Unconscious Psychological Influences and What You Can Do About Them», in *The American Review of International Arbitration*, vol. 24, 3 (2013), pp. 487-514, the first contribution on psychological influences in the field of arbitral decision-making was written by Coulson, R., «The Decisionmaking Process in Arbitration», in *Arbitration Journal*, 45, 3 (1990), pp. 37-41, whose «discussion of what was known at the time about psychological influences on arbitrator decision-making presaged the vigorous discussion of that subject which developed recently, some 20 years later. With the explosion of best-selling books on decision-making and the popularization of the psychological learning on the subject, attention has turned to its applicability to arbitrators» (p. 487).
19. See, in particular, Puchkov, S., «Subconscious Bias as a Factor Influencing Arbitral Decision-Making», in *Arbitration: The International Journal of Arbitration, Mediation and Dispute Management*, vol. 84, 1 (2018), pp. 52-76, who starts from the observation that «the human mind is a mechanism which we are used to, to the point of not taking notice of it most of the time. Only on rare occasions would most people ask themselves how it works, what forces are involved, what algorithms are processing the information we get. Rather we would upload



cultural and implicit nature<sup>20</sup> that might have a distorting effect in decision-making as by conscious bias<sup>21</sup>, and arbitrators should be aware of such biases<sup>22</sup>.

To give just one example among the many that could be recalled here, China offers a particularly interesting case of a cultural bias<sup>23</sup>. As is well known, *guanxi*<sup>24</sup> is the long-standing social, economic and business practice of building and utilizing shared information, trust, networks and relationships that serve as the fundamental units of Chinese society. An analysis of the available data on the development of international arbitration within and in connection to the Chinese legal system shows that the lack of familiarity with arbitration issues and some deficiencies in the legal framework have been substantially overcome in recent years and that the People's Republic of China is continuing to develop a pro-arbitration attitude<sup>25</sup>. Yet, Chinese arbitrators, according to

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*some raw data in our brain, use a bit of memory, a bit of logic... and enigmatically come up with a decision. What we do not understand is that this process is indeed enigmatic»* (p. 52).

20. On implicit bias see, in particular, Faigman, D. L., Kang, J., Bennett, M. W., Carbado, D. W., Casey, P., Dasgupta, N., Godsil, R. D., Greenwarld, A. G., Levinson, J. D., Mnookin, J., «Implicit Bias in the Courtroom», in *UCLA Law Review*, vol. 59 (2012), pp. 1124-1186; see also Greenwald, A. G., Hamilton Krieger, L., «Implicit Bias: Scientific Foundations», in *California Law Review*, vol. 94 (2006), pp. 945-967; Kang, J., Lane, K., «Seeing Through Colorblindness: Implicit Bias and the Law», in *UCLA Law Review*, vol. 58 (2010), pp. 465-520.
21. Brekoulakis, S., «Systemic Bias and the Institution of International Arbitration», cit., p. 562.
22. As regards counsel and the opportune strategies to prevail before Judges, Justice Scalia underlined that: «*While computers function solely on logic, human beings do not. All sorts of extraneous factors –emotions, biases, preferences– can intervene, most of which you can do absolutely nothing about (except play upon them, if you happen to know what they are)*» (Justice Antonin Scalia, *Introduction*, in *Making Your Case: The Art of Persuading Judges*, Saint Paul, Minnesota: Thomson, 2008).
23. See Chew, P. K., «A Case of Motivated Cultural Cognition: China's Normative Arbitration of International Business Disputes», in *International Lawyer*, vol. 51 (2018), pp. 469-496.
24. See Gold, T., Gold, T.B., Guthrie, D.&Wank, D. (eds.), *Social Connections in China: Institutions, Culture and The Changing Nature Of Guanxi*, Cambridge: Cambridge University Press, 2002.
25. See Colorio, A., Cozzi, F., «Arbitration from the Past to the Future: The Growing Role of International Arbitration and the Enforcement of Arbitral Awards in the Development of a Pro-Arbitration Culture in China», article accepted for publication in 2021, where it is emphasized that: «*The ratification of the New York Convention has been an essential step in China's path towards a more pro-arbitration attitude. The Convention is, however, the result of an incredible effort to create an instrument suitable to fit with as many legal systems as possible and, therefore, both the wording and the substance of the treaty leave the contracting states a certain margin of flexibility, since tighter provisions would have probably made a wide ratification of the Convention more difficult if not impossible. In this light, when ratifying the Convention in 1987, China made a number of reservations and, in particular, made clear that, on the one hand, only awards made in the territory of another contracting state shall be recognized and, on the other, that the Convention shall be deemed applicable, in China, only to disputes arising out of legal relationships, whether contractual or not, considered 'commercial' under Chinese law*».

some, would be integral to the *guanxi* system. In fact, in addition to being arbitrators, they are usually involved in activities of political, business and legal nature, with prominent roles in the legal and commercial environment. As members of a community with common or at least similar goals, they are strongly linked to each other and inclined to maintain this *status quo*, i.e. the «system» and their «membership» in it<sup>26</sup>. In this light, sharing the same cultural networks, they would be likely to identify with the perspectives and concerns of the Chinese party or parties involved in the case, «*naturally finding their arguments intuitive and worthy*»<sup>27</sup>, with *guanxi* relationships somehow shaping their point of view<sup>28</sup>.

## II. IN THE MIND OF ARBITRATORS: RATIONALITY OR INTUITION?

In this paper, the possibility of an impartial evaluation will be brought more sharply into focus and considered in relation to another, as yet almost unknown, issue: Does the possibility of an «objectively» impartial evaluation exist from a neurocognitive point of view? And if so, can it be exercised by international arbitrators?

In the context of Alternative Dispute Resolution (ADR) processes, Jeremy Lack tried to confront this issue and, in an article entitled «The Neurophysiology of ADR and Process Design»<sup>29</sup>, hypothesized that, in fact, there are neurobiological limits to an «objectively» independent, impartial and neutral action of the subjects involved in out-of-court settlement of disputes. In this regard, Lack makes reference to some of the most recent and revolutionary developments in neurobiology, according to which one would normally never act in a totally independent, but rather «interdependent», way and, consequently, would never judge, in principle, in a substantially impartial, but «multipartial» manner. As a result, one cannot maintain that a true and total neutrality of judgment is possible<sup>30</sup>.

26. See Chew, P. K., «A Case of Motivated Cultural Cognition: China's Normative Arbitration of International Business Disputes», cit., p. 481.

27. *Ibid.*, p. 482.

28. Hwang, K.-K., *Guanxi and Organizational Behaviors in Chinese Society*, in *Foundations of Chinese Psychology: Confucian Social Relations, International and Cultural Psychology*, vol. 1 (2012), pp. 297-326, where it is underlined, first of all, that «'Guanxi' is a key concept for understanding social behavior in Chinese society. For social scientists researching Chinese society, it is very easy to find a set of special terms related to *guanxi* that have been widely used by Chinese people in day-to-day social interactions».

29. See Lack, J., *The Neurophysiology of ADR and Process Design*, in Rovine, A. W. (ed.), *Contemporary Issues in International Arbitration and Mediation*, The Fordham Papers 2011, Leiden: Martinus Nijhoff Publishers, 2012, pp. 341-382.

30. In a recent paper, Baumgartner, T., Schiller, B., Hill, C., Knoch, D., «Impartiality in Humans is Predicted by Brain Structure of Dorsomedial Prefrontal Cortex», in *NeuroImage*, vol. 81 (2013), pp. 317-324, point out that the larger the gray matter volume and thick-

Such an assumption is, of course, a radical one, perhaps even dangerous in some respects, but nonetheless of great interest.

As is well known, some important scientific theories suggest that the human ability to relate to others and, in particular, the capacity to interpret their actions and gestures is subserved by a network of so-called «mirror neurons», single-cell neurons discovered by an Italian research group led by Giacomo Rizzolatti<sup>31</sup>, that are activated in response to specific actions, during both the execution and the observation of the same actions. This special capacity linked to the existence of a mirror-neuron system<sup>32</sup> of embodied simulation<sup>33</sup>, thanks to which actions perceived by an observer can be matched with the relevant representations of the observer's own motor repertoire, is of fundamental importance for social interactions<sup>34</sup> and has significant consequences on the evaluation of the relationship between action, perception and cognitive processes. In fact, the idea that nervous circuits similar to those activated during the personal execution of the same observed action are activated in the observers of an external action justifies the search for the very bases of human subjectivity within the «universe» of others<sup>35</sup>.

Things are made even more complicated by the fact that, according to some neurobiologists, the discoveries made through the most effective neuroimaging techniques would have found the biological substratum of decision-making and would have erased our illusion of the existence of free

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ness of the dorsomedial prefrontal cortex (DMPFC), the more individuals in the role of an uninvolved third-party impartially punish outgroup and ingroup perpetrators and show evidence of a possible mechanism that would explain the impact of DMPFC's gray matter volume on impartiality understood as perspective-taking.

31. See, in particular, Rizzolatti, G., Arbib, M. A., «Language Within Our Grasp», in *Trends in Neurosciences*, 21 (1998), pp. 188-194, and Rizzolatti, G., Sinigaglia, C., *Mirrors in the Brain: How Our Minds Share Actions and Emotions*, New York: Oxford University Press, 2008. See also Ferrari, P. F., Rizzolatti, G., «Mirror Neuron Research: The Past and the Future», in *Philosophical Transactions of the Royal Society B: Biological Sciences*, vol. 369, 1644, 5 June 2014, pp. 1-4.
32. Rizzolatti, G., Craighero, L., «The Mirror-Neuron System», in *Annual Review of Neuroscience*, vol. 27 (2004), pp. 169-192.
33. See Gallese, V., «Embodied Simulation: From Neurons to Phenomenal Experience», in *Phenomenology and the Cognitive Sciences*, vol. 4 (2005), pp. 23-48.
34. See Chong, T. T., Cunnington, R., Williams, M. A., Kanwisher, N., & Mattingley, J. B., «fMRI Adaptation Reveals Mirror Neurons in Human Inferior Parietal Cortex», in *Current Biology*, vol. 18, 20 (2008), pp. 1576-1580, where it is noted that: «Mirror neurons have been directly identified in the macaque ventral premotor cortex (area F5) and inferior parietal lobe (areas PF/PFG). In humans, action observation and execution activate homologous areas in the inferior frontal gyrus (IFG) and inferior parietal lobule (IPL), as well as the superior temporal sulcus (STS). In contrast to the findings from nonhuman primates, however, there currently is no human evidence that has directly established the existence of a single neural population that encodes specific actions during both the observation and execution of action».
35. For this reconstruction, see Colorio, A., *Scritti su diritto e scienza. Dal mondo greco-romano ai processi del XXI secolo*, Canterano: Aracne Editrice, 2020, p. 100.

will<sup>36</sup>; if, in fact, our behavior can be directly connected with some specific brain areas<sup>37</sup> and if an action can be predicted even before the acting subject becomes aware of the action they themselves are going to carry out, one must ask whether it is possible to continue to support, even in the context of international arbitration, the possibility of acting in an «objectively» impartial and independent manner from a neurocognitive point of view.

Decision-making mechanisms in the field of international arbitration are the specific subject of an important article, entitled «Inside the Arbitrator's Mind», published in 2017 in the *Emory Law Journal*<sup>38</sup>. Indirectly responding to an appeal made by many, including myself, with respect to the fact that neither the use of genetic evidence, nor the issue of decision-making processes and persuasion had been sufficiently investigated in the field of international arbitration, Susan D. Franck and her co-authors explore arbitrators' decision-making mechanisms, which to date have remained a «black box». In the context, on the one side, of important reforms proposed due to some strong criticism and mistrust towards international arbitration as a tool to solve certain disputes<sup>39</sup>, and, on the other, of the fundamental role played by arbitration in the resolution of high-level international disputes, the article approaches the issue based on results achieved on an experimental basis through a test administered to a group of international arbitrators.

The idea was born in 2007 and the opportunity was offered by the biennial Congress of the International Council for Commercial Arbitration, held in 2014 in Miami<sup>40</sup>, during which 548 of the international arbitrators participating in the event (out of 1,031 professionals in total) took part in a survey, the results of which were taken into consideration only with regard to

36. Merzagora, I., «Il colpevole è il cervello: imputabilità, neuroscienze, libero arbitrio: dalla teorizzazione alla realtà», in *Rivista italiana di medicina legale*, vol. 1 (2011), pp. 175-208.

37. See, in this respect, Bianchi, A., Gulotta, G., Sartori, G., *Manuale di neuroscienze forensi*, Milano: Giuffrè, 2009, p. 110.

38. Franck, S. D., van Aaken, A., Freda, J., Guthrie, C., Rachlinski, J. J., «Inside the Arbitrator's Mind», in *Emory Law Journal*, vol. 66 (2017), pp. 1115-1173. I wish to sincerely thank Prof. Franck for our interaction in the phases before the formal publication of the article.

39. In Franck, S. D., van Aaken, A., Freda, J., Guthrie, C., Rachlinski, J. J., «Inside the Arbitrator's Mind», cit., the authors write: «the European Parliament expressed a desire to strip arbitrators of jurisdiction in trade agreements with the United States, namely the Trans-Atlantic Trade and Investment Partnership (TTIP), and with Canada, namely, the Comprehensive Economic and Trade Agreement (CETA); instead, the EU demands that judges must resolve disputes» (pp. 1119-1120). See, in this respect, some interesting consideration of Van Harten, G., *Comments on the European Commission's Approach to Investor-State Arbitration in TTIP and CETA*, in *Osgoode Legal Studies Research Paper Series*, vol. 59, 2014.

40. Franck, S. D., Freda, J., Lavin, K., Lehmann, T., Van Aaken, A., «The Diversity Challenge: Exploring the 'Invisible College' of International Arbitration», in *Columbia Journal of Transnational Law*, vol. 53 (2014), pp. 429-506.

the 262 individuals (46 of whom were women) with actual previous arbitral experience in commercial or investment disputes<sup>41</sup>. Based on protocols already used in the past with judges of several North American, Swiss and Dutch courts, decision-making processes of the arbitrators involved were analyzed on the basis of the answers provided by participants with respect to different types of questions –including the deliberate reasoning Cognitive Reflection Test (CRT) developed by Shane Frederick of Yale University<sup>42</sup>– relating to possible arbitration scenarios in both commercial and investment arbitration, developed over the course of around two years of work and previously tested at the University of St. Gallen in Switzerland. According to the authors and despite the limitations of such a test<sup>43</sup>, the results, which were partially disappointing in some respects according to the authors themselves<sup>44</sup>,

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41. On the relationship between commercial and investment arbitration, see Böckstiegel, K. H., «Commercial and Investment Arbitration: How Different are they Today? The Lalive Lecture 2012», in *Arbitration International*, vol. 28, 4, 1 December 2012, pp. 577-590, with the relevant bibliography.
42. «The first CRT question is: ‘A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?’ The intuitive response, 10¢, is mathematically incorrect. If the bat costs US\$1 more than 10¢ (US\$1.10) and the ball is 10¢, the total cost is US\$1.20. The correct answer is 5¢, with a bat costing US\$1.05 and a ball costing 5¢. The calculation is relatively easy, but the analysis requires deliberation to avoid generating inadvertent error. The second CRT question is: ‘If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?’ The intuitive answer is 100, but this is wrong. Deliberation reveals that if five machines make five widgets in five minutes, then each machine makes a single widget in five minutes. With that base rate, one can calculate it takes five minutes for 100 machines to make 100 widgets. The final CRT question asks: ‘In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take the patch to cover half of the lake?’ The intuitive (and incorrect) answer is twenty-four days. Using slower cognition to override snap judgments reveals the correct answer is forty-seven days. If the rate of growth means the amount doubles every day, compounding means half the lake was covered the day before (i.e., day forty-seven, not day forty-eight)»: see Franck, S. D., van Aaken, A., Freda, J., Guthrie, C., Rachlinski, J. J., «Inside the Arbitrator’s Mind», cit., p. 1138.
43. Franck, S. D., van Aaken, A., Freda, J., Guthrie, C., Rachlinski, J. J., «Inside the Arbitrator’s Mind», cit., pp. 1167-1168, point out that: «Selection effects limit the value of inferences. Because we do not know, and likely will never be able to know, the demographic characteristics of the global population of international arbitrators, we cannot definitively confirm how representative our sample might be. It is possible that the international arbitrators who attended ICCA and participated in our study skewed older, more economically advantaged, more elite, and with a greater proportion of women. Second, international arbitrators’ conduct in real disputes could differ from responses to our hypotheticals. International arbitration proceedings are often lengthy, complex, and rely upon numerous witness statements and voluminous documents. Rather than making snap judgments during a survey, arbitrators have access to time, resources, tribunal secretaries who function like judicial clerks, and group deliberations».
44. One must consider, for instance, that, as regards the first question of the CRT test, 239 arbitrators answered the question and 158 answered incorrectly (with a percentage of 87.3% of «intuitive» wrong answers). This result, however, is more satisfying than that obtained, in the same test, by a group of American judges.

suggest that international arbitrators tend to make decisions that are often predominantly intuitive and influenced by past cognitive illusions<sup>45</sup>, such as anchoring<sup>46</sup> and framing, rather than fully rational and «desirable» decisions<sup>47</sup> from a strictly legal point of view<sup>48</sup>.

The results obtained by the arbitrators in the tests, however, somewhat overlap with and seem no worse than those obtained in similar tests by judges –whose own limited rationality has been explored in the past years<sup>49</sup>–, such that, to the extent that the tests used can be considered significant, the quality of arbitrators' decision-making cannot be considered as a criterion on the basis of which judges should be preferred to arbitrators.

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45. Franck, S., «International Arbitration. Between Myth and Reality. 9th John E.C. Brierley Memorial Lecture», in *McGill Journal of Dispute Resolution*, vol. 5, 1 (2018), p. 17: «Cognitive illusions (like availability) may also be affecting discourse surrounding investment arbitration. Many disputes are recent or controversial, and may be easy to recall. The ease of recall risks making these cases feel more prominent within the overall population, as well as representative of the larger whole. This means that despite the appearance of bias toward investors within these cases –which I would distinguish from the creation of substantive treaty rights that were designed by states to only benefit investors but provide no reciprocal protections for states– the myth about pro-investor bias in arbitration outcomes is not borne out. My research has identified that states have won more than investors, and that the difference is now statistically meaningful. A recent study conducted by the team at Pluricourts in Norway has thoughtfully replicated aspects of this research. The draft analysis revealed that –although our unit of analysis and measurement systems are different– states were winning in their research at a roughly 53% rate». See also Franck, S. D., Wylie, L., «Predicting Outcomes in Investment Treaty Arbitration», in *Duke Law Journal*, vol. 65 (2015), pp. 459-526; Behn, D., Berge, T. L., Langford, M., «Poor States or Poor Governance? Explaining Outcomes in Investment Treaty Arbitration», in *Northwestern Journal of International Law & Business*, vol. 38 (2018), pp. 333-389.
46. As explained by Lucy Reed in *Arbitral Decision-Making: Art, Science or Sport ?* (Kaplan Lecture 2012, Hong Kong, 2 December 2012), available at: [http://www.arbitration-icca.org/media/1/13581569903770/reed\\_tribunal\\_decision-making.pdf](http://www.arbitration-icca.org/media/1/13581569903770/reed_tribunal_decision-making.pdf): «Arbitrators regularly have to make decisions on the quantum of damages, which is a ripe area for a cognitive bias called 'anchoring.' As Professor Christopher Drahozal of the University of Kansas Law School explains: '[i]n estimating a numerical amount, people tend to start with some initial value –an 'anchor'– and then come up with a final estimate by making adjustments to the anchor. If the anchor provides useful information about the underlying value (such as the list price), and if people make reasonable adjustments, this 'anchor and adjustment' heuristic can be a useful decision-making [sic] approach. But anchoring can be problematic if people start with an irrelevant anchor or fail to make adjustments to the initial value'».
47. Even the excess of discovery in arbitration has been explained as a result of cognitive illusions of arbitrators. See, with bibliography, Rojas Elgueta, G., «Understanding Discovery in International Commercial Arbitration through 'Behavioral Law and Economics': A Journey Inside the Minds of Parties and Arbitrators», in *Harvard Negotiation Law Review*, vol. 16 (2011), pp. 165-191.
48. On the limited rationality of arbitrators, see Rojas Elgueta, G., «Razionalità limitata ed efficienza del procedimento arbitrale», in *Rivista dell'Arbitrato*, vol. 28, 4, 2018, pp. 633-654.
49. See, in particular, Guthrie, C., Rachlinski, J.J., Wistrich, A.J., «Inside the Judicial Mind», in *Cornell Law Review*, vol. 86, 4, 2001, pp. 777-830.

Even empirically, then, and although much research remains to be carried out, as we will see, through neuroscientific methodologies potentially applicable to the analysis of arbitration decision-making processes, an arbitration procedure –as indeed a judicial procedure<sup>50</sup>– is, according to a famous definition of Lucy Reed, both an «art» and a «science»<sup>51</sup> and, in this respect, can in no way be considered similar to a mathematical equation<sup>52</sup>, nor a pure sequence of strictly conscious reasoning, at least from the perspective of the arbitrator(s) directly involved in the evaluation of the case<sup>53</sup>. Their decision, in fact, inevitably presupposes, at a substantially subconscious level, the activation of both brain areas pertaining to reasoning and deliberation<sup>54</sup> and of those connected to emotions, instincts and intuition<sup>55</sup>: «... *international arbitration, whether commercial or investment-based, is currently caught within a larger geo-political maelstrom which includes a backlash against globalization,*

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50. See Guthrie, C., Rachlinski, J. J., Wistrich, A. J., «Blinking on the Bench: How Judges Decide Cases», in *Cornell Law Faculty Publications Paper*, 93, 1 (2007), pp. 1-43; Wistrich, A. J., Rachlinski, J. J., Guthrie, C., «Can Judges Make Reliable Numeric Judgments? Distorted Damages and Skewed Sentences», in *Indiana Law Journal*, vol. 90 (2015), pp. 695-739.
51. Lucy Reed, *Arbitral Decision-Making: Art, Science or Sport ?* (Kaplan Lecture 2012, Hong Kong, 2 December 2012), cit., explains that: «*At heart, the art of arbitral decision-making lies in intuiting whether and when witnesses are telling the truth, in perceiving the human stories underlying a business dispute, in crafting an award with the right reasoning and the right amount of reasoning. The science of arbitral decision-making lies in rigorously assessing the evidence, methodically finding the relevant material facts, identifying the governing law, applying that law to the facts, and [...] steadfastly resisting the preconceptions and premature judgments to which we are all prone*».
52. See Bishop, R. D., Kehoe, E. G., *The Art of Advocacy in International Arbitration*, New York: Juris Publishing, 2010, p. 2: «*An arbitral case, like a case in a national court system, is not just a simple mathematical equation, summing the facts and the law and arriving at a precise answer. Arbitral decision-making is neither mathematics nor science. Neuroscience has demonstrated that decision-making is often not limited to a single part of the brain, nor is it typically a simple step-by-step process of conscious reasoning*».
53. Franck, S. D., van Aaken, A., Freda, J., Guthrie, C., Rachlinski, J. J., «*Inside the Arbitrator's Mind*», cit., pp. 1167-1168, where the authors explain: «*We hypothesized that international arbitrators, like their judicial counterparts, make decisions using an 'intuitive-override model' whereby arbitrators may initially make an intuitive assessment that they could ultimately override using more rational and deliberative cognition*». It must be considered, in this respect, that the «*intuitive override*» model of adjudication involves initial intuitive assessments that can be tested against evidence and logic.
54. Sussman, E., «*Arbitrator Decision Making: Unconscious Psychological Influences and What You Can Do About Them*», cit., pp. 488-489, observes that: «*The human brain has both an intuitive and a deliberative component, a fact long known and now scientifically proven by the study of neuroscience. Plato, in discussing what drives people's actions, used the image of two horses, a good horse governed by reason and a bad horse who hurries along violently and without control. Descartes wrote about 'intuition and deduction' as the way to arrive at knowledge*».
55. See Bishop, R. D., Kehoe, E. G., *The Art of Advocacy in International Arbitration*, cit., p. 2: «*Human decision-making involves a complex and constantly shifting tension between the reasoning (neo-cortex) and emotional/instinctive (amygdala) parts of the brain, much of it a subconscious level*».

*the popularization of populism, and a turn toward nationalism and isolationism that rejects the reality of our globalized world. Rather than permit our decisions to be affected by this emotive torrent of intuitive forces that facilitate decisions based upon fear or easily accepted cognitive narratives, we should recognize our emotional impulses but proceed based upon rationality<sup>56</sup>, data analysis, and with an eye towards establishing evidence-based reform of international dispute settlement»<sup>57</sup>.*

### III. NEUROSCIENCE AND INTERNATIONAL ARBITRATION: «FMRI» AND «BRAIN-FINGERPRINTING» BETWEEN WITNESS EVIDENCE AND MEMORY

Even if, as has been argued, our decisions and deliberations cannot be totally reconciled with the neurophysiological reactions that may be analyzed through neuroscientific instruments<sup>58</sup>, it can be of particular interest to examine which scientific techniques can explore and understand human decision-making, and to what extent they can do so, provided that, in any case, such reactions must be examined in light of the fundamental characteristics of our humanity<sup>59</sup>.

Neuroscience, in fact, is providing exciting new discoveries and gradually occupying every space available in the field of legal studies, including the

56. Notwithstanding the fact that, as is somehow intuitive, «*rational decision-making is crucial for the functioning of many aspects of human society including dispute resolution*», in many cases we witness irrational results that are precisely connected to subconscious biases that might have, at least to a certain extent, conditioned the «*discrepancies in the outcomes*»: see, in this respect, Brekoulakis, S., Mitsi, M., El Far, A., *Arbitral Decision-Making: An Issue of Consistency and a Response to Bias*, Kluwer Arbitration Blog, June 12, 2018, <http://arbitrationblog.kluwerarbitration.com/2018/06/12/arbitral-decision-making-issue-consistency-response-bias/>, who also underline that: «*as an example, the CME v Czech Republic and Lauder v Czech Republic cases are based on essentially the 'same factual and legal background but, nevertheless, the tribunals' decisions are vastly different. Subconscious biases might have to a certain extent conditioned the discrepancies in the outcomes. One can fairly easily imagine a situation where a judge or an arbitrator sympathises with one party's case in general as a 'big question' but cannot accept arguments underpinning 'small issues' and thus has no option other than to dismiss the claim altogether (despite not feeling inclined to do so). In such cases, it must be helpful for a party to state its arguments broadly, in a way that would allow the decision-maker to exercise some degree of interpretation*». See also Mitsi, M., *The Decision-Making Process of Investor-State Arbitration Tribunals*, Alphen aan den Rijn: Wolters Kluwer, 2019, where the issue of interpretation of law (general principles, customary law, treaties, precedent, policies) in investor-state disputes is examined in depth and in a transnational perspective, with specific reference to the problem of consistency of arbitral awards and, more specifically, to the legitimacy and predictability of arbitral decision-making processes.

57. Franck, S., *International Arbitration. Between Myth and Reality. 9th John E.C. Brierley Memorial Lecture*, cit., p. 7.

58. See Nahmias, E., «*Is Neuroscience the Death of Free Will?*», in *New York Times* (13 November 2011).

59. See, in this specific respect, Boella, L., *Neuroetica: La morale prima della morale*, Milano: Raffaello Cortina Editore, 2008, p. 85.



sector of ADR, as emerges from a simple glance at the cover of the Dispute Resolution Magazine of the American Bar Association for the summer of 2011, dedicated to «Neuroscience and Negotiation». Fundamental data relating to a «brain-based understanding of human decision-making»<sup>60</sup> are being provided, in particular, by pioneering studies in cognitive neuroscience, whose implications are critical in the judicial sector, as well as in those areas connected with non-judicial solutions of controversies<sup>61</sup>: «Neuroscience is currently documenting both the pervasiveness of subconscious decision-making and the complex patterns of neurons firing in different sequences in various parts of the brain when people are faced with ethical decisions, which might be considered analogous to the types of decisions made by arbitrators»<sup>62</sup>.

In fact, it must be considered that decision-making processes involve a series of different brain functions connected to different parts of the brain, whose activity can be measured to reach an evidence-based understanding about these functions<sup>63</sup>, as well as a number of «hidden internal events» that, in turn, determine some aspects of human action<sup>64</sup>.

60. See Fellows, L. K., «The Cognitive Neuroscience of Human Decision Making: A Review and Conceptual Framework», in *Behavioral and Cognitive Neuroscience Reviews*, 3, 3 (2004), pp. 159-172 (citation at p. 169).

61. For this reconstruction, see Colorio, A., Cozzi, F., *International Arbitration and New Technologies: from «Neurolaw» to «Neuroarbitration» ?*, in Tackaberry QC, J., Planterose, R. (eds.), *A Brand New World: The Evolution and Future of Arbitration*, London: Chartered Institute of Arbitrators, 2019, pp. 141-152 (on this issue at p. 148).

62. See Bishop, R. D., Kehoe, E. G., *The Art of Advocacy in International Arbitration*, cit., p. 2.

63. See, in this respect, the considerations of Spain Bradley, A., *The Disruptive Neuroscience of Judicial Choice*, cit., who also stresses that: «From this perspective, your mind and your brain are functionally the same. Thus, decisions are made in your brain, not by a separate mind. By measuring which parts of the brain become active during different types of activity and thought, neuroscientists have added to these understandings in important ways» (p. 22), and that: «Because our mental activity is connected to our neurobiological brain and we are just beginning to understand the brain's complexity, much remains hidden. This means our brains can weave together assessments of information and memories that shape our judgment and our emotions to produce a decision without us being aware of it. Although we are aware of our decision or choice, we are not aware of the way our brain reached that choice because aspects of our cognition, such as memory, perception, knowledge, and emotion, can be implicit, meaning that their influence on our behavior occurs at the unconscious level» (p. 26).

64. See, in this respect, Song, J. H., Nakayama, K., «Hidden Cognitive States Revealed in Choice Reaching Tasks», in *Trends in Cognitive Science*, vol. 13 (2009), pp. 364-365 (cited by Spain Bradley, A., *The Disruptive Neuroscience of Judicial Choice*, cit., p. 26), where the authors observe that these hidden internal events indicate that «human action is not always the final product of perception and cognition». In general, see Graf, P., Masson, M. E. J. (eds.), *Implicit Memory: New Directions in Cognition, Development and Neuropsychology*, 1993. See also Clark, A., «What Reaching Teaches: Consciousness, Control, and the Inner Zombie», in *The British Journal for the Philosophy of Science*, vol. 58 (2007), pp. 563-594; Dehaene, S., Changeux, J. P., Naccache, L., Sackur, J., & Sergent, C., «Conscious, Preconscious, and Subliminal Processing: A Testable Taxonomy», in *Trends in Cognitive Sciences*, vol. 10, 5 (2006), pp. 204-211. Goodale, M. A., Króliczak, G., & Westwood, D.

Functional Magnetic Resonance Imaging or fMRI<sup>65</sup> is a technique that measures brain activity by monitoring fluctuations in blood oxygenation and flow in response to neural activity and, in this respect, it is a special candidate, among the instruments applied to the study of the human brain and its reactions, to be used in the field of international arbitration with respect to the analysis of arbitrators' decision-making processes.

As recently underlined in an excellent paper by Anna Spain Bradley, the fMRI study of neural mechanisms that can be seen in our brain can help us explain what occurs, for instance, in the event of subconscious bias such as the cultural biases connected to race, age, gender and sex<sup>66</sup>, which are a form of implicit cognition that potentially influences our thought and behavior<sup>67</sup>. For example, through brain imaging techniques, amygdala activity has been associated with some specific emotions and, in particular, with fear and, in this specific respect, it has been linked to prejudice<sup>68</sup>, even of an ethnicity-based character<sup>69</sup>, which, in turn, is associated with racial bias<sup>70</sup>: «*This is where neuroscience may provide an invaluable contribution to the discourse. No one wants to be labeled racist, sexist, or homophobic yet the biases connected to such discriminatory behavior are real. In order to move from description to prescription and remedy, people need to understand why bias of this sort occurs and what to do about it*»<sup>71</sup>.

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A., «Dual Routes to Action: Contributions of the Dorsal and Ventral Streams to Adaptive Behavior», in *Progress in Brain Research*, vol. 149 (2005), pp. 269-283.

65. See, with bibliography, Ashby, G. F., *An Introduction to fMRI*, in Forstmann, B. U., Wagenmakers, E.-J. (eds.), *An Introduction to Model-Based Cognitive Neuroscience*, New York: Springer, 2015, pp. 91-112, where it is argued: «*Functional magnetic resonance imaging (fMRI) provides researchers an opportunity to observe neural activity noninvasively in the human brain, albeit indirectly, as it changes in near real time*».
66. Spain Bradley, A., *The Disruptive Neuroscience of Judicial Choice*, cit., p. 28, underlines that: «*Where his or her identity is of an out-group and one that has historically or culturally been associated with negative traits, we process such perceptions and biases in our amygdala, which is where we also process fear*».
67. For this reconstruction, see Spain Bradley, A., *The Disruptive Neuroscience of Judicial Choice*, cit., p. 28.
68. See Fourie, M. M., Thomas, K. G., Amodio, D. M., Warton, C. M., & Meintjes, E. M., «Neural Correlates of Experienced Moral Emotion: An fMRI Investigation of Emotion in Response to Prejudice Feedback», in *Social Neuroscience*, vol. 9, 2 (2014), pp. 203-218.
69. See Kubota, J. T., Banaji, M. R., & Phelps, E. A., «The Neuroscience of Race», in *Nature Neuroscience*, 15, 7 (2012), pp. 940-948; Gowin, J., «The Neuroscience of Racial Bias», in *Psychology Today* (Aug. 20, 2012), accessible at: <https://www.psychologytoday.com/blog/you-illuminated/201208/the-neuroscience-racial-bias>.
70. See Chekroud, A. M., Everett, J. A., Bridge, H., & Hewstone, M., «A Review of Neuroimaging Studies of Race-Related Prejudice: Does Amygdala Response Reflect Threat?», in *Frontiers in Human Neuroscience*, vol. 8 (2014), pp. 179-189, who argue that: «*differential amygdala activity may best be considered in terms of threat, arising through culturally-learned associations between black males and potential threat*».
71. See Spain Bradley, A., *The Disruptive Neuroscience of Judicial Choice*, cit., p. 28.

Since fMRI has been designed to identify specific brain areas connected to mental processes, it is able to detect deceptive assertions from the parties and the witnesses involved in a case in a more reliable way compared to instruments traditionally utilized to ascertain malignancy<sup>72</sup>. Also in this respect, fMRI can be a valid candidate for use in the field of international arbitration. In fact, fMRI has already started to be requested in the course of judicial proceedings<sup>73</sup> and some firms, such as Cephos Corporation in Tyngsboro (Massachusetts) and No Lie MRI in San Diego (California), offer fMRI technology for the judiciary.

Of strong mediatic impact was the 2007 trial of Peter Braunstein, a well-known fashion journalist, in which the Court allowed the accused to be subjected to brain imaging investigations in order to let his defense team try to prove that the criminal behavior shown in December 2005 –when Braunstein had been arrested for having imprisoned a former colleague in her apartment and having sexually assaulted her for many hours– was linked to a sort of psychic inability to control violence. Although the American judicial system actually admitted PET scans, offered to prove that Braunstein's brain areas connected to moral judgment showed impaired functioning, as trial evidence, the jury found him guilty and sentenced him to 18 years in prison: «*in their minds, the fact that Braunstein turned up at his former colleague's apartment block dressed as a fireman and that he threw a smoke grenade in the lobby to simulate a fire in order to get her to open her door looked pretty much like a premeditated crime*»<sup>74</sup>.

Another case, less known to the general public but of no less interest, is that of Zachary Short, who in 2005 was tried for the murder of a police officer in South Carolina and then sentenced to death. However, Short's defense team decided to propose post-conviction relief petition based on the total re-reading of his social and family history and, above all, on a series of new tests that seemed to confirm that –due to, *inter alia*, fetal exposure to alcohol and toxic chemicals– Short's brain presented serious neurological dysfunctions

72. Such as the Pneumoencephalograph, Angiography, CT scan (Computed Tomography) and PET (Positron Emission Tomography).

73. For a review of the use of neuroscientific evidence in criminal trials from 2005 to 2012 in the US, Canada, the Netherlands, England, and Wales, see Meixner, J. B., «The Use of Neuroscience Evidence in Criminal Proceedings», in *Journal of Law and the Biosciences*, vol. 3, 2 (2016), pp. 330-335. See also Farahany, N. A., «Neuroscience and Behavioral Genetics in US Criminal Law: An Empirical Analysis», in *Journal of Law and the Biosciences*, vol. 2, 3 (2015), pp. 485-509. Denno, D. W., «The Myth of the Double-Edged Sword: An Empirical Study of Neuroscience Evidence in Criminal Cases», in *Boston College Law Review*, vol. 56, 2 (2015), pp. 493-551, underlines that 63.29% of the reviewed cases of neuroscience evidence being used in criminal trials involved a form of neuroimaging evidence such as fMRI, PET, and CT scans.

74. See Willmott, C., Macip, S., *Where Science and Ethics Meet: Dilemmas at the Frontiers of Medicine and Biology*, Santa Barbara, California: Praeger, 2016, p. 123.

not detectable through normal psychiatric evaluation techniques, but only through fMRI and PET scans: «on the day that Officer Simon was killed, Short was operating with an abnormal brain and a lifetime of disadvantages. He was not just a drunk who decided to kill a cop out of spite. The images of Short's brain damage corroborate this story and visually depict the story's result, but the images are not the story itself. In other words, there was a much more compelling story to be told on Short's behalf, and the results of the neuroimaging played an important part in completing that picture»<sup>75</sup>.

Some years later, in the famous case *United States v. Semrau*<sup>76</sup>, the US Court of Appeals Sixth Circuit examined the request of the defense of Dr. Lorne Allan Semrau, who had been convicted of healthcare fraud by a district court of the State of Tennessee, that exculpatory fMRI be used to demonstrate his lack of intent. However, based on the *Daubert* standard<sup>77</sup> –the standard used, in US trials, to preliminarily assess whether an expert witness's scientific testimony is based on scientifically valid reasoning that can properly be applied to the facts at issue– the Court of Appeals upheld the decision of the district court that had excluded expert witness Dr. Stephen Laken's testimony, based on two main sets of questions posed to Dr. Semrau in an fMRI scanner, deeming such technique not ready to be used in real-world lie detection and the results provided by Dr. Laken too unreliable, given that only the second set of questions posed to Dr. Semrau was actually exculpatory: «Dr. Laken devised two sets of questions to pose to Dr. Semrau. One set of questions involved whether Dr. Semrau had intentionally used incorrect billing codes, while the other set of questions related to his separate billing for tests that should have been included in regularly scheduled appointments. After practicing answering the questions on a computer, Dr. Semrau entered the scanner, where he was asked the questions in random order. Dr. Semrau apparently passed the first set of questions with flying colors, because Dr. Laken concluded that the results showed that he was 'not deceptive'. On the second scan, relating to the testing charges, Dr. Laken found that

75. See the reconstruction of Short's case in Blume, J. H., Paavola, E. C., «Life, Death, and Neuroimaging: The Advantages and Disadvantages of the Defense's Use of Neuroimages in Capital Cases – Lessons from the Front», in *Mercer Law Review*, vol. 62, 3 (2011), pp. 909-931 (on the case at pp. 916 ff and citation at pp. 924-925).

76. 693 F.3d 510 (6<sup>th</sup> Cir. 2012).

77. Under the *Daubert* standard, the factors that may be considered in determining whether the methodology is valid are: (1) whether the theory, technique or method used to develop such theory can and has been tested; (2) whether the relevant methodology has been subjected to peer review and publication; (3) the known or potential error rate for such methodology; (4) the existence, reliability and maintenance of standards controlling its operation relied upon by the expert; and (5) whether it has attracted universal acceptance within the relevant scientific community. Case law relevant to this particular standard –currently used in the federal court system, as well as in forty state courts and in the District of Columbia– was established by *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

Dr. Semrau was 'being deceptive'. Attributing this to fatigue, however, Dr. Laken devised a third set of shorter questions related to the billed tests and scanned again, this time in the evening (the first two scans had been conducted at 6:00 a.m.). This time, Dr. Laken concluded that Dr. Semrau was not deceptive»<sup>78</sup>.

In the cases of Abdelmalek Bayout and Stefania Albertani<sup>79</sup>, however, fMRI results, along with genetic findings, were considered as «admissible evidence» by two Italian courts, which decided the cases, ascertaining the criminal responsibility of the accused, also on the basis of fMRI results.

As has been recently argued<sup>80</sup>, there could be a role to play in international arbitration by another brain-detection instrument called «brain-fingerprinting»<sup>81</sup>, a neuroscientific technique aimed at investigating and providing evidence of guilty knowledge of crimes through the detection of specific information in the brain of the accused. Originally based on the so-called «P300 Brain Response» and later on the «Memory and Encoding Related Multifaceted Electroencephalographic Response» (MERMER) technique<sup>82</sup>, the idea is that this methodology would allow the detection of brain prints connected to the knowledge of specific facts, so that it would be possible to exclude the commission of a crime whenever the relevant print is absent from the accused's brain.

In the United States, an Iowa District Court has already considered brain-fingerprinting as admissible scientific evidence, according to the *Daubert* standard<sup>83</sup>, in the famous post-conviction relief action of *Harrington v. State of Iowa*. However, although the electroencephalographic evidence presented by Terry Harrington was taken seriously, according to the Court the accused could not meet his burden of proof with respect to the fact that the outcome of the trial probably would have been changed by the evidence under discussion<sup>84</sup>.

78. See the recent reconstruction of the case in Beecher-Monas, E., Garcia-Rill, E., *Fundamentals of Neuroscience and the Law: Square Peg, Round Hole*, Newcastle Upon Tyne: Cambridge Scholars Publishing, 2020, pp. 137-141 (citation at pp. 137-138)

79. On which see Musumeci, E., *New Natural Born Killers? The Legacy of Lombroso in Neuroscience and Law*, in Knepper, P., Ystehede, P. (eds.), *The Cesare Lombroso Handbook*, London-New York: Routledge, pp. 131-146 (on this issue at pp. 135 ff.).

80. See Colorio, A., Cozzi, F., *International Arbitration and New Technologies: From «Neuro-law» to «Neuroarbitration» ?*, cit., pp. 150 ff.

81. On which see Palmer, R., «Time to Take Brain-Fingerprinting Seriously? A Consideration of International Developments in Forensic Brainwave Analysis (FBA), in the Context of the Need for Independent Verification of FBA's Scientific Validity, and the Potential Legal Implications of its Use in New Zealand», in *The Wharenga – New Zealand Criminal Law Review*, vol. 6 (2018), pp. 330-356.

82. See Biswas, G., *Review of Forensic Medicine and Toxicology*, Kundli: Jaypee Brothers, 2012, p. 401.

83. See Freeman, M. (ed.), *Law and Neuroscience: Current Legal Issues*, Oxford: Oxford University Press, 2011, p. 346.

84. See Freeman, M., Goodenough, O. (eds.), *Law, Mind and Brain*, Farnham: Ashgate Publishing, 2009, pp. 235-236.

Nonetheless, in light of a due process violation under *Brady v. Maryland*<sup>85</sup>, Harrington was granted the possibility of a new process, because, after being confronted with the brain-fingerprinting results, the sole eyewitness, Kevin Hughes, recanted his testimony, confessing his perjury in the original trial<sup>86</sup>: «Hughes testified that he made up the story about he, Harrington and McGhee going to the dealership to steal a car. He said he lied to obtain a \$5000 reward being offered for information about the murder and to avoid being charged with the crime. (It appears Hughes was being held in Omaha on car theft charges at the time he came to the attention of the Council Bluffs police. Omaha authorities suspected that Hughes or others involved in a car theft ring might have been involved in or might know something about the Schweer homicide, and so contacted the Council Bluffs investigators)».

A similar technique, which likewise falls within what is generally indicated as electroencephalogram-based forensic brainwave analysis (FBA), is that of Brain Electrical Oscillation Signature (BEOS)<sup>87</sup>. This technique was developed by Champadi Raman Mukundan, a former professor of psychology at Bangalore's National Institute of Mental Health and Neuro-Sciences. It has been admitted as evidence, in India, in the famous murder case of *State of Maharashtra v. Sharma*<sup>88</sup> –in which the Sessions Court of Pune convicted 24-year-old Aditi Sharma of murdering her ex-fiancé by poisoning him<sup>89</sup>– and in other cases and criminal pre-trial investigations<sup>90</sup>.

85. 373 U.S. 83 (1963). In fact, «*the prosecutor did not disclose to the defense eight police reports that indicated there was an alternative perpetrator, an early suspect in the investigation, who had shown deception when denying involvement in the murder*». See MacLean, C. E., Berles, J., Lamparello, A., «Stop Blaming the Prosecutors: The Real Causes of Wrongful Convictions and Rightful Exonerations», in *Hofstra Law Review*, vol. 44, 1 (2015), pp. 151-200.

86. See *Terry J. Harrington, Appellant, v. State of Iowa, Appellee*. No. 01-0653. Decided: February 26, 2003. At the end of the new process, Harrington was freed after 26 years spent in jail.

87. See Mukundan, C. R., Wagh, N. B., Khera, G., Khandwala, S. U., Asawa, T. L., Khopkar, N. M., & Parekh, D. D., *Brain Electrical Oscillations Signature Profile of Experiential Knowledge*, 2008, pp. 1-45, accessible online at: [https://secure.axxonet.com/wp-content/uploads/2019/06/BEOS\\_Paper.pdf](https://secure.axxonet.com/wp-content/uploads/2019/06/BEOS_Paper.pdf)

88. *State of Maharashtra v. Sharma, C.C.*, No. 508/07, Pune, June 12, 2008.

89. See Gaudet, L.M., «Brain Fingerprinting, Scientific Evidence, and Daubert: A Cautionary Lesson From India», in *Jurimetrics: The Journal of Law, Science & Technology*, vol. 51 (2010), pp. 293-318 (on this case at pp. 293 ff.).

90. As has been underlined, in such context: «*The BEOS system was used primarily by police and prosecutors, together with the polygraph and narco-analysis, as tools of criminal investigation*». See, in this respect, Palmer, R., «Time to Take Brain-Fingerprinting Seriously? A Consideration of International Developments in Forensic Brainwave Analysis (FBA), in the Context of the Need for Independent Verification of FBA's Scientific Validity, and the Potential Legal Implications of its Use in New Zealand», cit., pp. 344.

#### IV. CONCLUSIVE REMARKS

In the past twenty years, international arbitration has not been immune to the pressure of new technologies and it is in the course of being radically changed by them<sup>91</sup>. Besides other important innovations –such as instruments that will formally allow «virtual telepresence» and «universal translation» during multi-language arbitral hearings<sup>92</sup>–, technological tools such as fMRI and other advanced lie –and memory– detection instruments might mediate or reduce the so-called cognitive bias in arbitration<sup>93</sup>.

As we have seen, arbitral decision-makers do not see themselves as biased. On the contrary, they believe in their own objectivity, even if such belief is something of an illusion from a neuroscientific perspective. Yet, if it is true that the integrity of their decision-making is somehow confirmed by their own belief to be neutral decision makers and that they can represent this point of view to others in good faith, it is no less true that when arbitrators «are confronted with their illusion of objectivity, for instance, by making the preferential ideological factor apparent, the motivated cognitive effect can be eliminated»<sup>94</sup>.

This means that even if subconscious bias of a cognitive, cultural and implicit nature affects arbitrators' decision-making no less than conscious bias, and might have a distorting effect on decision-making processes<sup>95</sup>, being aware of such biases and recognizing psychological influences is the first

91. See, with bibliography, Colorio, A., Cozzi, F., *International Arbitration and New Technologies: From «Neurolaw» to «Neuroarbitration»?*, cit., p. 142.

92. *Ibid.*, p. 146 ff.

93. On the interplay of human memory and witness evidence in international arbitration, see Cartwright-Finch, U., *Human Memory and Witness Evidence in International Arbitration*, in Cole, T., *The Roles of Psychology in International Arbitration*, Alphen aan den Rijn: Wolters Kluwer, 2017, pp. 199-230, where it is noted that the «area of memory research is particularly pertinent to witness evidence, because the process of preparing witness evidence necessarily exposes fact witnesses –whose primary purpose is to report to the arbitral tribunal on events after the fact– to post-event information» (p. 201).

94. See, in this respect, Sood, A. M., Darley, J. M., «The Plasticity of Harm in the Service of Criminalization Goals», in *California Law Review*, vol. 100 (2012), pp. 1313-1358 (citation at p. 1357).

95. Scherer, M., «Artificial Intelligence and Legal Decision-Making: The Wide Open?», in *Journal of International Arbitration*, vol. 36, 5 (2019), pp. 539-574, refers to a study that provides an empirical example of how human decision-making is directly affected by extraneous factors: «Looking at more than 1,100 decisions rendered over ten months by Israeli judges in relation to 40% of the country's parole applications, the study showed that the majority of applications are rejected on average, but the probability of a favourable decision is significantly higher directly after the judge's daily food breaks. While not falling into the generalization of the well-known saying that 'justice is what the judge had for breakfast', the results 'suggest that judicial decisions can be influenced by whether the judge took a break to eat'».

step for arbitrators to de-bias and improve their decisions, ensuring a more impartial result<sup>96</sup>.

Precisely in this first respect, neuroscience can provide an extremely important contribution in helping to understand why and how subconscious bias occurs and what arbitral decision-makers can do to improve their impartiality. In her important article on arbitral decision-making, Edna Sussman refers to the survey of arbitrators she conducted in October 2012, distributed both in the US and to arbitrators around the world. On the basis of this work, she observes that through a deeper knowledge of their biases (or «blindness», as she prefers to call them<sup>97</sup>), arbitrators can do more to counter them: *«As reported, 46% of arbitrators review the evidence that supported what was preliminarily viewed to be the losing side when deliberating 50% or less of the time. And it is not clear if the arbitrators' responses as to their own review of evidence referred to looking for citations to support a conclusion or a review of evidence that supports both sides. As arbitrators learn more about the blinders that affect their thinking, best practices to foster a more engaged deliberative process [are] likely to evolve to improve the quality of decision making»*<sup>98</sup>.

96. Sussman, E., «Arbitrator Decision Making: Unconscious Psychological Influences and What You Can Do About Them», cit., p. 514, observes, in this respect, that: *«While legal principles and precedents provide a constraint and impose some rigor on decision-making by arbitrators, subconscious factors that inevitably influence every person also play a significant role. Many arbitrators already take steps to assure a sound award but, with the current recognition of the psychological influences, a reexamination of best practices in arbitrator decision making is in order. There are concrete debiasing steps that arbitrators can take to improve the quality of their decisions and to assure a more impartial result»*.

97. *Ibid.*, p. 488: *«The literature which studies the psychological phenomena that are the subject of this article refers to them as 'biases'. Because the word 'bias' has such profound negative connotations in the field of arbitration and forms the basis for the extensive learning on arbitrator disclosures and challenges which are not the subject of this article, this article borrows the nomenclature used by Professor Guthrie, and refers to biases as 'blinders'»*.

98. *Ibid.*, p. 509. The author observes that, according to her survey, many arbitrators *«perform well in applying their deliberative functions to the decision-making process, but there is value in developing a list and reviewing it for applicability and action to further counter psychological blinders»* (pp. 507-508, where she recalls many interesting suggestions in this respect: *«As you consider your decision and as you write the award consider the opposite side, assuming each to be correct. Identify why you may be wrong, what are the important pieces of evidence that go the other way and why are they not reliable or credible. Consult your co-arbitrators and review all aspects of the facts and law and conclusions with them. Make sure you elicit the independent thinking of each member of the tribunal. Create a checklist with columns for each party and list the facts that favor that party. Create a checklist listing the legal claims and the elements of each claim and review how and whether they have been met, looking at it from each side's perspective. Reduce your reliance on memory; look for record citations for all of the important facts for both sides to ensure that you have recalled them correctly. Replay how you reached your conclusion and think about what evidence you rejected and why, in reaching that conclusion. Write down your reasoning, even if you are issuing a bare award at the request of the parties. Estimate the odds of being wrong. If you conclude they are too high, rethink the case until you are more certain of your conclusion. Try to identify any significant evidence*



It has even been observed that technology itself that allows, or better will allow through neuroscientific tools such as virtual telepresence, remote witness testimony might reduce cognitive bias in arbitration. There is, in fact, «no extant research... on whether remote witness testimony might reduce the tendency of arbitrators (human as they are) to make unconscious judgments about witness credibility based on superficial and irrelevant signals that they receive from the witness. On a certain level, the answer might at first seem to be negative: assuming the prerequisite that the video feed is good enough to see and hear the witness, a fact-finder will be able to discern that witness's gender, ethnicity, mode of dress, and general affect. The subconscious cues will therefore kick in in any event. On a more abstract level, however, the fact that a witness is on a screen, rather than in front of the arbitrators, may neutralize their tendency to be affected by unconscious bias»<sup>99</sup>. This is a second aspect where neuroscience could play an important role in the field of arbitral decision-making.

As regards evidence, the discourse is similar. In a recent article, entitled «Neuroscientific Evidence in the Courtroom: A Review», Darby Aono, Gideon Yaffe and Hedy Kober<sup>100</sup> argue that neuroscientific expert testimony, with or without accompanying neuroimages, may be mitigating<sup>101</sup>

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*that would be inadmissible or is unreliable that may have influenced you and consider the outcome without that evidence. Focus especially on the blinders that have been shown to affect judicial decision-makers, such as the anchoring and hindsight blinders, and affirmatively and consciously consider whether you may have been influenced by them. Don't take too many cases. Make sure you leave enough time to think through all of the issues, both factual and legal. Leave time to sleep on the award so that you can continue to think about it and then go back and review it with fresh eyes. Consider what evidence you would have needed presented to you in order to come to the opposite conclusion, and consider whether in fact such evidence was presented. Ask yourself what the losing party would feel that you overlooked in your analysis. Consider, if somebody were to have concluded the other way, how would he or she write the award and where and how would it differ. Stay informed as the study of arbitral decision-making and psychology develops to learn more about blinders and improve your practices»).*

99. See, in this respect, P. H. Cohen, «Bytes and Prejudice: Technology as a Means to Address Unconscious Bias in Arbitrators», in *Journal of Technology in International Arbitration*, vol. 1, 1 (2015), p. 70.

100. Darby, A., Yaffe, G., Kober, H., «Neuroscientific Evidence in the Courtroom: A Review», in *Cognitive Research: Principles and Implications*, vol. 4, 1 (2019), pp. 1-20.

101. As far as the United States is concerned, Blume, J. H., Paavola, E. C., «Life, Death, and Neuroimaging: The Advantages and Disadvantages of the Defense's Use of Neuroimages in Capital Cases – Lessons from the Front», *cit.*, p. 916, underlines that: «*The Supreme Court has consistently defined mitigation in the broadest possible terms. In Woodson v. North Carolina, 428 U.S. 280 (1976), the Court explained that if our society chooses to impose the ultimate punishment, the Eighth Amendment requires that we do so by individualized determinations that permit consideration of 'the possibility of compassionate or mitigating factors stemming from the diverse frailties of humankind.'* *Id.* at 304. The Court later reiterated that the Eighth and Fourteenth Amendments require that the sentencer 'not be precluded from considering, as a mitigating factor, any aspect of a defendant's character or record and any of the circumstances of the offense that the defendant proffers as a basis for a sentence less than death.' *Lockett v. Ohio, 438 U.S. 586, 604 (1978) (emphasis omitted); see also Penry v.*

in criminal cases, at least under certain circumstances: «*In specific cases, it led mock jurors to forgo the death penalty in one study (Appelbaum et al., 2015) although not another (Saks et al., 2014). In another study, such evidence was mitigating for a subset of defendants described as posing a high risk of future dangerousness (Greene & Cahill, 2012). Importantly, expert + neuroimage conditions mitigated NGRI/GBMI verdicts compared with control conditions (Gurley & Marcus, 2008; Schweitzer & Saks, 2011), a verdict type that was not tested in any study with expert testimony alone. Notably, the defendant's mental disorder diagnosis did not appear to moderate the effect of the expert + neuroimage on NGRI verdicts (Gurley & Marcus, 2008). Furthermore, unlike the effects of expert testimony alone, the combination of expert + neuroimage also had a mitigating effect on guilty/not guilty verdicts in some studies (Schweitzer et al., 2011), while several other studies reported no effects (Mowle et al., 2016; Schweitzer et al., 2011)*».

Irrespective of the fact that national courts might still be cautious with regards to the admissibility of neuroscientific instruments such as fMRI and brain-fingerprinting, arbitral institutions are in no way prevented from making use of such techniques to ascertain malignancy and deception. In fact, the attitude of caution that various judicial bodies could have towards the use of neuroscientific instruments should not, in itself, imply a refusal of a similar investigation methodology by international arbitrators and arbitral institutions. If such methodologies have been deemed admissible by state courts, it appears probable that, in the future, they might also be validly introduced in the practice of international arbitration, considering the clear advantages they have in comparison with traditional techniques such as the polygraph, which measures physiological signals according to a less reliable emotion-based system.

In respect of brain-fingerprinting, from March 2016 to March 2017 the New Zealand Law Foundation funded a pilot study on forensic brainwave analysis (FBA), with the primary aim of investigating its reliability, as well as the legal implications of the possibility of applying such technology. The results of the study were that once unequivocally established, i.e. with all the necessary protections, safeguards and legal rights established, FBA technology appears to have the potential to make a significant contribution to the administration of justice not only in criminal settings, such as anti-terrorism initiatives, but

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*Lynaugh*, 492 U.S. 302, 319 (1989); *Skipper v. South Carolina*, 476 U.S. 1, 6 (1986); *Eddings v. Oklahoma*, 455 U.S. 104, 113-14 (1982). More recently, the Court has stated, '[virtually no limits are placed on the relevant mitigating evidence a capital defendant may introduce concerning his own circumstances.]' *Tennard v. Dretke*, 542 U.S. 274, 285 (2004) (quoting *Payne v. Tennessee*, 501 U.S. 808, 822 (1991)]».

also in civil ones, including employment disputes, and in schools and other non-legal settings<sup>102</sup>.

As regards fMRI, one must consider that the main objections to its being introduced into international arbitration, in terms of both cost and accuracy, appear extremely weak. It is clear, on the one hand, that the progression of neuroscientific studies leads us to think that, in coming years, technological development will make fMRI increasingly efficient from the point of view of cost effectiveness; on the other hand, it is no less evident that the accuracy level of fMRI will gradually improve and, in any case, even now such accuracy is far superior to that of an «average» arbitrator in identifying lies<sup>103</sup>.

Considering that, according to some authors, decision-making based on artificial intelligence<sup>104</sup> would be superior to its human equivalent, with computers being «immune to cognitive biases or undue influence of extraneous factors»<sup>105</sup>, instruments that can improve and enhance human impartiality and accuracy of evaluation should be more than welcome.

102. Palmer, R., «Time to Take Brain-Fingerprinting Seriously? A Consideration of International Developments in Forensic Brainwave Analysis (FBA), in the Context of the Need for Independent Verification of FBA's Scientific Validity, and the Potential Legal Implications of its Use in New Zealand», cit., p. 355.

103. See Smit, R. H., p. 17 of the draft distributed at the international conference for the 30th anniversary of the School of Arbitration of Queen Mary University, London, entitled *The Future of Science and Technology in International Arbitration: The Next Thirty Years* (now published in Brekoulakis, S., Lew, J.D.M., Mistelis, L. (eds.), *The Evolution and Future of International Arbitration*, International Arbitration Law Library, Alphen aan den Rijn: Wolters Kluwer, 2016, pp. 365-378, citation at p. 372): «given that... studies show that human beings are only about 50% accurate in their credibility assessments, challenges to the reliability of fMRI lie-detection technology, which yields a 78%-90% accuracy rate, hardly appear compelling. Even if the average arbitrator were better at lie-detection than the average juror, he or she is unlikely to be able to claim accuracy rates in the range achieved by fMRI technology».

104. On some important aspects of the possible impact of artificial intelligence on international arbitration, see, with bibliography, Carrara, C., *The Impact of Cognitive Science and Artificial Intelligence on Arbitral Proceedings – Ethical Issues*, in Klausegger, C., Klein, P. et al (eds.), *Austrian Yearbook on International Arbitration 2020*, Vienna: Manz'sche Verlags – und Universitätsbuchhandlung, 2020, pp. 513-529, where the author underlines that «selection and predictive tools, in particular, raise a series of questions because of their potential impact on the role and function of the arbitrators, due process concerns and the fundamental rights of the parties (in particular to a fair justice)». See also the considerations of Berardicurti, B., *Artificial Intelligence in International Arbitration: The World is All That Is The Case*, in González-Bueno C. (ed.), *40 Under 40 International Arbitration 2021*, Madrid: Editorial Dykinson, 2021, pp. 377-391.

105. See Scherer, M., «Artificial Intelligence and Legal Decision-Making: The Wide Open?», cit., p. 559, where the author stresses that, on the contrary, «a blind deferential attitude towards algorithmic objectivity and infallibility is misplaced. AI research over the past years has highlighted the risks of misbehaving or biased algorithms. Important studies discuss bias concerns in computer systems used for a variety of tasks, such as flight listings, credit scores, or on-line advertisements»).