

**SUMMARY REPORT ON:  
APHASIA RESEARCH & THERAPIES  
WITH DETAILS ON MAJOR  
INSTITUTIONS  
& RESEARCHERS**

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## RESEARCH SUMMARY

### Aphasia overview

Aphasia is an “acquired disorder of previously intact language ability secondary to brain disease.”<sup>1</sup> Aphasia may affect the production of, or comprehension of, speech, as well as the ability to read or write.

According to current accepted estimates, one million people in the United States and an additional one million in the rest of the world have aphasia. Most of these people have acquired aphasia as a result of a stroke, although head injury, brain tumor and other neurological trauma may also result in aphasia.<sup>2</sup>

Of the approximately half-million stroke victims each year in the US, about 40 % of patients will have some kind of speech and language disorders,<sup>3</sup> and, of those, half will have been rendered aphasic.<sup>4</sup>

Other speech disorders, such as dysarthria, arise as a result of stroke and other neurological damage. These are motor speech problems resulting from

damage to cranial nerves or the frontal lobe (motor cortex).

When motor speech disorders causing difficulty with articulation, speech speed and evenness occur concomitant with aphasia after strokes and brain injury, it creates a more complex language problem than aphasia alone.

Most current research has centered on aphasia as the result of stroke because these lesions can be mapped more readily. Disorders such as brain tumors or injuries tend to be less well localized in the brain, with remote pressure effects that are difficult to identify and isolate.<sup>5</sup>

Currently, no steps can be taken to prevent the onset of aphasia following stroke or head injury.<sup>6</sup>

The prevailing thought is that the severity of aphasic condition is determined by the location and size of damaged area in the brain,<sup>7</sup> so therapies that offset stroke damage may also mitigate the degree of aphasia.

Rapid spontaneous language improvement may be seen in many cases. And it appears that some degree of improvement can continue for a long period.

Problems persist, however, even in patients who recover partial speech. Loss of familiar employment, social isolation, disruption of family roles, and

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<sup>1</sup> Kirshner HS. “Introduction to aphasia.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York: Marcel Dekker. 1995.

<sup>2</sup> *Aphasia Fact Sheet*. National Aphasia Association. <http://www.aphasia.org/NAAfactsheet.html>

<sup>3</sup> Gresham GE, Duncan PW, Stason WB, et al. *Post-Stroke Rehabilitation*, Clinical Practice Guideline, No. 16. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research. AHCPR Publication No. 95-0662. May 1995.

<sup>4</sup> Kirshner, HS. “Introduction to aphasia.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York: Marcel Dekker. 1995.

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<sup>5</sup> Kirshner HS. “Introduction to aphasia.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York: Marcel Dekker. 1995.

<sup>6</sup> Gonzalez Rothi LJ, Nadeau SE, Ennis MR. “Aphasia treatment: a key issue for research into the twenty-first century.” *Brain and Language*. 71, 78-81 (2000).

<sup>7</sup> Warburton E, Price CJ, Swinburn K, Wise RSJ. “Mechanisms of recovery from aphasia: evidence from positron emission tomography studies.” *J Neurol Neurosurg Psychiatry*. 1999; 66:155-161.

depression create enormous barriers to adequate recovery

In addition, there may be specific neurobehavioral correlates that can occur with aphasia, corresponding to lesion location.<sup>8</sup> Not all patients will develop severe emotional reactions following stroke, however, the presence of neuropsychiatric difficulties will impact treatment efficacy and can delay or prevent recovery.

Depression is the most common mood disorder observed after stroke. Some researchers report finding clinically significant depression in up to 50 % of patients after acute stroke.

“Much work remains in the development of a comprehensive understanding of the neurobiological basis of neuropsychiatric syndromes associated with local brain injury.”<sup>9</sup>

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## Recovery

There is no way to predict the outcome of post-stroke aphasia for an individual. A number of factors may come into play:

“Unique patterns of individual emotional and psychosocial adjustment were found even in patients with similar aphasia type and severity.”<sup>10</sup>

“Other factors, concerning imprecise variables such as level of

motivation, pre-traumatic response to challenge, and other personality factors, probably also modulate the effects of treatment for aphasia...no clear answer is available as to precisely which patient characteristics are consistently associated with failure.”<sup>11</sup>

Although the effect of stress on stroke recovery isn't widely discussed per se in the aphasia literature, it is important to note that long term stress has deleterious effects on the brain and body.

Robert M. Sapolsky, Ph.D., professor of neuroscience at Stanford University, notes that, “Westernized humans...are likely, to an unprecedented extent, to be made seriously ill by a stress-related disease.”<sup>12</sup>

He reports that recent evidence demonstrates how prolonged stress damages the nervous system.

Glucocorticoids that are released by the body as a result of stress reactions are neurotoxic and may accelerate the rate of neuron loss, resulting in memory degradation. Glucocorticoids can also interfere with the ability of certain neurons important to memory function to survive strokes, seizures or certain infections.

And to add to the difficulty of endogenous stress, synthetic glucocorticoids such as prednisone or dexamethasone are often given to stroke victims, with the belief that their action will reduce edema. Unfortunately, post-stroke edema, unlike edema due to a brain tumor, is resistant to the action of these

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<sup>8</sup> Helm-Estabrooks N and Albert ML. *Manual of Aphasia Therapy*. Austin: Pro-Ed. 1991.

<sup>9</sup> Craig AH and Cummings JL. “Neuropsychiatric aspects of aphasia.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York Marcel Dekker. 1995.

<sup>10</sup> Helmsley G, Code C. Abstract: “Interactions between recovery in aphasia, emotional and psychosocial factors in subjects with aphasia, their significant others and speech pathologists.” *Disability and Rehabilitation*. 18 (11): 567-584.

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<sup>11</sup> Holland AL, Beeson PM. “Aphasia therapy.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York Marcel Dekker. 1995.

<sup>12</sup> Margolis D. “Neuroscience 2000: a new era of discovery.” *Annals of Internal Medicine*. 1999; 131: 318-320.

steroids. But the brain is not resistant to the neurotoxicity of the synthetic glucocorticoids either!<sup>13</sup>

This could have less than happy consequences on the memory and cognition of stroke patients.

In addition, chronic stress, even a low levels, can contribute to depression, lack of attention, lowered immunity to disease, increased difficulty handling pain, as well as decreased ability to cope with day to day life.

Damage from strokes in an already stressed person cannot be readily measured. Research on chronic conditions which are rooted in disturbances of the neuroendocrine systems (as a result of stress) are only now being examined with brain imaging.

The loss of speech can itself be considered a major stressor. Since strokes are likely to create a variety of other physical challenges leading to stress reactions, it is likely that one of the reasons individuals with similar kinds of lesions nonetheless do not progress equally well has to do with the pre-stroke health of the brain and neuroendocrine system.

Some researchers in the field of cognitive neurology have suggested that attention and similar deficits may account for some of the difficulty regaining speech functions after a stroke.

“Indirect evidence exists that attempts to treat attentional dysfunction in individuals with aphasia may ameliorate the language disorder; and experimental

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<sup>13</sup> Sapolsky RM. *Why Zebras Don't Get Ulcers: An Unupdated Guide to Stress-Related Diseases, and Coping*. 1998. New York: W.H. Freeman and Company.

studies are just beginning to test this hypothesis.”<sup>14, 15</sup>

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## Who speaks for the voiceless?

*Seventy of those with aphasia surveyed felt that people avoided contact with them because of difficulty with communication.*

The National Aphasia Association reports that the general public knows little about aphasia.<sup>16</sup> Aphasia is not only invisible, it is silent.

Ninety percent of those with aphasia surveyed by the NAA felt that the public's awareness of this disability is minimal.

Further, NAA reports:

- although people with aphasia are likely to be elderly, aphasia can occur in all age groups
- people with aphasia come from all races, educational and socio-economic groups
- 70 % of those with aphasia surveyed felt that people avoided contact with

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<sup>14</sup> Albert, ML. “Treatment of aphasia.” *Archives of Neurology* 1998; 55:1417-1419.

<sup>15</sup> Petry MC, Crosson B, Gonzalez RLJ et al. Abstract: “Selective attention and aphasia in adults: preliminary findings.” *Neuropsychologia*. 1994; Nov 32 (11): 1387-1408.

<sup>16</sup> *Impact of Aphasia on Patients and Family. Results of a Needs Survey*. National Aphasia Association. <http://www.aphasia.org/NAAImpact.html>

them because of difficulty with communication

- 60 % of those with aphasia surveyed indicated that more information about aphasia was needed, both for the public and themselves; they also felt that healthcare professionals needed to be better informed about resources for people with aphasia and their families.

Loss of, or profound changes in, the ability to communicate challenges the inner resources of the patient with aphasia or motor speech difficulties, as well as disrupting his or her family, work, and social environment.

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## Aphasia therapy

We now understand that social isolation affects health in a number of ways. Not only does loneliness and isolation increase certain unhealthy behaviors like overeating, smoking and drinking, “*they increase the likelihood of disease and premature death from all causes by 200 to 500 percent, independent of [self-destructive] behaviors...*”<sup>17</sup>

Restoring a patient’s communication to his or her desired level is not a luxury!

It is important to consider that loss of language may impact the overall physical health of individuals by downgrading their quality of life, making them more likely to develop chronic, stress-related illnesses, as well as

distancing them from family and community.

This represents a cost not only in the quality of individual human life, but in medical and social resources, including long-term care expenses, costs of assistive therapies, and disability payments.

Views on the value of interventions for language disorders have fluctuated in the last half century. Some researchers insist that spontaneous recovery accounts for improvement. Others have seen significant improvements when evaluating pre- and post-therapy language skills.

Although this statement is from Italy, it is nonetheless a good statement of the issues plaguing aphasia therapy in the U.S. and elsewhere:<sup>18</sup>

“Over the last years there have been important developments in the treatment of aphasia. Contributions from Europe, America and Australia covering cognitive, linguistic and social aspects of the aphasia therapy, carry out a well articulated theoretical framework for a variety of approaches and research to support the claim that aphasia therapy works.”

“Eight different schools of aphasia therapy have been defined and described in literature (behavioral, cognitive, neuropsychological, pragmatic, etc.) with common assumptions about the process of therapy and the nature of aphasia. In spite of the wide spectrum of theoretical perspectives related to aphasia therapy, at the present, the common idea among therapists and researchers is to address attention to the individual needs and social problems of the aphasic persons.

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<sup>17</sup> Ornish, Dean, *Love and Survival*. New York: HarperPerennial. 1998.

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<sup>18</sup> *Aphasia Forum*.  
<http://www.aphasiaforum.com/engl.htm>

In this recent view, aphasia is not only a deficit of speech language, but a disorder of the communication in all its modalities. In this way the aim of aphasia therapy is not to re-learn specific damaged skills, but to increase the use of all other potential means of communication to support and compensate impaired language.

In Italy the study of language disability has been neglected and the therapy has been undervalued respect to the diagnosis. In Italy, aphasics benefit from intervention of National Health Service's speech therapists. **They offer a 'traditional' treatment, based usually on unselected 'stimulation' or many personal therapeutic approaches.**

Italian speech therapists take care of aphasic people alone, without possibility to discuss their professional choices with other members of the rehabilitation team. There are many reasons to explain this situation: big cultural distances among rehabilitation members, lack of contact between neuropsychological researchers and local operators.”

The question of aphasia therapy efficacy lingers. Although many aphasia researchers (and, of course, speech and language pathologists) staunchly support therapeutic intervention, there is no question that clear evidence derived from randomized controlled trials (RCT) is lacking.<sup>19</sup>

The Cochrane Library reported a major survey of the speech and language rehabilitation literature (the “black box”

of rehabilitation<sup>20</sup>) current through July 1999. They reviewed decades of journal articles and isolated 60 studies that met certain experimental criteria and examined these in detail. Only 12 of the 60 were even suitable for their review. And of these, most were “old with poor or unassessable methodological quality.”

Their review of speech and language therapy after stroke stated:

“It is...important to determine whether formal speech and language therapy is effective in treating people with aphasia, or whether any improvement would be as great or greater when left untreated or treated informally by an unqualified person or friend/family member. If speech and language therapy is effective, it would also be important to identify the optimal approaches to treatment.”

“The main conclusion of this review is that speech and language therapy treatment for people with aphasia after a stroke has not been shown either to be clearly effective or clearly ineffective within a RCT. Decisions about the management of patients must therefore be based on other forms of evidence. Further research is required to find out if effectiveness of speech and language therapy for aphasic patients is effective (sic). If researchers choose to do a trial, this must be large enough to have adequate statistical power, and be clearly reported.”

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<sup>19</sup> Greener J, Enderby P, Whurr R. *Speech and language therapy for aphasia following stroke* (Cochrane Review). In: The Cochrane Library, Issue 4, 2000. Oxford: Update Software.

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<sup>20</sup> Azouvi P, Denys P, Bussel B. Abstract: “Validation of procedures of rehabilitation after cerebrovascular accident.” *Rev Neurol (Paris)*. 1999; 155 (9): 737-742.

A foremost researcher on aphasia says: <sup>21</sup>

“One reason, I suspect, that many neurologists have been skeptical about the value of aphasia therapy was the relative dearth of statistically valid and reliable studies documenting the benefit of aphasia therapy over spontaneous recovery. Research over the last 10 years has changed that picture.

In a meticulously detailed study on the efficacy of treatment for individuals with aphasia, Robey <sup>22</sup> carried out a meta-analysis of 21 studies that provided sufficient information for inclusion.....

The effect of treatment beginning in the acute stage of recovery was nearly twice as large as spontaneous recovery alone, while treatment initiated after the acute period achieved a smaller, but nevertheless appreciable, effect....

Holland and colleagues <sup>23</sup> ....noted that nearly 200 studies pertaining to aphasia treatment have been published in the English language alone....Holland et al conclude that individuals with aphasia meeting certain specific selection criteria who are treated improve more than those who do not receive treatment. Improvement was documented in both the quantity and quality of language.”

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<sup>21</sup> Albert, ML. “Treatment of aphasia.” *Archives of Neurology* 1998; 55:1417-1419.

<sup>22</sup> Robey R. “The efficacy of treatment for aphasic persons: a meta-analysis.” *Brain and Language*. 1994; 47:582-608.

<sup>23</sup> Holland A, Fromm D, DeRuyter F, Stein M. “Treatment efficacy: aphasia.” *Journal of Speech and Hearing Research*. 1996; 39: S27-S36.

## What is good enough?

*“How are therapeutic goals for aphasia treatment too modest?”*

An accurate diagnosis of aphasia demands a multi-disciplinary approach. The neurologic examination combined with neurodiagnostic techniques, such as CT or PET scans, and MRIs, provides the basis for establishing a treatment program which may be carried out in conjunction with speech and language professionals, physical rehabilitation specialists, cognitive neuropsychologists, nurses, occupational therapists, social workers and psychologists.

The diagnosis and treatment of aphasia necessitates an understanding of the patient’s medical, neurological, and psychological status.

Clinicians must be aware of the possibility that factors other than aphasia might be interfering with recovery of function. <sup>24</sup>

Assessment ranges from the “bedside language examination,” <sup>25</sup> nonstandard and qualitative, to a battery of standardized language tests (for example, the Boston Aphasic Examination and the Western Aphasia Battery) to isolate the nature of the pathology.

Tests are administered throughout the course of therapies conducted by speech and language pathologists.

Even as a variety of tests have been developed over the years, some

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<sup>24</sup> Helm-Estabrooks N and Albert ML. *Manual of Aphasia Therapy*. Austin: Pro-Ed. 1991.

<sup>25</sup> Kirshner, HS. “Introduction to aphasia.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York: Marcel Dekker. 1995.

researchers are questioning whether they actually provide “culturally appropriate measures for aphasia.”<sup>26</sup> Being unable to diagnose aphasia accurately impacts the efficacy of treatment.

The problem of applying research results from languages other than English has also attracted attention (International Aphasia Project):

“Researchers at the Center for Research in Language at the University of California-San Diego and other colleagues are conducting an international research project on aphasia to study the effects of unilateral brain injury (usually due to strokes) on language and communication abilities. The research is being conducted in seven different languages at the present time.

Since so much research on aphasia has been carried out in English, it is difficult to separate universal mechanisms (discoveries that ought to hold for every language in the world) from language-specific content (results that are only true for native speakers of English).

By doing crosslinguistic comparisons, they allow us to disentangle these differences while we address one of the most important issues in cognitive neurobiology, the issue of behavioral and neural plasticity: How many different forms can the language processor take under a range of normal and abnormal conditions? The focus is on patients with forms of aphasia that are known to affect the processing of words and grammar

(Broca’s, Wernicke’s aphasia and variation of anomia).”<sup>27</sup>

Although the aphasia does demand the intervention of multiple specialists, both in research and treatment, for many patients the ideal of the interdisciplinary team may not be a reality except in major research hospitals or clinics that specialize in post-stroke rehabilitation.

After a stroke the patient may be referred to several rehabilitation specialists without any one in particular overseeing his or her recovery. The family doctor may get reports, the neurosurgeon almost certainly steps back once surgical issues have been resolved, and the neurologist may not remain in active (interactive) contact with the patient during the long process of rehabilitation.

A survey conducted at the Royal Free London Hospital<sup>28</sup> in the UK (the results would probably be similar in the U.S.) examined how health care professionals regarded their work with stroke patients. The observations from the study point to the inherent difficulty of treating the whole patient in a fragmented, time and resource limited health care system.

- occupational therapists reported that they theoretically had lots to contribute but the lack of resources and staff shortages prevented them from fulfilling their potential

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<sup>26</sup> Wertz RT, Chapman SB, Ulatowska HK. *Cultural Influence on Aphasia in African-Americans*. Research is ongoing. Audiology and Speech Pathology, VA Medical Center, Nashville TN and University of Texas-Dallas, Dallas TX.

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<sup>27</sup> Center for Research in Language (UC-San Diego). <http://crl.ucsd.edu/aphasia/>

<sup>28</sup> Pound P, Ebrahim S. Abstract: “Redefining ‘doing something:’ health professionals’ views on their role in the care of stroke patients.” *Physiother Res International*. 1997; 2(2): 12-28.

- nurses and physiotherapists reported they had much to offer and many rewards to gain from their work
- speech therapists reported scarce resources, lack of recognition of their specialty, but felt they contributed to patients' quality of life
- psychologists reported their work to be satisfying and stimulating
- doctors felt they had little to offer and little to gain from working with people with stroke.

A study of speech therapists in Scotland revealed that they had concerns about the effectiveness of their treatments and about other factors that might influence therapy effectiveness.<sup>29</sup>

If a therapist has doubts about treatment efficacy, how will that impact the outcome?

Research on placebo effects and health care professional's attitudes in pain management raises some significant issues that are worth considering.

In some ways, handling patients with chronic pain conditions and those with aphasia present similar kinds of challenges: there is no accurate gauge for how much pain a person is experiencing nor is there an accurate gauge of how much actual language function remains after a stroke nor how capable of rebuilding language function an individual is (taking into account all the factors influencing recovery, as discussed earlier.)

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<sup>29</sup> Greener J, Grant A. Abstract: "Beliefs about effectiveness of treatment for aphasia after stroke." *Int J Lang Commun Disord.* 1998; 33 Suppl. 162-3.

How and why some patients learn to handle chronic pain is as difficult to quantify as how and why some patients can regain their use of language.

No one can say, "Based on such and such a test, you ought to be pain-free or chattering like a magpie."

The effect of intangibles cannot be underestimated on the outcome of therapy, especially therapies administered with a great deal of person-to-person contact.

"The provider's warmth, friendliness, interest, sympathy, empathy prestige, and positive attitude toward the patient and toward the treatment are associated with positive effects of placebos as well as of active treatments."<sup>30</sup>

The lack of results, or results that do not satisfy the patient's own important, internal measure of 'success' leads to an enormous amount of frustration for all concerned.

When expectations are unclear and a health care provider appears dubious or lacks confidence, this has a negative affect on outcomes in pain treatment.

If speech and language pathologists as well as doctors are not completely engaged in the notion that rehabilitation is valuable and that they have a genuine helpful role to play, it could certainly undermine treatment interventions.

Aphasia therapy generally concentrates on improving com-

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<sup>30</sup> Turner JA, Deyo RA, Loeser JD, et al. "The importance of placebo effects in pain treatment and research." Grant HS 06344 from the Agency for Health Care Policy and Research and the Health Services Research and Development Field Program, Seattle WA VA Medical Center. <http://www.muhealth.org/~shrp/ptwww/courses/assign/turner.html>.

munication. It has not yet set the goal of “curing” patients. Patient and family expectations usually mirror the expectations of those providing expert medical advice. As in many other catastrophic illnesses, only a small percentage of families will seek the top specialists in the field. This is partially due to limited financial resources, but also because if your expert has low expectations, it may seem futile to look elsewhere.

For areas in which research is rapidly changing what specialists know, it can be almost impossible for the specialist, much less the layperson, to keep up. So if a patient is told he or she will regain only limited use of the voice or of language skills, that is, sadly, accepted as true.

In some cases, regaining speech may not be possible. Other methods of communication can be introduced. For some patients, the ability to point to pictures may enable them to communicate basic needs.

Assistive technologies such as software with exercises for speech practice are becoming more widely available for the home computer as well as in therapeutic settings. Their value is still questioned.<sup>31</sup>

If patients and their families set a goal to use assistive technologies in order to maximize communication, progress can be made toward basic communication.

For most patients and families, however, settling for an abbreviated form of verbal interaction is far from satisfactory.

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<sup>31</sup> Ruiz A. “Aphasia treatment: on drugs, machines, and therapies: what will the future be?” *Brain and Language*. 71, 200-203 (2000).

Steven Small<sup>32</sup> asks a significant question, “How are therapeutic goals for aphasia treatment too modest?”

He continues:

“The best of modern aphasia treatments try to make small restorative or compensatory changes in language behavior, without ever aspiring actually to *cure* aphasia. The main reason that we limit our aspirations in this way is that it has been inconceivable to make more than modest gains in linguistic or communicative performance after large left hemispheric infarcts. So, while aphasia treatment helps, it does not do enough, and its aspirations are generally too modest for families and patients, and the rapidity and extent of gains from existing approaches keep patients frustrated and disappointed.”

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## What do we know?

Aphasia therapy remains a difficult challenge even with the marvelous insights provided by functional magnetic resonance imaging (fMRI), x-ray computed tomography (CT), and positron tomography (PET.)

Brain imaging studies have demonstrated the importance of brain regions other than the ‘classical’ language cortex in both normal language and aphasia.

“Language requires the interaction of a number of highly integrated systems of the brain...subcortical and prefrontal areas associated with various aspects of arousal, attention, and sequenced planning

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<sup>32</sup> Small S. “The future of aphasia treatment.” *Brain and Language*. 71: 227-232 (2000).

of response seem particularly important in language and speech.”<sup>33</sup>

A hint of the difficulties and sources of frustration for patient and therapist alike because of the fragmented knowledge about aphasia can be found in the *Manual for Aphasia Therapy*.<sup>34</sup>

“It is the clinician’s duty to discover the best way to help an aphasic patient. If a patient does not respond to a particular treatment program, other methods must be explored. If all best attempts to treat the patient fail, then the clinician must explore ways in which communicative factors external to the patient can be manipulated. Aphasic patients who seek our help do not fail us, but we sometimes fail them because our methods for treating brain damage are limited.”

Speech and language pathologists have a variety of exercises and techniques at their disposal. For patients struggling to put their communication skills back together, it may seem as if they are participating in a seemingly random and often simplistic series of tasks.

As with other kinds of medical intervention, the patient’s need to understand why and what the therapies are is often overlooked. The current atmosphere of cost-cutting in medicine contributes to the sense of frustration felt by patients and their families.

For many years, aphasia therapies were based on early neuroanatomic concepts developed in the 19<sup>th</sup> century.

“This part of the brain does that,” in other words.

Our understanding of the brain and of language has led to a less structure-driven approach.

Both hemispheres of the brain do contribute to language function. Although the left-hemisphere seems to be the primary regulator of language, researchers now recognize that the right-hemisphere also contributes to language production.

The brains of some patients have demonstrated surprising plasticity in language recovery after strokes (which is the good news) but seem to involve a variety of neural mechanisms which have yet to be clearly identified (which is the bad news.)<sup>35</sup> Reorganization of the speech networks many possibly occur for more than one year after the stroke.<sup>36</sup>

However, “...results stress the inferior role of the right hemisphere language-related network for recovery from post-stroke aphasia; i.e., it contributes to improvement to some extent, if the more important left hemispheric areas are destroyed....”<sup>37</sup>

We are still learning about the brain mechanisms for human language, considered the most complex of human cognitive functions. Language uses a large amount of the cerebral cortex, but does

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<sup>33</sup> Metter EJ. “PET in aphasia and language.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York Marcel Dekker. 1995.

<sup>34</sup> Helm-Estabrooks Nand Albert ML. *Manual of Aphasia Therapy*. Austin: Pro-Ed. 1991.

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<sup>35</sup> Thompson CK. “Neuroplasticity: evidence from aphasia.” *Communication Disorders*. 33 (2000), 357 - 366.

<sup>36</sup> Karbe HS. “Brain repairs, reorganizes itself to regain speech after stroke.” Presented at the Academy of Neurology Annual Meeting., April 1998. <http://www.plsgroup.com/dg/6FCOA.htm>

<sup>37</sup> Heiss WD, Kessler J, Thiel A, Ghaemi M, Karbe H. “Differential capacity of left and right hemispheric areas for compensation of poststroke aphasia.” *Annals of Neurology*. 1999; 45: 430-438.

not map directly to regions in a straightforward fashion.

Brain imaging now points to three neural correlates of language: widely distributed; regional; and highly localized.<sup>38</sup>

Thus we know that language is not confined to one or two discrete areas but aren't yet able to capitalize on this knowledge.

As imaging techniques continue to improve, the diagnostic and treatment value of brain imaging will certainly increase the chances of reasonable recovery of language after strokes. At the moment, however, it is not clear exactly what we need to know from imaging studies that would improve the outcome of speech and language, or even pharmacotherapeutic interventions.

An additional challenge is the question of how available brain imaging would be for the average patient. Until there is a clear connection demonstrated for how the results of brain imaging could enhance aphasia therapy, it is unlikely that insurance companies or Medicare would reimburse for functional MRI's or other scans.

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## Summary of current treatment approaches for aphasia

"Until World War I, the majority of techniques used in aphasia rehabilitation were 'borrowed' from the field of childhood education. The years following

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<sup>38</sup> Helm-Estabrooks N and Albert ML. *Manual of Aphasia Therapy*. Austin: Pro-Ed. 1991.

World War I witnessed an increase in aphasia treatment studies because of the large numbers of patients with penetration cranial injuries returning from the war."<sup>39</sup>

Research in the past fifteen years has largely focused on resolving the question of whether therapy can produce measurable gains over that observed in spontaneous language recovery.

"Although different aphasia therapies are usually considered to be either effective or ineffective in particular settings, they have not generally been thought of as having the potential for harm. Thus, it is perfectly reasonable to try one approach, and if it doesn't work, to try another, without ever facing a risk of detriment to the patient (other than prolonging recovery.) This may not be correct. If aphasia treatments have the potential to change the brain, then they have the potential to change it both for better or for worse."<sup>40</sup>

### Stimulus-response approach (most common)

"First the aphasic deficit is identified and, then, repetitive drill through several modalities (e.g., reading or repetition) is encouraged. An endless array of sophisticated modifications of this traditional approach has been developed."<sup>41</sup>

A promising modification of the stimulus-response model is Melodic Intonation Therapy. "Based on the assumption that the stress, intonation, and melodic patterns of language output are

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<sup>39</sup> Gonzalez Rothi LJ, Nadeau SE, Ennis MR. "Aphasia treatment: a key issue for research into the twenty-first century." *Brain and Language*. 71, 78-81 (2000).

<sup>40</sup> Small S. "The future of aphasia treatment." *Brain and Language*. 71: 227-232 (2000).

<sup>41</sup> Albert, ML. "Treatment of aphasia." *Archives of Neurology* 1998; 55:1417-1419.

controlled by the right hemisphere and, thus, are available for use in the individual with left hemisphere damage.”<sup>42</sup>

MIT “is a hierarchically structured program that is divided into three levels....multisyllabic words and short, high-probability phrases are musically intoned....then, longer more phonologically complex sentences are intoned ...and finally spoken normally.”<sup>43</sup>

Not all patients are suitable candidates for MIT.

The drill basis for speech therapy is widely used. Doubtless, even with newer therapies, it will be found that repetition of some kind will continue to be important component of therapy.

### **Psycholinguistic approach**

Combining both the psychologist’s and linguist’s approaches to the study of language as it is learned and used by people, psycholinguistics has proven more helpful with anomia and agrammaticism than aphasia.

Psycholinguists “ask questions about what information is in the ‘mental dictionary’ and how it is organized so it can be accessed in ‘real time’ (i.e., while we are listening or speaking), and used to assemble multi-word phrases and sentence structure into coherent discourse.”<sup>44</sup>

“The premise underlying this approach is that a specific aphasic sign of symptom may be the surface clinical manifestation of different underlying deficits in within the cognitive structure of language. Only by uncovering the precise

underlying psycholinguistic deficit can therapy be properly targeted.”<sup>45</sup>

### **Cognitive neurorehabilitation**

Treating neurobehavioral deficits such as inattention and memory loss is at the core of cognitive neurorehabilitation.

Some researchers are finding that treating perseveration or attentional dysfunctions can help improve language function.<sup>46</sup>

The neuropsychological exam can uncover many problems with cognition: such as level of self-awareness; attention/concentration difficulties; visual and perceptual abilities; memory and learning abilities; planning and organizing abilities; and perseveration.<sup>47</sup>

Each of these deficits may require a different set of tasks or exercises, which cognitive neuroscientists are developing.

Brain imaging studies support the involvement of “subcortical and pre-frontal areas associated with various aspects of arousal, attention, and sequenced planning of response seem particularly important in language and speech.”<sup>48</sup>

### **Computer aided therapy**

“Technology has also entered the scenario of aphasia therapy, with computers and mechanical devices that can potentially help aphasic persons to communicate more efficiently. The

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<sup>42</sup> Albert, ML. “Treatment of aphasia.” *Archives of Neurology* 1998; 55:1417-1419.

<sup>43</sup> Helm-Estabrooks N and Albert ML. *Manual of Aphasia Therapy*. Austin: Pro-Ed. 1991.

<sup>44</sup> Garrett MF.

<http://w3.arizona.edu/~psych/facsfls/gmri.html>

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<sup>45</sup> Albert, ML. “Treatment of aphasia.” *Archives of Neurology* 1998; 55:1417-1419.

<sup>46</sup> Albert, ML. “Treatment of aphasia.” *Archives of Neurology* 1998; 55:1417-1419.

<sup>47</sup> Helm-Estabrooks N and Albert ML. *Manual of Aphasia Therapy*. Austin: Pro-Ed. 1991.

<sup>48</sup> Metter EJ. “PET in aphasia and language.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York Marcel Dekker. 1995.

development of various programs for computerized language training opened new expectation on aphasia treatment. These programs were considered either as a way for improving cost effectiveness in aphasia treatment, or as a potential tool for developing new therapeutic approaches.

Despite the initial enthusiasm, most programs consist of repetitive drills with lack of flexibility and proved to be no good substitutes for a trained speech pathologist...Hopes for the future lay on an increasingly thoughtful use of technology.”<sup>49</sup>

The use of computers for some patients with severe aphasia can be almost life-saving. Icons, pictures and even simple words are represented on a screen and patients learn to point or manipulate them in order to express basic concepts.<sup>50</sup>

### **Treating the whole patient**

Dr. Martha T. Sarno was one of the early pioneers in recognizing the loss of language had vast implications on the individual and his or her community. One of the methods for dealing with the various social and community issues, as well as individual and family difficulties, was to encourage the formation of aphasia support groups.

Group treatment for patients with aphasia has a great deal of support. There are community based groups. Major research centers for aphasia have support

groups associated with them, as do many out-patient clinics. Most universities with speech and language pathology graduate programs also have communication disorder clinics associated with them which may include aphasia support groups.

The idea is to help aphasics recover functional communication using all available techniques in a comprehensive manner.

As with other groups recovering from major illness or disability, groups can form a powerful social support network as well as opportunity to practice skills and share knowledge.

The Dalhousie School of Human Communication Disorders in Halifax, Nova Scotia has an intensive residential rehabilitation effort. This service, which is unique in Canada, is based on two main principles: research in aphasia has indicated that improved communication skills can be best facilitated through intensive treatment; and, communication does not occur in isolation, therefore partners must be actively involved in any communication intervention program.

The National Aphasia Association founded in 1987 is the first national association in the United States to focus on the person with aphasia and his or her family.

Aphasia support groups are now found in almost state in the US.<sup>51</sup> The NAA lists the groups on its web site and points out: that the list “represents a wide variety of group types and structures. Some consist only of persons with aphasia and their significant others and some are

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<sup>49</sup> Ruiz A. “Aphasia treatment: on drugs, machines, and therapies: what will the future be?” *Brain and Language*. 71, 200-203 (2000).

<sup>50</sup> Albert, ML. “Treatment of aphasia.” *Archives of Neurology* 1998; 55:1417-1419.

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<sup>51</sup> *Aphasia Community*. National Aphasia Association.  
<http://www.aphasia.org/NAAcommunity.html>

more inclusive. Some are free and some are not.”

### Pharmacotherapy

The use of drugs in stroke has been largely limited either to stroke preventative measures or acute post-stroke therapies administered to reduce damage.

Using adjunct drug therapies to improve communication has a sound theoretical basis, but the experimental evidence of real benefit remains unconvincing to some researchers.

“Pharmacotherapy has not yet fulfilled its promise, despite many decades of effort.”<sup>52</sup>

The drugs are utilized in conjunction with speech therapy and some promising work is being done in Germany with piracetam to facilitate rehabilitation of post-stroke aphasic patients.<sup>53</sup> Other drugs that have been tried include bromocriptine<sup>54, 55</sup> which was found helpful in high doses. Vasopressin used in Russia resulted in improvement in speech in 79% of cases.<sup>56</sup> Other promising work

has been done using amphetamines<sup>57</sup> and agents that influence specific neurotransmitter systems.<sup>58</sup>

“Selected linguistic capacities, including verbal fluency and verbal memory, appear to be influenced by specific neurotransmitter systems... At this moment, we are aware of no neurochemical agent that has yet been rigorously proven to ameliorate specific language signs or symptoms... The purpose of pharmacotherapy would not be to replace traditional language therapy.”<sup>59</sup>

### Future directions of therapy

- “Further development of mechanisms to promote neural plasticity in adult humans;” and further development of behavioral techniques that optimize the re-laying of new neural networks within a more plastic cerebrum.<sup>60</sup>
- “Information gained from functional neuroimaging, in combination with behavioral assessment, could direct the therapist to target relatively left or right hemisphere language processes

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<sup>52</sup> Small S. “The future of aphasia treatment.” *Brain and Language*. 71: 227-232 (2000).

<sup>53</sup> Kessler J, Thiel A, Karbe H, Heiss WD. “Piracetam improves activated blood flow and facilitates rehabilitation of poststroke aphasic patients.” *Stroke*. 2000; 31: 2112-2116.

<sup>54</sup> Gold M, VanDam D, Silliman ER. “An open-label trial of bromocriptine in nonfluent aphasia: a qualitative analysis of word storage and retrieval.” *Brain and Language*. 74, 141-156 (2000.)

<sup>55</sup> Bragoni A, Altieri M, Di Piero V, Padovani A, et al. Abstract: “Bromocriptine and speech therapy in non-fluent aphasia after stroke.” *Neurolog Sci*. 2000; 21 (1); 19-22.

<sup>56</sup> Belokoskova SG, Dorofeeva SA, Klemen'ev BI, Ba'unov OA. Abstract: “The clinical evaluation of vasopressin in the treatment of aphasias.” *Zh Nevrol Psikhiatr Im SS Korsakova*. 1998; 98 (7): 25-8.

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<sup>57</sup> Batson-Walker D. “Use of pharmacotherapy in the treatment of aphasia.” *Brain and Language*. 71, 252-254 (2000.)

<sup>58</sup> Hughes JD, Jacobs DH, Heilman KM. “Neuropharmacology and linguistic neuroplasticity.” *Brain and Language*. 71, 96-101 (2000.)

<sup>59</sup> Mimura M, Albet ML, McNamara P. “Toward a pharmacotherapy for aphasia.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York Marcel Dekker. 1995.

<sup>60</sup> Gonzalez Rothi LJ, Nadeau SE, Ennis MR. “Aphasia treatment: a key issue for research into the twenty-first century.” *Brain and Language*. 71, 78-81 (2000).

for treatment in a particular individual.”<sup>61</sup>

- “Refinement of cognitive processing models so that they more closely approximate real brain mechanisms...envison candidate treatment approaches specified for a patient might be tested in simulation.”<sup>62</sup>
- “Use novel biological therapies, including stem cell infusion, neuronal transplantation, and pharmacotherapy to make the brain more amenable to dramatic change in function... This will put new responsibilities on therapists, requiring a shift from ‘effective therapy’ (by comparison with no therapy) to ‘beneficial therapies’ to achieve certain particular biological and behavioral goals.”<sup>63</sup>
- Increased understanding of role of specific neuro-transmitters; defining optimal amount of drug treatment and timing effects on the recovery process...based on the increasing body of literature exploring the use of pharmacotherapy in aphasia therapy.<sup>64</sup>

### About dysarthria

The dysarthrias are a group of diverse, chronic motor speech disorders in which patients are unable to speak with normal muscular speed, strength, pre-

cision, or timing. Dysarthria is a frequent symptom found in conditions such as Parkinson’s disease, cerebral palsy, amyotrophic lateral sclerosis, as well as being a complication of stroke.

The location of the lesion or damage corresponds to a specific pattern of abnormal speech. The Mayo Clinic developed a classification system for six groups of dysarthria.

The type of dysarthria determines the treatment.

“Speech scientists have argued that the instrumental assessment of speech physiology provides more accurate and comprehensive information in neurological cases than do clinical speech tests....(researchers have described) a sophisticated instrumental model for assessment of the dysarthric speaker. However, such a well-equipped speech laboratory is not available to many speech pathologists in the field...it appears that a combination of perceptual measures, nonspeech maneuvers, and instrumental measures provides the most reliable and valid assessment of dysarthria.”<sup>65</sup>

In the treatment of dysarthrias, “the roles played by speech-language pathologists include participation in differential diagnosis, provision of speech treatment, staging of treatment, and timely education so that clients and families can make informed decisions about communication alternatives.”<sup>66</sup>

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<sup>61</sup> Beeson PM, Rapcsak SZ. “Toward a theory of aphasia.” *Brain and Language*. 71, 22-25 (2000.)

<sup>62</sup> Beeson PM, Rapcsak SZ. “Toward a theory of aphasia.” *Brain and Language*. 71, 22-25 (2000.)

<sup>63</sup> Small S. “The future of aphasia treatment.” *Brain and Language*. 71: 227-232 (2000).

<sup>64</sup> Batson-Walker D. “Use of pharmacotherapy in the treatment of aphasia.” *Brain and Language*. 71, 252-254 (2000.)

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<sup>65</sup> Love RJ. “Motor speech disorders.” In: *Handbook of Neurological Speech and Language Disorders*. Ed. Howard S. Kirshner. New York Marcel Dekker. 1995.

<sup>66</sup> Yorkston KM. Abstract: “Treatment efficacy: dyarthrias.” *J Speech Hear Res*. 1996; Oct 39 (4): S46-57.

## Clinical guidelines for treatment of aphasia

### United States

Current United States clinical guidelines<sup>67</sup> for post-stroke speech and language therapy recommend:

“Patients with aphasia should be offered treatment targeted at the identified language retrieval or comprehension deficits and aimed at improving functional communication.”

This recommendation was a “consensus” recommendation, which means that 75 to 89 % of the reviewers agreed with it. (Strong consensus means that 90 % of the reviewers agree.)

The research evidence was “C” which means that the recommendation was supported by a single, non-randomized controlled trial by studies using historical controls or studies using quasi-experimental designs such as pre- and post- treatment comparisons.

Further comments:

“Treatment for aphasia can be integrated with treatments for sensorimotor or cognitive deficits or can be provided separately. Treatment should involve family and caregivers so that effective communication can be reestablished....”

“Evidence from controlled trials on the effectiveness of treatment for aphasia is not conclusive....Some studies indicate benefit...while other studies fail to document sustained benefits....Treatment by trained volunteers appears to be equally effective as that by speech and language professionals, and results appear to be unaffected by delaying treatment.”

In addition, the guidelines have the following recommendations:

- identify characteristics of patients most likely to benefit from rehabilitative interventions
- determine optimal type of rehabilitation program for different types of patient
- identify factors that affect optimal timing, intensity, and duration of rehabilitation
- determining effectiveness of specific treatments or combinations thereof, in reducing impairments
- develop and validate standardized tests for monitoring post-stroke rehabilitation.

### Scotland

Scottish guidelines<sup>68</sup> state explicitly:

“All patients with a communication problem resulting from a stroke

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<sup>67</sup> Gresham GE, Duncan PW, Stason WB, et al. *Post-Stroke Rehabilitation*, Clinical Practice Guideline, No. 16. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research. AHCPR Publication No. 95-0662. May 1995.

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<sup>68</sup> *Management of Patients with Stroke*. A National Clinical Guideline recommended for use in Scotland by the Scottish Intercollegiate Guidelines Network. Pilot Edition. April 1998.

should be referred to a speech and language therapist for assessment and treatment.”

Further, the guidelines state:

“Family therapy involving aphasic patients and other family members improves handicap of the aphasic handicap and reduces depression and emotional isolation in patients.”

“The efficacy of treatment for dysarthria has rarely been addressed, but benefits of early intervention are indicated.”

### United Kingdom

Guidelines issued in the United Kingdom<sup>69</sup> state:

“Stroke can affect communication in different ways. The patient may have impaired motor speech production (dysarthria) resulting in unnatural or unintelligible speech; they may have impaired language skills (aphasia or dysphasia); or they may have impaired planning and execution of motor speech (articulatory dyspraxia). The patient may have subtle communication problems due to higher level language impairment associated with non-dominant hemisphere stroke. Untrained clinicians may misdiagnose the cause of abnormal communication. Accurate diagnosis is essential to guide and inform the team and the family. A speech and language therapist is the most competent person to assess a patient with abnormal communication.

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<sup>69</sup> *National Clinical Guidelines for Stroke.*

Intercollegiate Working Party for Stroke, coordinated by the Clinical Effectiveness and Evaluation Unit of the Royal College of Physicians. London. 2000.

[http://www.rcplondon.ac.uk/pubs/ceeu\\_stroke\\_background.htm](http://www.rcplondon.ac.uk/pubs/ceeu_stroke_background.htm)

- Every patient with a dominant hemisphere stroke should be assessed for dysphasia using a reliable and valid method
- Every patient with difficulties in communication should be assessed fully by a speech and language therapist (SLT)
- If the patient has communication difficulties, the staff and relatives should be informed by the SLT of communication techniques appropriate to the impairment
- Where achievable goals can be identified, and continuing progress demonstrated, patients with communication difficulties should be offered appropriate treatment, with monitoring of progress
- Patients with specific communication difficulties should be assessed by a SLT as to their suitability for intensive speech and language therapy treatment which the trials suggest should be for a 4–8 week period
- For patients with long-term language difficulties, especially with reading, a period of reading retraining should be considered
- Any patient with severe communication disability but reasonable cognition and language should be assessed for and provided with appropriate alternative or augmentative communication aids.”

Tables of evidence supporting the recommendations appear for the guidelines. The criteria for recommendations are modeled on those used by the United States.

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## Glossary of terms

This information is derived from the National Aphasia Association website.<sup>70</sup>

**Aphasia** is an impairment of language, affecting the production or comprehension of speech and the ability to read or write. Aphasia can be so severe as to make communication with the patient almost impossible, or it can be very mild. It may affect mainly a single aspect of language use, such as the ability to retrieve the names of objects, or the ability to put words together into sentences, or the ability to read. More commonly, however, multiple aspects of communication are impaired, while some channels remain accessible for a limited exchange of information.

**Global aphasia** is the most severe form of aphasia, and is applied to patients who can produce few recognizable words and understand little or no spoken language. Global aphasics can neither read nor write. Global aphasia may often be seen immediately after the patient has suffered a stroke and it may rapidly improve if the damage has not been too extensive. However, with greater brain damage, severe and lasting disability may result.

**Broca's aphasia** is a form of aphasia in which speech output is severely reduced and is limited mainly to short utterances, of less than four words. Vocabulary access is limited in persons with Broca's aphasia, and their formation of sounds is often laborious and clumsy. The person may understand speech relatively well and be able to read, but be limited in writing. Broca's aphasia is often referred to as a 'non fluent aphasia' because of the halting and effortful quality of speech.

**Mixed non-fluent aphasia** is applied to patients who have sparse and effortful speech, resembling severe Broca's aphasia. However, unlike persons with Broca's aphasia, they remain limited in their comprehension of speech and do not read or write beyond an elementary level.

In **Wernicke's aphasia** the ability to grasp the meaning of spoken words is chiefly impaired, while the ease of producing connected speech is not much affected. Therefore Wernicke's aphasia is referred to as a 'fluent aphasia.' However, speech is far from normal. Sentences do not hang together and irrelevant words intrude-sometimes to the point of jargon, in severe cases. Reading and writing are often severely impaired.

**Anomic aphasia** is applied to persons who are left with a persistent inability to supply the words for the very things they want to talk about-particularly the significant nouns and verbs. As a result their speech, while fluent in grammatical form and output is full of vague circumlocutions and expressions of frustration. They understand speech well, and in most cases, read adequately.

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<sup>70</sup> *Aphasia Fact Sheet*. National Aphasia Association.  
<http://www.aphasia.org/NAAfactsheet.html>

Difficulty finding words is as evident in writing as in speech.

**Perseveration** is susceptibility to interference from previous stimuli. In some cases this shows up as being unable to shift to a new category or activity. Behavior may also be continue inappropriately, for example, drawing extra loops when copying a multi-loop design. It may result from difficulty in disengaging attention from a stimuli.

In addition to the foregoing syndromes that are seen repeatedly by speech clinicians, there are many other possible combinations of deficits that do not exactly fit into these categories. Some of the components of a complex aphasia syndrome may also occur in isolation.

This may be the case for disorders of reading (alexia) or disorders affecting both reading and writing (alexia and agraphia), following a stroke. Severe impairments of calculation often accompany aphasia, yet in some instances patients retain excellent calculation in spite of the loss of language.

There are a variety of disorders of communication that may be due to paralysis, weakness, or incoordination of the speech musculature or to cognitive impairment. Such impairment may accompany aphasia or occur independently and be confused with aphasia. It is important to distinguish these disorders from aphasia because the treatment(s) and prognosis of each disorder are different.

**Apraxia** is a collective term used to describe impairment in carrying out purposeful movements. People with severe aphasia are usually extremely limited in explaining themselves by pantomime or gesture,

except for expressions of emotion. Commonly they will show you something in their wallet, or lead you to show you something, but this is the extent of their non-verbal communication. Specific examination usually shows that they are unable to perform common expressive gestures on request, such as waving good-bye, beckoning, or saluting, or to pantomime drinking, brushing teeth, etc. (limb apraxia). Apraxia may also primarily affect oral, non-speech movements, like pretending to cough or blow out a candle (facial apraxia). This disorder may even extend to the inability to manipulate real objects. More often, however, apraxia is not very apparent unless one asks the patient to perform or imitate a pretended action. For this reason it is almost never presented as a complaint by the patient or the family. Nevertheless it may underlie the very limited ability of people with aphasia to compensate for the speech impairment by using informative gestures.

**Apraxia of speech** is a term frequently used by speech pathologists to designate an impairment in the voluntary production of articulation and prosody (the rhythm and timing) of speech. It is characterized by highly inconsistent errors.

**Dysarthria** refers to a group of speech disorders resulting from weakness, slowness, or incoordination of the speech mechanism due to damage to any of a variety of points in the nervous system. Dysarthria may involve disorders to some or all of the basic speech processes: respiration, phonation, resonance, articulation, and prosody. Dysarthria is a disorder of speech production not language (e.g., use of vocabulary and/or grammar). Unlike apraxia of speech, the speech errors that occur in dysarthria are

highly consistent from one occasion to the next.

**Dementia** is a condition of impairment of memory, intellect, personality, and insight resulting from brain injury or disease. Some forms of dementia are progressive, such as Alzheimer's disease, Picks disease, or some forms of Parkinson's disease. Language impairments are more or less prominent in different forms of dementia, but these are usually overshadowed by more widespread intellectual loss. Since dementia is so often a progressive disorder, the prognosis is quite different from aphasia.

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## **IF YOU BUILD A MODEL, WILL THEY COME?**

### **Compassionate, dedicated therapists without the proper tools**

Because we are in the midst of what scientists call a paradigm shift, there is no integrated biological and behavioral model of aphasia.

*Does language get lost after a stroke? Are words, sentences, paragraphs, concepts, and symbols erased from the brain-as-blackboard? Or is access blocked? Like a rock fall in the road? Or a diverted stream? How are the areas in the brain needed to hold words and put them together affected after a stroke? Is attention deficit the problem or simply one of many problems? What about memory? Are we re-teaching language? Or are we digging it out? Are we drilling phrases just so people can “get by” in their life (maybe this is the best we can offer now)? Are we weaving new connections? What happens to the brain during recovery? Can we facilitate the brain’s ability to recruit new neural networks through either specific behavioral therapies or medications? How? What works?*

Because we are in the middle of a shift, we need a variety of studies drawing on all the current research approaches. No one can point clearly and say, “*This is what happens. This is how to explain aphasia.*” We need all approaches right now.

Everyone I spoke generally with finds no fault with speech-language pathologists. Speech therapy is an art and a science. Doubtless, speech-language pathologists will remain the major providers of direct therapy to aphasic patients. They will be given new theory and new tools as a model evolves. More science to go with the art. SLPs are the front line, working alongside patients and families. As new concepts are developed, the SLPs need to be given the additional training to integrate ideas into practice. Perhaps certification requirements will need to change. Perhaps a new discipline drawing on multiple fields will emerge to work with aphasic individuals.

### **Just spit it out!**

The wonderfully demented comedy troupe, Monty Python, had a routine in which the tag line was, “*Nobody expects the Spanish Inquisition.*” The Inquisition’s auto de fe, the infamous public burning of a heretic, was an acutely difficult situation, no doubt.

The arrival of aphasia is as unexpected and unwelcome as the Spanish Inquisition. The slow, eternal burn of broken language, aborted comprehension, and a life turned upside down is chronic torture for the aphasic patient. Even those who regain a great deal of function are left scarred with the loss of some

cherished activity or another. Those who do not regain much function often find life lonely and barren.

Aphasia is generally is not the only challenge following a stroke or traumatic brain injury. Patients often have to deal with paralysis, swallowing difficulties, and depression. Then patients have to deal with their families, caregivers, doctors and other health care professionals, employers, and insurance companies. Once they are somewhat out and about, they get to deal with strangers. With the rest of us in the “normal” world.

The valuable role of family and community in assisting aphasic patients is known. Unfortunately, resources are modest and outreach to these groups is minimal. For lucky patients living near major research centers, access to experts and support groups is reasonably good. Most patients and families, however, do not have the resources to seek continued therapy after the token paid by their insurance providers.

Aphasic adults become the proud owners of a chronic affliction (and who can doubt that losing comprehension and communication even to a slight degree is not an affliction?) Once their brief formal, paid-for therapy is over, what next? Researchers and clinicians around the world have found that support groups can provide not only warm and fuzzy support and encouragement, but also concrete coping strategies and that all too infrequent commodity, hope.

What can make life work for an aphasic patient? Certainly not, “*Just spit it out,*” which was the response of one spouse for years to her aphasic husband. Until she learned more about what was wrong and how to help him facilitate communication she was a helpless outsider in the process whose frustration cast a pall on their marriage. Imagine how frustrating it was for the husband who could not even begin to explain.

Clearly there is a place for active family and caregiver training. Who pays for this, however?

Because there is not an integrated model of aphasia, we are largely left holding a big bandage and trying to wrap patients and families in a comprehensive approach that includes, at its center, traditional speech therapy. We must continue to support and increase groups and treatments based on pragmatic communication. We cannot offer more, yet, to most patients. In spite of the dedication and skill of those studying and treating aphasia, the overall outcome for many patients, when all is said and done, is only marginally better than, “*Just spit it out.*”

## **I have a mind...just can't talk**

It is no secret that we Americans are squeamish about brain damage and anything that appears to suggest mental deficiency. Even as we applaud participants in the Special Olympics, we are often kindly condescending.

We are a country of doers and goers and when faced with difficulties often find it easier to evade and avoid than to slow down and learn, or stop judging.

Aphasic adults are blown out of their lives. They open their eyes after a stroke or brain injury and open their mouths and nothing comes out. Or garble comes out (and they think it means something.) Or two or three words come out. Maybe they can understand, maybe they can't. Perhaps all numbers elude them, even though they were math whizzes once. Maybe they can read, maybe they can't. Infinite variations.

I remember Mr. Miller, a loyal patron in the public library where I worked for many years.

He had severe cerebral palsy, was missing one hand, had a swallowing problem, and could only speak slowly and indistinctly. But if I sat down and listened to him, we could not just converse politely, we could communicate. Over the years I have encountered Mr. Miller. He takes the bus, volunteers at a local rehab hospital, got married several years ago, and continues to frequent the library. I am not sure if he has aphasia, certainly dysarthria. But he taught me about endurance and patience.

I know that many people thought he was "slow." His estimation dropped in their eyes. Or they pitied him. Who wants to be patronized? Who wants to be pitied? I don't. Neither do aphasic patients. Yet their forays into the world of talkers is often unpleasant and even painful. They isolate themselves, which makes everything much worse.

We value sharpness, intelligence, and speed in our culture. When one loses his or her edge, can't express his or her intelligence, and slows down: out of the loop! Where are the public awareness campaigns about this chronic condition that effects 1 million Americans? Someone needs to speak up.

While we are asking this, we can ask: What about doctors treating brain injury and stroke? When are more of them going to catch up on their literature and offer support and encouragement to their aphasic patients?

## **There's nothing you can do**

So far I haven't talked to anyone with aphasia whose initial encounter with the medical profession was better than, *"You might get a little better with time. But really there is nothing you can do so don't expect much change."*

That was the positive statement. Often the judgment (remember the Spanish Inquisition) was, *“She will never talk again.”* The husband of an aphasia patient (12 years post-stroke) who was told she’d never talk, put it more bluntly, *“We’ll have to wait until the old guard dies off before aphasia patients get the help they need.”*

Some folks react strongly to being told “never.” They won’t capitulate. They have families and support and that elusive motivation or inner drive. We know that is important but we can’t measure it. We don’t know how to tap into it. Others give up. One caregiver told me that there are two kinds of stroke survivors: those who give up and those who don’t. Can we do anything about those who give up?

Perhaps not telling them nothing can be done would be a good start.

We do know that over 50 percent, perhaps as high as 70 to 80 percent of aphasic patients will have depression. Oh, they are sad. Who wouldn’t be after stroke? I am going out on a limb here to say that very few people, including so-called experts, have a clear understanding of what depression is.

Let’s look at this so-called mood disorder more closely. Depression is one of the unruly stepchildren of mind-body medicine. A stepchild that has been kept relatively controlled by a variety of medications. Seemingly guided by, *“Oh, this seems to help even if we don’t know why.”* The neurochemical basis for depression is still unclear. Serotonin, much beloved by theorists, is not the whole answer. It might not even be an answer for some kinds of depression.

Depression is not merely a bad or sad mood. Mood can change with depression and is often the outward signal of something wrong, but it is simply a symptom of a more profound, far-reaching physiological sea change that has ramifications throughout the body and brain.

For some, mood itself governs the course of their depression. For others, with chronic pain and other conditions, mood may be secondary to physical symptoms. In other words, mood itself is not a reliable indicator of depression.

What simple thing have we learned about strokes and depression? The incidence of depression in aphasic patients, with no ancestral history of depression, is related to the area affected by the stroke. This is important.

We now are getting into the brain and zeroing in on changes in neural network. Depression is not randomly distributed among the patient population after a stroke. You’re sad and I’m not. He’s depressed. She’s not. It is highly correlated to the site of damage. Right front quadrant has zero incidence of depression. Right rear quadrant, 13 percent. Left rear quadrant, 17 percent. And left front has 60 percent! (Based on work done by Jeffrey Evans, Ph.D. at the University of Michigan.)

If depression in an aphasic patient is not controlled, little progress regardless of other therapies can be expected. And maybe the presence of depression is giving us important information about neurochemistry that we are not in a position to understand yet.

We know from other studies of illness and depression that this will be an uphill battle. Depression's role in exacerbating or even producing symptoms is generally misunderstood at best, at worst not well applied or ignored in the real world of patients and doctors.

### **Computers (not covered in detail in *Research Summary*)**

Computers can be used as an augmentative aid in aphasia, a substitute, in a sense, for the patient's own language. Although being able to communicate basic needs and concepts is a boon to someone who previously could not, it is a pale replica of conversation and comprehension.

Malcolm McNeil (University of Pittsburgh) summarized:

Computers will not facilitate a bad treatment and they are not likely to provide a treatment that cannot be done in their absence. They could help deliver an otherwise theoretically sound and experimentally validated treatment.

Perhaps the greatest potential for computers is in conjunction with therapeutic assessment and treatment. Surely being able to vary exercises for patients to use at home, being able to manage endless repetition and feedback can allow motivated aphasic individuals more practice than is possible now. With the current climate of minimal insurance reimbursement of speech therapy, being able to take the proper practice home could make a huge difference. The goal is to provide easily administered, efficacious treatments that can be delivered cost-effectively.

The use of computers, however, is limited in the same way as other current therapeutic interventions. The best exercises are not experimentally validated. The model that allows treatment is still rooted in childhood education. The rapidly growing body of knowledge regarding brain function and recovery has not been incorporated into an integrated model of aphasia.

Michael Weinrich (Departments of Neurology and Rehabilitation at the University of Maryland in Baltimore) is one of the pioneers in computer-assisted therapy. At the Aphasia Research Center in Boston, Errol Baker and Marjorie Nicholas are showing "modest but real" with C-ViC. (icon based computer-assisted visual communication.) Work is being done to predict which patients are the best candidates for C-ViC by mapping lesions and looking at the patients' success using C-ViC.

Speech recognition technology based on natural language understanding (MossTalk) has shown promise for rebuilding communication skills. The program provides feedback on whether patients are building sentences correctly. MossTalk is being developed with the assistance of Unisys Corp. (Marcia Linebarger) at the Moss Rehabilitation Institute in Philadelphia (Myrna Schwartz.)

Myrna Schwartz is currently studying the effect of using a specialized email system to help aphasic patients form social bonds using communication groups, email, and a PC-based augmented communication system (CS.) Eventually, vocal messages will be able to be sent via the Internet. Will the combination of conversation groups, Internet communication, and CS have a positive effect on language performance, functional communication, and psychological well-being? One hopes so.

A study in Scotland of a computer-based communication system called TalksBac (University of Dundee, Department of Applied Computing) concludes that "TalksBac has the potential to augment the communication abilities of nonfluent adults with aphasia, who have not been able to develop their own compensatory strategies."

A study at Frenchay Hospital in Bristol, UK looked at whether potentially harmful behavior patterns might be adopted when computers were used at home. They found no evidence of harmful habits being developed.

Leora Cherney (Rehabilitation Research Institute Corp. in Chicago) is using her reading aloud treatment as the basis for a computerized approach to aphasia therapy. Oral Reading for Language in Aphasia (ORLA). She has found in preliminary work that her approach produces improvement not only in reading comprehension, but also auditory comprehension and oral expression.

At the Department of Veterans Affairs Medical Center in Phoenix researchers concluded that a computerized reading treatment for aphasic adults was efficacious. Improvement was generalized to non-computer language performance.

Several programs (C.H.A.T. and software from Bungalow) were mentioned to me by aphasia patients mentioning the hope these might help them.

### **Follow the money**

The National Institute of Deafness and Communication Disorder is the lead National Institutes of Health agency funding aphasia research. In 2000, 4.1 percent of its budget went to aphasia research. That was slightly over 9 million dollars.

That's the big piece of the aphasia research pie. The leading advocacy group for aphasia, the National Aphasia Association, doesn't providing research funding. I received no response from my inquiries about research funding from the American Speech and Hearing Foundation. The Department of Veterans Affairs also funds aphasia research. I do not have a figure for that.

Assuming (really wildly) that DVA also spends about 9 million dollars on aphasia, it gives one pause to think that **\$20 dollars per aphasia patient would more than double (probably actually triple) monies spent on aphasia research in the United States.**

Although some medications are being researched, the often mixed-blessing relationship between industry and research is lacking with aphasia research. If some pill or another proves successful that will increase the amount of money available for pharmacotherapy.

This is not a solution, however, to funding aphasia research.

The only other major industry collaboration potential is with software and computer engineering firms. Because the role of computers in treating aphasia is still relatively unproven, there are not huge opportunities for co-research. Again, if a particular system or approach proves successful, those funding opportunities will increase. Again, hardly a systematic solution.

Research universities and institutions are able to process private donations for research so that they are tax deductible. It would be possible to assemble an informal advisory board and contribute money without the infrastructure of a foundation or organization. This might be one approach to supporting research on a case by case basis without restricting future options.

### **Hot off the genome**

Finally, the first research directly linking a speech and language disorder with a specific gene, the FOXP2. Scientists now have a locus, once a locus, then more individual genes and the proteins they code for. This is how breakthroughs are born.

It is difficult to anticipate how the recent research on the FOXP2 gene will influence research in aphasia. Identifying this gene, one that causes a severe speech and language disorder, is the first step, perhaps, in unraveling the overall genetics of speech and language. Undoubtedly, research into the neural circuits for speech and language will get a boost from this very specific study. Are some people at greater risk for poor recovery due to an underlying genetic strength or weakness in speech and language? We don't know and we need to find out!

### **What I think is most important**

- Public awareness of aphasia as a chronic condition must be increased!
- Ditto
- Educational programs for caregivers and families need to be packaged and distributed. The Internet is now a major tool for health care information. Let's exploit that.
- Education of doctors and insurance companies on aphasia as a chronic condition in which improvement can be seen over time is vital.
- Support for support groups needs to increase: educational materials, advice on finding sponsorship that kind of thing, small grants to community groups.
- Research that involves brain imaging to track changes in neural anatomy needs to be encouraged. Regardless of the therapies being tried, brain imaging studies should accompany them.
- Research borrowing from constraint-induced therapy and other behavioral approaches not apparently directly tied to language may be important to integrate.
- Research in neurochemistry is important, although pay-offs are likely to be many years off.
- Efforts to find a useful pharmacological adjunct need to continue.
- Further developing our social model of aphasia treatment using groups and social support in a setting that can provide comprehensive help is important until a cure is found.

## RESEARCHER STATEMENTS

*The following statements are a mixture of verbatim and paraphrased dialogue. I integrated email, phone interviews, and published works to capture the essence of what each researcher had to say. If I inadvertently mis-stated an opinion or fact, I alone am responsible for that error. When in doubt, assume I did it, not the researchers who generously assisted me. More detailed information about several of the interviewees can be found in the Appendix.*

### **AUDREY L. HOLLAND, Ph.D.**

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Dr. Holland emphasized the value of increasing aphasia awareness through public education and awareness campaigns. She also underscored the vital role that family members, caregivers, and the community at large can have in helping patients cope with their aphasia and learning how to communicate more effectively.

She pointed out one of the real roadblocks: the attitude of many doctors that there "isn't much you can do about it."

Aphasia is a chronic condition that can be ameliorated to some extent throughout a patient's life time. Skills can be improved through a variety of strategies. When patients accept that their life has changed, there is no going back, then they can devise ways to communicate their basic needs. Basic needs are not simply requests for food, water, and shelter, but the needs of an individual who had a life full of activities and interests prior to the condition which lead to aphasia. Pointing and grunting are not satisfactory substitutes for human communication and interaction. Sometimes, however, the choice is that bleak: being held incommunicado or learning to point to pictures. For more fortunate patients, language skills actually return to some extent.

Almost always, however, loss is present. Some activity is beyond reach even for those whose cognitive and conversation skills are close to their pre-stroke levels. Aphasic patients are dealt a blow to their quality of life, to their self-esteem.

The question posed by the University of Arizona team is, "What would you like to do that you can't because of your aphasia?" If the patient has accepted the fact his or her life is now different, is now transformed, a strategy of living that takes aphasia into account can be designed using a comprehensive psychosocial

approach. With individual and group therapy, some semblance of a satisfactory life can be re-constructed.

We lack a coherent theoretical model that explains aphasia, thus we lack concrete experimental evidence that indicates which therapeutic intervention might surpass another. A psychosocial approach toward functional communication at least allows patients to achieve some degree of relevant conversational, reading and comprehension skills. “What can we do now to improve the quality of life for aphasic adults?” summarizes Audrey Holland’s approach to this challenging problem.

**What are the current gaps between aphasia research knowledge and field application of that knowledge? How do we reach practitioners and patients with relevant information? Are there any good models for this?**

There are huge gaps, and two big reasons for them. First of all, most aphasia research focuses on the language disorder, and what can be learned about normal language processing by studying disordered language. This means that for much of this work, its clinical application is limited. Even though most researchers give lip service to clinical implications, those of us in the trenches can’t often find the implications, and those who do the language processing research often don’t know very much about the persons with aphasia, just about the exotic language.

Second, research that directly focuses on the value of clinical intervention and the development of new treatment approaches is notoriously difficult to do, extremely time consuming and seldom looked on with favor by federal funding sources. For example, the use of qualitative methodologies, many of which are very appropriate to treatment research, are basically anathema to the NIH. Thus many studies that have purported clinical value end up using methodologies that are so tightly constrained as to make the behaviors of their focus (for example, obscure syntax, or word retrieval devoid of context) almost trivial in relation to the big picture of living with aphasia.

In terms of reaching practitioners, I don’t see reaching practitioners as the big problem. Rather, I see their being able to use some of the available, cutting-edge techniques as a bigger problem. The limitations imposed by the current healthcare climate, where quality of life seems to have gotten lost in the shuffle, is the culprit.

I spend a lot of my time doing workshops and seminars that teach new methods and stretch the wings of clinicians. Attendance is always good, and responses are very positive. But the underlying complaint never varies, *“How can we apply these approaches in the places we work? Under the current rules for reimbursement?”*

**What are the current gaps between aphasia therapies and access to therapies? Is this an insurance issue? Education of physicians? Are patients being enthusiastically and appropriately referred to therapists? Who is doing this well?**

I think I got into this question in the preceding paragraph to some extent. It certainly is an insurance issue, but it also reflects the medical culture in which aphasia therapies were born. Doctors are skeptical—the Cochrane report to which you referred is an excellent example of overstatement in the extreme, but reflects the problem. Thank you for quoting my counter position to it as balance. And the medical model is frankly outdated in its relevance for the treatment of aphasia. The model has moved into the social, interactional realm. But it is the medical model that controls access to treatment. And patients run out of funding long before they run out of appropriate treatment possibilities.

Under these circumstances, it is hard to think of “enthusiastic and appropriate referral patterns.” We have a very large aphasia clinic here at the University of Arizona and because we focus on group therapy and cost effective individual treatment of a functional nature, we are relatively cheap. We have sold this notion to local hospitals and rehab centers, and we get tons of referrals from them when their patients run out of benefits because we provide an affordable alternative. I think this is an expandable model.

A second model is that embraced by the Connect Program in London, which is sponsored by a private foundation. Its goal is to serve aphasic patients, develop treatment methods, and to spread itself across the English healthcare system. (Sally Byng at Connect, 16–18 Marshalsea Road, Southwark, London, SE1 1HL, UK.)

**What are the levels of research funding? Are there any significant clinical trials that need funding?**

Aphasia treatment research per se is not sexy at the NIH, for reasons described earlier. It looks a lot better on paper from say NIDCD, than it actually is because of the factors listed under question 1.

My sense is that there is a lot of relevant research that fails to make the funding cut for most agencies, and my own thinking is that private foundations really need to be made more aware of the aphasia community’s needs in this regard.

Clinical trials are always welcome. But as you know randomized controlled trials are designed for pharmacological and surgical (medical model again) treatments. When they get applied to behavioral changes, they become very complex and extremely expensive. For example, dose-

response curves are easy with pills. Imagine trying to do them well with sessions and focus of language therapy.

**Are computer programs helpful in regaining speech? Who are the experts in this area?**

I think computers have a role in aphasia treatment. I do not think they substitute for clinicians, nor are they appropriate for all problems in aphasia, but they certainly are useful adjuncts. I think the most knowledgeable persons in this regard are Marcia Linebarger (associated with Myrna Schwartz at Moss Rehab in Philadelphia. MossTalk) and the C-Speak group at the Boston VA.

**What about the great enthusiasm in some quarters for use of fMRI in therapeutic interventions?**

As for therapies based on fMRI, I am leery, except in the most general senses. I see the potential for fMRI as being able to find out how and if the brain might be altered physiologically BY therapy, and for tracking changes over time, but it basically leaves out the neurochemistry—and I think we're a long way off from building treatment on it. In fact, there are huge gaps in knowledge that fMRI might never touch. Mind you, I am a great advocate of learning what we can from this powerful tool, but guiding therapy? Not now.

Research on neural plasticity, some of which can be demonstrated using the fMRI as an observational tool, is hot stuff. But we are just beginning to understand the implications of this.

**What do you think is the greatest difference between your “supported conversation for adults with aphasia approach” and that of the cognitive neuropsychologists?**

First, there is a difference in focus from strengths (us) versus weaknesses and areas of deficits (them), in a nutshell. Please note that neither of these approaches is right or wrong, and there is overlap at many times, too. Second, groups have a central role in our treatment, not a peripheral one.

There are a couple of big structural differences: first, we target very different behaviors to work on. Cognitive neuropsychologists tend to target more linguistic and structural elements than we do (unless, of course a patient clearly WANTS to do that sort of work). Second, our clinic and our research base is clearly centered on learning to live as well as possible with aphasia. This means we have an opportunity almost daily to see the effects of what works and what doesn't work in lessening aphasia, and although we are concerned with the impairment of aphasia, we are perhaps even more concerned with its effects on limiting normal activities and societal participation (World Health Organization's terms). So our designs for treatment research are not limited to single-subject

designs, but are often pre-post treatment comparisons, group studies, and in some cases, derived from qualitative methodologies as well.

On a more philosophical level, involvement of aphasic person/family in setting treatment goals is central to what we do. So are a couple of issues, like planning and promoting work to be done at home, not only to make up for lost time under current reimbursement plans, but clearly illustrating the necessity of personal/family responsibility in lessening aphasia (and of course, thereby playing havoc with tight treatment designs).

We also focus more on the development of strategies for compensating for language problems (for use by both aphasic people and their families) as well as approaches that focus on attempts to eradicate language problems. The chronicity of aphasia is what people have been ignoring when in fact, understanding its chronicity and working within it to improve the aphasic condition is a key to management.

Indeed, paradigm differences are at the heart of all of this—and I agree that both approaches need to be supported. I cannot imagine, regardless of our functional thrust for example, saying to a patient, *“We can’t work on your word retrieval problems.”* Or, *“Forget the little words. They don’t contribute much to transmitting meaning.”*

We have plans for expanding our aphasia clinic here at Arizona. I am going to be spending most of my time next year developing a residential program to complement our current day clinic, concentrating predominantly on chronic aphasic patients, and evaluating a holistic approach to learning to live successfully with aphasia, rather than curing it. There is a groundswell of enthusiasm in the US, Canada, Australia and England for such approaches.

**What are the major differences in assessment tools that you use and the strict neurolinguists use for aphasia?**

There are practically no differences. We all use a range of different tests for different purposes (in our case, some functional measures are added that are not used by “strict neurolinguists”.) But almost all of us use tests such as the Western Aphasia Battery or the Boston Diagnostic Aphasia Examination to gain a clear picture of someone’s aphasia, and as a baseline measure, and selected subtests of, say, the PALPA (Psycholinguistic Assessment of Language Processing in Aphasia), when we are going about attempting to delimit a patient’s particular neurolinguistic deficit at the single word/phrase/contextual level.

To this mix, we add other measures specifically related to other variables of interest. For example, I might decide I want to put the aphasia into its overall cognitive context, so I might opt for a measure such as the Test of

Nonverbal Intelligence, or use another test, on which we should not expect to see change as a result of treatment, as a control test. I think this is probably true of most research programs, as well.

**If you were to go with a strictly cognitive/neurolinguistic approach, where is the best work (from the point of view of developing tools for treatment) being done?**

This one is the tough one. Work by Pelagie Beeson here at the University of Arizona is particularly strong using a cognitive neuropsychological approach to reading and writing in severe aphasia, although she gives it a lovely functional twist as well. Rita Berndt at Maryland is excellent at both lexical and syntactic issues from this point of view, and so is the MossRehab Group in Philadelphia (Myrna Schwartz and Marcia Linebarger et al) although they seem to grow more functional by the moment.

Finally, in a direct cognitive tradition, not cognitive/neuropsychological, there is Nancy Helm-Estabrooks at the Boston Aphasia Research Center, and (while not terribly practical in the real world of patients) Cynthia Thompson works impeccably within a Chomskian linguistic tradition. (Example of current funded study: Linguistic Specific Treatment in Aphasia.)

**Do you think there is value in endowing a university chair to support aphasia research?**

I have doubts about that as a way to go, primarily because, as you sit in one of those, you still have the same academic responsibilities and I suspect that that fact makes it easier to forget how and why you were endowed. Research grants, clear expectations, funding of specific projects, and deadlines strike me as a sounder approach. That is, the research itself takes the money, paying for an endowed chair fails to address the issue. An alternative in that ballpark might be a grant with some strings attached, to, say, conduct research on treatment—something like a MacArthur grant. Also, this would not limit recipients to academic institutions.

**MARTIN L. ALBERT, MD, Ph.D.**

Currently on sabbatical in Paris

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First, I think it is extremely (I would like to find a stronger word, like exceptionally or supremely) important for those of us who are trying to help persons with aphasia to understand the degree to which their limitations with communication can be stressful.

It is not unusual for me to hear aphasiologists say, “so-and-so has made a good recovery,” and for me to find that “so-and-so” is still trying to come to terms with the residual communication difficulty. Consequently, I find your statement about a patient who “is doing extremely well, but remains frustrated...” to be the rule, rather than the exception.

**Is there any particular research or programs that you would like to see funded? Are there any significant clinical trials that need funding?**

What is lacking more than anything else in this field, in my opinion, **is** funding for clinical trials. These are expensive. Support from NIH is excellent, but is generally limited to research that is highly likely to succeed. Thus, there is a conservative streak in NIH funding which ends up yielding publishable results of often derivative research.

Money is needed for what could be called ‘high risk, high return’ research. That is, it could provide a funding boost to original, creative ideas that may not pan out but which, if they did, would make a big difference to the world of aphasia therapy. An example of this would be to fund projects similar to one I have been working on for a number of years in pharmacotherapy, but have difficulty getting NIH to fund because it is not clearly a ‘winner.’

I have been working on a project, with assistance from researchers in Paris and Japan, to examine the role of certain neurotransmitters. We have gross results that need to be further supported experimentally: language output abnormalities have been linked to dopaminergic system deficiencies and anomia and auditory comprehension disorders have been linked to cholinergic deficiencies. We have had some remarkable results with a small pool of single-case studies in which patients served as their own controls.

I am involved with the National Aphasia Association (NAA) which has struggled with a modest budget for over ten years. It is the first and major U.S. group devoted to active advocacy for aphasia patients and their families. As little as \$50,000 could make a big difference. Obviously, more money could enable NAA to perhaps emulate the successes of organizations like the National Head Injury Foundation (NHIF) and the Alzheimer’s Association. These groups have local chapters and are active in influencing major funding decisions as well.

Interestingly, when looking at numbers, according to the NHIF, 30,000 to 50,000 of the 400,00 to 600,000 people who sustain traumatic head

injuries are left with noticeable physical, social, and cognitive deficits severe enough to prevent them from returning to their former levels of function.

Compare this to the approximately 80,000 out of 500,000 stroke victims each year who become aphasiac. Even though 1 million Americans are aphasiac, diseases such as multiple sclerosis (250,000 to 300,000 in the US) and Parkinson's (600,000 to 1 million in the US) are much better known due to active public awareness and education campaigns, televised programs, and grass roots events.

Nearly 4 million Americans have Alzheimer's disease, according to the Alzheimer's Association. This is clearly a problem that needs to be addressed in a comprehensive fashion, as they have been doing, with an active international organization. It is a useful model for aphasia.

According to a survey by NAA, 90 percent of those with aphasia believe that public knowledge about aphasia is minimal. We have a lot of work do!

**Are there promising researchers that might not be as well known as some I have mentioned?**

If you have not run across him yet, I'd like to mention David Caplan at Massachusetts General Hospital. Two of his current funded projects are "Sentence Production in Aphasia," and "An Investigation of the Trace Deletion Hypothesis."

His research on sentence production aims to gather basic data currently unavailable, with the goal of improving aphasic patient's sentence production abilities. As you know, producing sentences in conversation would go a long way in improving the quality of life for aphasic patients.

### **MALCOLM R. "MICK" MCNEIL, Ph.D.**

Professor and Chair, Department of Communication Science and Disorders  
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We are looking at brain change with aphasia research. Although we can change the context of communication and assist aphasic adults in learning how to leverage their skills so as to participate more fully in their life, the goal needs to be understanding where the deficits are in the brain so we can fix them.

I don't think that language is lost after a stroke. It becomes difficult or impossible to retrieve language because of brain damage. We aren't trying to re-teach

language with therapy and treatment, we are trying to help aphasic patients find out where the lost words and symbols are and regain full access to them.

**Is there an non-research activity that you think could be valuable to support?**

I think funding a small conference of some sort where leading experts could convene to discuss these important issues and perhaps realize a set of priorities and a set of strategies for their resolution. If you are interested, I might be interested in organizing (or helping) such a summit. A possible model for this kind of summit might be one in which I am participating in February, 2002 on *Apraxia of Speech*.

The Academy of Aphasia, for example, provides a valuable international forum supporting shared research and expertise.

**What are the current gaps between aphasia research knowledge and field application of that knowledge?**

There certainly are gaps between research supported clinical evidence and practitioner's implementation of this information. Among the most prominent reasons I believe are: a culture among practicing clinician to not keep up on the literature and insurance (3rd party payers) coverage limitations that absolutely and categorically prevent "best practices" when they are available and known.

**What are the current gaps between aphasia therapies and access to therapies? Is this an insurance issue? Education of physicians? Are patients being enthusiastically and appropriately referred to therapists? Who is doing this well?**

There are always issues of getting appropriate referrals from PCPs because of misinformation, lack of information, disciplinary arrogance and bias. Our ability to get appropriate referrals is probably considerably higher than the average because of our procedures in the Pittsburgh Aphasia Treatment, Research and Education Center and because of the circumstances with the VA hospital (a portion of the PATREC). Another factor is the relatively high profile and perceived competence of the co-directors of PATREC (myself, Dr. Patrick Doyle and William Connors) due to our clinical successes and because we do research on these issues that the referring physicians (and others) know about and respect.

The psychosocial approach is important. We use a comprehensive approach here, but that is not sufficient to address what I believe to be the underlying problems that result in aphasia: attention deficits, memory and resource allocation problems. We need to get at those kinds of issues before we can see any real, substantial improvement in the kinds of therapies we can provide.

The team we have at Pittsburgh and Carnegie Mellon is well positioned to do research in aphasia. Endowing a university chair, which incidentally costs \$1.5 million here at Pittsburgh, often has magnet effect and attracts additional money along with top researchers.

**What are the levels of research funding? Are there any significant clinical trials that need funding?**

The levels of research funding are relatively low compared to many other less prevalent and handicapping conditions. This is due to a couple of factors: few qualified persons doing this research; an emphasis on “randomized controlled trials” as the only source of evidence, a standard that the field is not yet ready to undertake; and, we have not had a public figure with aphasia to draw attention to aphasia (possible exception of Kirk Douglas) the way that Parkinson’s Disease (Michael J. Fox) or Alzheimer’s Disease (former President Reagan) has.

There are a thousand clinical trials that need to be funded! They are all (or nearly all) pre-RCT paradigm. We need more applications of small-scale studies. We need to find funding for the right small scale work in order to justify the larger, multi-site clinical studies so beloved by NIH.

Lobbying for federal funds for the “right kind” of research is very important. Other solutions to funding pinches are also appropriate and possible with support from well-endowed private foundations, direct support of post-doctoral candidates, endowing a university chair, or even hiring an executive director for programs like PATREC that require researchers’ time to administer and run.

**How sufficient are the assessment tools neurolinguists use for aphasia?**

For the most part, the assessment tools are OK. The measures are pretty good. Some of the more specialized assessments do require additional training. They are not off the shelf for the majority of speech-language pathologists. We do provide specialized training at Pittsburgh with this assessment tools.

**Are computer programs helpful in regaining speech?**

There are experts in the implementation of computers in aphasia treatment and computers clearly should have a place in the treatment armamentaria of SLP’s, however, the problems of good aphasia treatment are not due to computer applications research or development.

Computers will not facilitate a bad treatment and they are not likely to provide a treatment that cannot be done in their absence. They could help

deliver an otherwise theoretically sound and experimentally validated treatment.

## **MARCEL A. JUST, Ph.D..**

D.O. Hebb Professor of Psychology  
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We discussed the importance of having access to a sufficient pool of candidates for research. Obtaining subjects for human research is a challenge in of itself. For some researchers access to subjects is more restrictive than lack of funding.

Dr. Just is completing work on a paper that is not ready for public release. He sent me the paper which appears to be a useful model for continued work in aphasia treatment. The work is based on a neurocognitive approach using fMRI to determine whether the therapy produced a task-specific change in patterns of brain activation. The research was a collaborative effort with researchers at the University of Pittsburgh, in addition to the professionals at Carnegie Mellon. This relationship, which includes access to the VA system, as well as a number of hospitals, permits a great deal of research on aphasia to take place.

It is important to recognize that improvements can continue for a number of years post- stroke. Aphasia is a chronic condition. Insurance companies treat it as an acute situation and do not support efforts to continue therapy. Some of Dr. Just recent work has been with patients more 5 years after their stroke. It appears that old function doesn't return, but new networks are established. The brain has a remarkable capacity for recovery through recruitment of new areas and we need to learn to exploit that with appropriate therapies.

Dr. Just mentioned how moving the theatrical production of *Wings* (Arthur Kopit) about the struggles of a person with aphasia was.

<http://endeavor.med.nyu.edu/lit-med/lit-med-db/webdocs/webdescrips/kopit826-des-.html>:

*In the well-written preface, Arthur Kopit describes how he came to write Wings, a play about stroke and language disorder. And he explains there how his fictional account of strokes and their aftermath, "is a work of speculation informed by fact." One fact important to Kopit was that his father suffered a major stroke seven months before Kopit was commissioned by National Public Radio to write an original radio play. Wings, (which has been successfully staged as well) however, is not*

*based on Kopit's father, but on the life of a character, Emily Stilson, who is an amalgam of people, both stroke victims and their stroke-recovered caregivers, from the rehab center caring for Kopit's father. The title of the play refers to an early career of Emily Stilson--she was an airplane wing-walker. Kopit deftly employs the sounds of an airplane in the scenes in which Emily is experiencing a stroke. In fact, the sounds and sights inside and outside of Emily as well as her private dialogue are combined masterfully by Kopit to bring about a high degree of verisimilitude to the chaos produced by stroke.*

## **STEVEN SMALL, MD, Ph.D..**

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Dr. Small asks, "Can we cure aphasia?" Although he understands that we now regard aphasia as chronic condition, he sets his bar high: cure it. To cure aphasia, we need to change the brain. That's where the work is.

He suggests that we change the current, standard definition of aphasia:

"...an acquired impairment of language performance produced by damage to the brain."

He thinks this definition is more applicable:

"Aphasia is a result of a stroke and other brain injury which is characterized by difficulties with language use, signified by language, memory, motor, visual spatial and affectual disorders. Aphasia is chronic but gradually improving over months to years, often accompanied by social problems for both the afflicted person and their communication partners."

Although there is no question that aphasia therapy helps, no method has been proven superior to any of the others. There is no integrated model of aphasia, but that doesn't mean we can't help people with aphasia. Right now, a comprehensive approach similar to that used in Alzheimer's clinical centers is a reasonable model. But we can't stop there!

There are a number of important issues to address, even in the absence of an integrated biological and behavioral model of aphasia. We need to know what medications can interfere with stroke recovery. Over 80 percent of people are

taking medicine at the time of their stroke. We don't need to make matters worse. What inhibits recovery?

Also, we need to identify remedies for specific biological problems in the brain. We know that people with strokes have decreased cerebral perfusion; they have decreased glucose metabolism globally; and, they have decreased catecholamine concentrations in particular regions. We also know that catecholamine, monoamine and cholinergic receptors are found throughout brain regions involved in language and memory. Let's move ahead and study these concepts.

Clearly, the problem of depression and other so-called affective disorders needs to be addressed. We find that 70 to 80 percent of people with aphasia probably have depression. We don't know what anti-depressants are most efficacious for aphasics because we don't know what isn't working (neurochemically) post-stroke.

We have seen the importance of motivation in stroke recovery. We cannot quantify motivation, but clearly one of the things that correlates best with patient recovery, perhaps more so than injury size or site, is how driven the patient is to get better. What can we do to maximize motivation? Can we learn to measure it in a clinically useful way?

We need interventions that are biological and behavioral, and then establish the correlation between biology and function. For effective therapies of any kind, we need to monitor their biological effects. We have to keep looking at the brain until we can cure aphasia.

Dr. Small's Mary Law Lecture 2000, "*The Future of Aphasia Therapy - is it just a dream?*" provides excellent insight into aphasia research. Perhaps he would not be too offended if I summarized his approach, in an ideal world, as "*It's the brain, stupid.*"

## **LEORA CHERNEY, Ph.D.**

Rehabilitation Institute Research Corp.  
345 East Superior St  
Chicago IL 60611-4496

Dr. Cherney is one of a handful of researchers trying to tap the potential of technology in treating aphasic adults. She is developing a computerized treatment program, Oral Reading for Language in Aphasia (ORLA), based on her approach for improving language skills in aphasic individuals through reading aloud.

She uses techniques originally designed for reading-disabled children and modified them to work with her aphasic patients. Her approach is graduated: beginning with 3 to 5 word sentences, increasing the complexity to 8 to 10 word sentences, and then to 20 to 30 word paragraphs. Of necessity, there is a great deal of repetition. Improvements in verbal expression and reading comprehension are seen.

Part of her study will be to remove the “personal” influence with clients to see whether the approach itself is successful and not dependent on the therapist-patient bond. Additionally, she is going to monitor brain changes with her therapy using brain imaging studies on the study subjects.

If a computerized ORLA system is effective, it will be used in conjunction with a SLP who will do assessments and evaluations of individual patients. The program can be distributed to professionals as stand alone software or via the Internet. In light of the limited amount of therapy that is reimbursed by insurance companies, having cost-effective software available for ongoing training could make a big difference for patients. Rural areas are under-served by SLPs and this program could easily make therapy available to many that have no access to ongoing treatment.

**Information received from the NATIONAL INSTITUTE ON DEAFNESS AND OTHER COMMUNICATION DISORDERS at the National Institutes of Health**

**Prevalence of aphasia:** approximately 3.5 per 1,000 adults in the United States; approximately 1,000,000 Americans have some form of aphasia.

**Extramural Research Funding:** In 2000, the most recent year with actual figures, extramural aphasia research spending represented 4.1 percent of the NIDCD budget.

**Funding Levels of Extramural Research on Aphasia at NIDCD <sup>1</sup>**

<b>Fiscal Year</b>	<b>Amount</b>
2002 est.	\$11,328,000
2001 est.	\$10,244,000
2000	\$9,195,000
1999	\$5,910,000
1998	\$5,956,000
1997	\$5,735,000

**General State of Science Concerning Aphasia:** Aphasia research is providing new ways to evaluate and treat aphasia as well as to further our understanding of the function of the brain. Brain imaging techniques are helping to define brain function, determine the severity of brain damage, and predict the severity of the aphasia. These procedures include PET (positron emission tomography), CT (computed tomography), and MRI (magnetic resonance imaging) as well as the new functional magnetic resonance imaging (fMRI), which identifies areas of the brain that are used during activities such as speaking or listening.

Using imaging technology, NIH-supported scientists recently have documented reorganization of brain activity after treatment for acquired reading disorders following stroke. The neuroimaging performed during a reading task before and after treatment indicated a shift in brain activation from one area to another, showing that it may be possible to alter brain activity patterns with therapy for acquired language disorders (Steven Small, FUNCTIONAL NEUROANATOMY OF NORMAL AND IMPAIRED LANGUAGE).

For future studies, functional brain maps of individuals with brain injury performing cognitive tasks will be compared to those of uninjured individuals to determine how damage affects normal brain function. To characterize the impact

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<sup>1</sup> NIDCD is the lead NIH agency funding research on aphasia; total awards made by NIDCD in FY 2000 equaled \$226,151,629; for the same period, total NIH awards equaled \$14,791,024,329.

of rehabilitation on the brain, functional brain maps will be acquired for individuals with brain injury performing cognitive tasks before and after rehabilitation. (Leslie J. Gonzalez-Rothi, TREATMENT OF APHASIA AND RELATED DISORDERS).

The central goal of aphasia therapy is to improve an individual's ability to communicate by helping the person to use remaining abilities, to restore language abilities as much as possible, to compensate for language problems, and to learn other methods of communicating. Treatment may be offered in individual or group settings. NIH-supported scientists are designing and studying the efficacy of behavioral treatments for agrammatisms, anomia, aprosodia, and attention disorders associated with aphasia. The impact that these behavioral treatments may have on the quality of life of the participants and their caregivers will also be monitored (Leslie J. Gonzalez-Rothi, TREATMENT OF APHASIA AND RELATED DISORDERS).

In-depth testing of the language ability of individuals with the various aphasic syndromes is helping to design effective treatment strategies. The use of a computer-assisted visual communication system to assist aphasics who are unable to produce or comprehend language is being studied (Martha W. Burton, PROCESSING DEFICITS IN APHASIC PATIENTS.)

Promising new drugs that may improve the rate of language recovery administered shortly after some types of stroke are being investigated as ways to reduce the severity of aphasia (Delaina Walker-Batson, PHARMACOLOGIC MODULATION IN THE TREATMENT OF APHASIA.)

The NIH supports a multitude of programs that are designed to prepare individuals to become active and responsible members of the scientific community. Some programs provide research training for individuals who are interested in aphasia. For example, an NIDCD-supported Institutional Training Grant provides research training to individuals interested in communication sciences and disorders. Hands-on apprenticeship training is provided in speech production, development and disorders across the lifespan with special attention to sensorimotor processes in speech and speech disorders from development to aging; language structure, development and disorders, including studies of aphasia; and peripheral and central processing of speech and non-speech acoustic stimuli.

A primary purpose of the training program is to provide intensive interactive research experience, leading toward the establishment of successful independent clinical investigators.

Another pre- and postdoctoral program is based at the Aphasia Research Center in Boston and has produced 36 post-doctoral trainees, with a high proportion who have gone on to careers in research and research training in the area of adult communication disorders. In addition, there are opportunities across NIH that

provides support to individual postdoctoral researchers to prepare them for careers in research in aphasia or other cognitive disorders.

**NIH Intramural Research on Aphasia:** Functional imaging techniques are being used to characterize brain activation patterns in normal subjects and individuals with neurological disorders affecting human communication in the Voice, Speech and Language Branch of NIDCD's Division of Intramural Research.

A goal of the branch is the development of neuroimaging methods to study aphasia in individuals recovering from stroke. The branch is involved in 1) longitudinal fMRI-EEG/ERP (electroencephalogram/event related potential) studies of speech production in the course of recovery and 2) development of neurochemical PET methods as indices of neuroplasticity.

Images of the living brain as it re-acquires the ability to speak provide valuable information on the physiology of language recovery. In addition, the use of neuroimaging technology to show functional reorganization of the brain during spontaneous recovery will be an effective tool to evaluate treatment of aphasia. To further research in this area, the NIDCD is establishing collaborations with major regional stroke centers at The Johns Hopkins University, National Rehabilitation Hospital, The University of Maryland, George Washington University, and Suburban Hospital, and has also begun a pilot study using MR/EEG paradigms in control subjects. (Allen Braun, IN VIVO NEUROCHEMICAL IMAGING STUDIES and PET AND fMRI ACTIVATION STUDIES.)

**Collaborative NIH Efforts and Future Initiatives on Aphasia:** Biomedical research has become complex and involves multidisciplinary approaches. Research on aphasia is currently being supported by the NIDCD, NICHD, NINDS, NIMH and NIA with NIDCD serving as the lead institute. When research opportunities overlap the mission of several institutes, collaborative efforts will be fostered. As the primary Institute conducting aphasia research, the NIDCD has cosponsored over the past year a symposium series, "New Perspectives in Language Research," with the NICHD, NINDS, NIMH and NIA.

The development of language across the lifespan and the effects of brain injury on language performance were major themes of this symposium. The March 2001 symposium on "Developmental Disorders of Language" also included scientists involved in aphasia, language development, spatial cognition and underlying neural systems.

The NIDCD is in the planning stages of two initiatives related to aphasia. Both activities are related to treatment and rehabilitation of adult aphasia. One initiative is a Request for Applications, co-sponsored with NICHD, that is focused on augmentative and alternative treatments relevant to adult aphasia. The other initiative being planned is a planning workshop to formulate research

recommendations on aphasia intervention and use of neuroimaging techniques. Other NIH institutes conducting aphasia research will be invited to participate in the workshop. The NIDCD was invited to present at the annual conference of Clinical Aphasiology; in addition, NIDCD will be presenting at the Academy of Aphasia's annual meeting in October 2001. Presentations by NIDCD staff at these two major meetings highlight research and funding opportunities for researchers and clinicians in adult aphasia.

The NIDCD Strategic Plan states that research that focuses on the perceptual and cognitive processing in normal and disordered communication is a major priority of the Institute. In particular, NIDCD recognizes the need for additional research to investigate the perceptual and cognitive consequences of disordered communication and to determine how these processes change with treatment. In addition, the NIDCD Strategic Plan emphasizes research that develops and improves devices, pharmacologic agents, and strategies for habilitation and rehabilitation of human communication disorders as a high priority.

Specifically, research is needed to:

- Capitalize on emerging technologies to design and improve devices that enhance communication.
- Use clinical trials and other clinical studies to evaluate the efficacy of newly developed devices, drugs, and other therapies for individuals with communication disorders.
- Develop and refine diagnostic criteria and capabilities to facilitate early diagnosis of hearing, speech, or language disorders.
- Use clinical trials and other clinical studies to develop and assess medical and behavioral interventions for infants and children who have a hearing, speech, or language disorder.
- Develop cost-effective techniques for the assessment of speech/language development and disorders in the broad range of languages currently used by residents of the United States, taking into account all cultural and ethnic groups.
- Use molecular genetic, electrophysiological, imaging, and other approaches to precisely define the phenotypes of communication disorders as a basis for optimizing clinical diagnosis and intervention.

**Regarding clinical trials on aphasia:** one has to have a defined therapeutic protocol, validated outcome measures, and sufficient pilot data to show justification for the major expenditure of dollars involved in a typical clinical trial.

It is questionable if there are sufficiently specified treatment programs and substantial efficacy data currently, to serve as the basis of a trial for aphasia intervention. However, smaller-scale studies of treatment efficacy are underway and additional studies are needed.

**NIH Institutes, with contact persons, that conduct aphasia research:**

National Institute on Deafness and other Communication Disorders:  
Judith Cooper 301.496.5061

National Institute of Child Health and Human Development:  
John McGrath 301.496.5133

National Institute of Neurological Disorder and Stroke:  
Marian Emr 301.496.5924

National Institute of Mental Health:  
Clarissa Wittenberg 301.443.4513

National Institute on Aging:  
Jane Shure 301.496.1752

## INTRODUCTION TO APPENDIX

It is estimated that more than two million people in the world have aphasia. Approximately, 40 % of people surviving strokes have language and speech disorders of some magnitude. About 20 % of stroke survivors have some degree of aphasia.

Research on diagnosis and treatment therapies is conducted in clinics and university and medical school departments under banners as varied as: neurology, cognitive neuroscience, psychology, linguistics, radiology, brain imaging, geriatrics, communication sciences, neurobiology, neuropsychiatry, speech pathology, speech and hearing, brain science, rehabilitation, clinical neurosciences, and so forth.

It is not uncommon to find primary aphasia researchers with joint appointments to one or more institutions, universities and government health facilities (such as the US Veterans Administration.) Many researchers publish jointly, regardless of institutional affiliation, and belong to one or more of the major organizations that deal with aphasia and speech pathology.

It is unlikely that a talented researcher on aphasia would be unknown in the field. It appears that there is significant intellectual interaction among all parties working to understand and ameliorate aphasia. Many of the experts in the field have been collaborating for a number of years.

Many major associations (this includes the Academy of Aphasia and National Aphasia Association) have meetings in which research results are discussed with other researchers and, often, with laypersons. International meetings provide opportunities for 'cross-pollination' of the many disciplines involved in aphasia research. There appears to be no shortage of conferences in which subject matter aphasia, speech disorders, and brain imaging are discussed to some extent.

Because the field of aphasia research touches on many disciplines, articles are likely to appear in journals dealing with a variety of subjects.

At the end of this introduction, I present detailed information on a Danish researcher, Anders Gade, who serves as an excellent example of how researchers in this field interconnect.

Some institutions not specifically mentioned or detailed either in the **MAJOR APHASIA RESEARCH CENTERS** or **TREATMENT PROGRAMS AND OTHER RESEARCH CENTERS** sections of this appendix, but nonetheless involved in research on aphasia or brain imaging of language as it relates to aphasia:

- Nijmegen, The Netherlands: University of Nijmegen - sponsors an annual Conference on Speech Motor Production and Fluency Disorders
- Toronto, Canada: Rotman Research Institute (Sandra E. Black, M.D., FRCP(C))
- London Ontario: Dept. of Clinical Neurological Sciences, St. Joseph's Hospital, University of Western Ontario
- Martinez and Davis, California: University of California-Davis and VA Northern California
- Aberdeen, Scotland: Health Services Research Unit, University of Aberdeen
- St. Louis, Missouri: Departments of Radiology and Neurology, Washington University School of Medicine

- Halifax, Canada: Cognitive/Clinical Neuroscience Unit, Dept. of Psychology, Dalhousie University
- Baltimore, Maryland: Dept. Neurology and Cognitive Science at the Johns Hopkins University (Barry Gordon, M.D., Ph.D.)
- Rome, Italy: Clinic of Neurology, Tor Vegata University; Dept. Neurological Sciences, University of Roma La Sapienza
- New Haven, Connecticut: Haskins Laboratories (Yale University and the University of Connecticut)
- Evanston, Illinois: Dept. of Communication Sciences and Disorders and Dept. of Neurology, Neuroscience Institute, Northwestern University
- Tel Aviv, Israel: Tel Aviv University
- Australia: Brain Damage and Communication Research, University of Sydney and other locations
- Cologne, Germany: Max-Planck Institute for Neurological Research and Dept. of Neurology, University Hospital
- Nashville, Tennessee: Department of Neurology, Vanderbilt University School of Medicine (Howard D. Kirschner, M.D.)
- Charlottesville, Virginia: Communication Disorders Program, University of Virginia
- Dallas, Texas: Aphasia Center, Texas Women's University
- Seattle, Washington: Dept. of Rehabilitation Medicine, University of Washington
- College Park, Maryland: Dept. of Hearing and Speech Sciences, University of Maryland
- Stanford, California: Dept. Radiology and Stanford Stroke Center Stanford University (Judy Illes, Ph.D.)
- London, United Kingdom: MRC Cyclotron Unit, Imperial College School of Medicine

**JAPAN**<sup>1</sup> : Modern speech research in Japan started during World War II with a unique effort to understand the relationship between phonetic and physical properties of vowels. Japanese speech research during the 1950s and early 1960s was built on the methodology largely created in the United States by researchers at MIT, Bell Laboratories, and Haskins Laboratories. However, in more recent years the fruit of basic research by Japanese groups includes unique methodologies and leading contributions, particularly in physiological studies of speech production processes.

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<sup>1</sup> SURVEY OF SPEECH RESEARCH IN JAPAN, The Ohio State University, for the U.S. Department of Commerce, Office of Technology Policy, Asia-Pacific Technology Program, Phyllis Genter Yoshida, Project Director, July 1996

Some U.S. researchers note that speech science is one of the unique areas where the Japanese have led the world in basic research discoveries and methodological innovations, in contrast to other areas where they applied principles discovered in other countries, such as the United States, to develop leading-edge technology applications.

For example, the first effective computational principle for automatic speech recognition was proposed and implemented by the speech research group at NEC under the leadership of Yasuo Kato [Kato et al. 1971]. It was several years before any U.S. group followed up. IBM, Bell Laboratories, Carnegie Mellon University and other groups in the United States, however, eventually led the world in the art of this and other methods of automatic speech recognition. The most widely used basic speech signal processing algorithm, called linear predictive coding (LPC), was invented by Bishnu Atal at Bell Labs. At about the same time, Fumitada Itakura, a student at Nagoya University prior to joining NTT, independently invented an algorithm called PARCOR [published as Itakura & Saito, 1968]. Later this algorithm was shown to be mathematically equivalent to LPC.

Japanese research groups in speech science have systematically and steadily led the world in speech physiology work. For example, the Research Institute of Logopedics and Phoniatics (RILP), established in 1965 as an interdisciplinary research organization within the Medical Faculty at the University of Tokyo, has produced a battery of new methods of physiological observation and recording-of-speech production processes such as: the computer-controlled x-ray microbeam. The third generation machine is still operating at the University of Wisconsin, Madison, producing the most accurate and uniquely useful data of tongue movement during speech utterance; fiberscopic methods of observing laryngeal gestures during speech production; and computer-based dynamic palatography later generally called electropalatography.

**University of Tokyo, Research Institute of Logopedics and Phoniatics**

This research organization, founded in 1995 by a reputable otologist, Prof. Ichiro Kirikae, has led the world in speech physiology research through creative contributions to the field, particularly with respect to new instrumentation for quantitative observation of speech production activities, combining physiological and phonetic expertise with the most advanced and original methods in experimental physics and computer technology.

A variety of research activities are being conducted by this group, ranging from brain activity measurement during speech production/perception, visual perception, to development of a speech signal analysis package for widely-used personal computers and speech database analysis tools.

**DENMARK**<sup>2</sup> - Anders Gade

**Copenhagen Neuropsychology Database** (Brain60) - a literature database of more than 60.000 references maintained by Anders Gade, available at <http://www.psy.ku.dk/gade/>

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<sup>2</sup> Anders Gade. Copenhagen University. <http://www.psy.ku.dk/gade/>

INVESTIGATORS STATEMENT: *I had my basic training in psychology at Copenhagen University, graduating with a Ph.D. in 1974 following experimental work in physiological psychology. My thesis dealt with neostriatal and frontal lobe function in rats. The next 16 months was spent at the Boston University Aphasia Research Center at Boston VA Hospital. I pursued clinical neuropsychology, first at Odense Hospital, Dept. of Neurophysiology, and from 1979 at the National Hospital (Rigshospitalet) in Copenhagen, Dept. of Neurology. At the same time I acted as a neuropsychological consultant to several neurology departments at provincial hospitals. From 1982 to 1985 I was the recipient of a Medical Research Foundation grant to study amnesia after aneurysms on the anterior communicating artery. In 1988 I obtained a post at the University of Copenhagen, Department of Psychology, as an associate professor (adjunkt) in neuropsychology. Since 1992 I have been senior lecturer (lektor). My main teaching responsibility has been as coordinator of the graduate program in neuropsychology. Primary research affiliation: Memory Disorders Clinic, Department of Neurology, Rigshospitalet*

### **Current research**

- PET-studies of language, memory and visual cognition in normal subjects
- Studies of putative frontal lobe aspects of memory in amnesic subjects with PET and neuropsychological tests
- Studies of visual recognition and other deficits in stroke patients with posterior infarcts (posterior cerebral artery territory)
- Studies of Alzheimer's disease and related dementia disorders

### **Teaching**

- Cognitive psychology (Language, memory, attention, visual perception, emotion)
- Neuropsychology (Changes in cognition, emotion and personality following brain damage)
- Cognitive neuroscience (Brain processes, interdisciplinary studies of cognition)

**International Collaboration:** Institute of Biological and Medical Psychology, Section of Somatic Psychology, University of Bergen, Norway (Professor Kenneth Hugdahl); Center for Cognitive Neuroscience, School of Psychology, Birmingham University, UK (Professor Glyn Humphreys); Muriel Boucart, Laboratoire de Neurosciences du Comportement, Université Lille 1, Villeneuve d'Ascq, France; Brain Image Analysis Lab, University of California San Diego, Dept. of Psychiatry (Drs. Terry Jernigan and Arne Østergaard); MRC Prion Unit, Neurogenetics Department, London (Professor John Collinge, Lisa Chakrabarti)

# MAJOR APHASIA RESEARCH CENTERS IN THE UNITED STATES WITH DETAILS ON SELECTED RESEARCHERS

## **BROWN UNIVERSITY BRAIN SCIENCES PROGRAM**

Brain Science Program  
PO Box 1953  
Brown University  
Providence, RI 02912-1953

Telephone: 401.863.9524

<http://www.brainscience.brown.edu/index.html>

### **ABOUT LANGUAGE RESEARCH AT BROWN UNIVERSITY**

Research in language at Brown is both broad-based and multidisciplinary, drawing from linguistics, cognitive psychology, computer science, neuroscience, and applied mathematics. We look at language from multiple perspectives including experimental, computational, and theoretical approaches. Within the experimental study of language, we have active research and teaching programs in language development, the neural basis of language and speech, language processing, particularly word recognition and sentence processing, speech, and evolution. The computational approach to language focuses on the computational processes involved in language comprehension, production, and learning. Within the theoretical domain, the main area of specialty is the syntax/semantics interface, which is concerned with the question of how the semantics fits meanings together, how these tie in with the syntactic composition, and how these two systems work together.

### **FACULTY OF BROWN UNIVERSITY'S BRAIN SCIENCES PROGRAM**

James Anderson  
Walter Atwood  
Mark Bear  
Elaine Bearer  
David Bereiter  
David Berson  
Elie Bienenstock  
Michael Black  
Sheila Blumstein  
Seth Boatright-Horowitz  
William Brennan  
Rebecca Burwell  
Mary Carskadon  
Eugene Charniak  
Russell Church  
Ruth Colwill  
Barry Connors  
David Cooper  
Leon Cooper  
Jerry Daniels

Tom Dean  
Katherine Demuth  
Curtis Doberstein  
Fulvio Domini  
John Donoghue  
Charles Elbaum  
Mel Epstein  
Justin Fallon  
Gerhard Friehs  
Stuart Geman  
Robert Gordon  
Samuel Greenblatt  
Frederick Harrington  
Nicholas Hatsopoulos  
Edward Hawrot  
William Heindel  
Laurie Heller  
Rachel Herz  
Thomas Hofmann  
John Hughes

Conrad Johanson  
Mark Johnson  
Gary Kaplan  
Nicolaus Kapouleas  
Bruce Kay  
Martin Keller  
Benjamin Kimia  
Paul Knopf  
David Laidlaw  
Henrietta Leonard  
Philip Lieberman  
Diane Lipscombe  
Paul Malloy  
John Marshall  
James McIlwain  
Dale Mierke  
James Morgan  
David Mumford  
Brian Ott  
Michael Paradiso

Robert Patrick  
Steven Rasmussen  
Stephen Salloway  
Jerome Sanes  
Julie Sedivy  
Harel Shouval

Harvey Silverman  
Andrea Simmons  
James Simmons  
Steven Sloman  
John Stein  
Ed Stopa

Bob Swift  
Michael Tarr  
Michael Walker  
William Warren  
Leslie Welch  
Anita Zimmerman

## **SELECTED RESEARCHER**

### **Sheila Blumstein**

Sheila Blumstein@brown.edu

Albert D. Mead Professor of Cognitive and Linguistic Sciences  
PO Box 1978, Brown University  
Providence, RI 02912

Telephone: 401-863-2616; 401-863-2849

Ph.D. Harvard University

<http://www.bu.edu/aphasia/bios.html#blumstein>

Blumstein is a Senior Research Investigator at the (Harold Goodglass) Aphasia Research Center.

She is also the Albert D. Mead Professor and Chair of Cognitive and Linguistic Sciences at Brown University. She received both her AB (at the University of Rochester) and Ph.D. (at Harvard University) in Linguistics. She has been affiliated with the Aphasia Research Center since 1967 (as a very young graduate student) and worked closely with Harold Goodglass who was/is her mentor. She also had the good fortune of studying with Roman Jakobson who first encouraged her work in aphasia. In recent years, she has worked in close collaboration with Bill Milberg and together they have been developing the theoretical framework which has formed the basis for their joint research program on lexical processing deficits in aphasia.

FROM: <http://www.cog.brown.edu/~seb/>

Sheila Blumstein's research is concerned with the biology and neurology of language and the processes involved in speaking and understanding. A major focus of her work has been on neurolinguistics, the relation between language and brain. Here her research focuses on the effects of brain-damage on normal language processing as a window into the neurological bases of language, and the mechanisms contributing to normal language processing. To this end, her research has explored speech and language processing deficits in adult aphasics. Particular areas of investigation include the nature of speech production deficits in aphasia, the basis of lexical and syntactic processing deficits in aphasia, and the processes and mechanisms which contribute to auditory language comprehension. Her recent research has focused particularly on lexical processing deficits in aphasia. Results are consistent with the view that the basis of these deficits reflects an impairment in the activation level of lexical candidates. Such a deficit could underlie what appear to be deficits at other levels of the linguistic grammar including speech processing and syntactic processing. Current research is actively exploring these issues.

Blumstein also has an active research program exploring the nature of speech processing in normal subjects. The basic question is what are the acoustic properties that define the sound structure of language and how do listeners extract these properties in speech perception. Her view is that there are a set of stable acoustic properties or criterial attributes that define the phonetic categories of speech and these properties remain stable across a number of sources of variability including speaker, phonetic context, speaking rate, and language. To test this hypothesis, acoustic analyses of natural speech are conducted and acoustic measures are developed to determine whether stable acoustic properties can be identified. Perception experiments involving synthetic speech and computer-editing of natural speech are conducted to determine the perceptual role of the proposed acoustic properties. Additional research is exploring how the sound structure of speech contacts the lexicon. In particular, the question is whether acoustic variations which affect the 'prototypicality' of a particular phonetic dimension will affect lexical access.

FROM: <http://www.bu.edu/aphasia/bios.html#blumstein>

Blumstein is a Senior Research Investigator at the Aphasia Research Center. She is also the Albert D. Mead Professor and Chair of Cognitive and Linguistic Sciences at Brown University. She received both her AB (at the University of Rochester) and Ph.D. (at Harvard University) in Linguistics. She has been affiliated with the Aphasia Research Center since 1967 (as a very young graduate student) and worked closely with Harold Goodglass who was/is her mentor. She also had the good fortune of studying with Roman Jakobson who first encouraged her work in aphasia. In recent years, she has worked in close collaboration with Bill Milberg and together they have been developing the theoretical framework which has formed the basis for their joint research program on lexical processing deficits in aphasia.

FROM: <http://www.brainscience.brown.edu/departments/faculty/blumstein.html>

## **BIOGRAPHY/INVESTIGATOR STATEMENT**

*My research examines how humans produce and understand language. In particular, I am interested in delineating the neural basis of language and the processes and mechanisms involved in speaking and understanding. To study this, I have focused on the effects of brain damage on normal language processing. In particular, I am interested in how the continuous acoustic signal is transformed by perceptual and neural mechanisms into the sound structure of language, how the sound structure of language maps to the lexicon (mental dictionary), and how the mental dictionary is organized for the purposes of language comprehension. I have collaborated with other researchers to develop a neural model of lexical processing and have simulated both normal and aphasic performance. Additionally, we have used functional neuroimaging to investigate the neural mechanisms involved in perceiving the sounds of speech.*

*My research interests are a natural intersection of a number of important threads throughout my life. From the time I was a child, I seemed to have a particular affinity for learning and enjoying things auditory, whether they were language or music. In college, I had my introduction to the profound effects of stroke on language as I watched my grandmother struggle with her aphasia. Her impairment ultimately piqued my curiosity and interest in the neural basis of language deficits in aphasia, and most particularly, the neural processing of the sound structure of language and the mapping of that structure on to the mental dictionary. I pursued this research in graduate school at Harvard University under the guidance of two extraordinary research scholars, Roman Jakobson and Harold Goodglass, both of whom were pioneers in the study of aphasia.*

## **SELECTED PUBLICATIONS**

**Blumstein, S.E. 1994. The neurobiology of the sound structure of language. In M. Gazzaniga (Ed.). Handbook of Cognitive Neuroscience. Cambridge: MIT Press.**

**Milberg, W., Blumstein, S.E., Katz, D., Gershberg, F., Brown, T. 1994. Semantic facilitation in aphasia: Effects of time and frequency. J. Cognitive Neuroscience, 7, 33-50.**

**Andruski, J., Blumstein, S.E., and Burton, M. 1994. The effect of subphonetic differences on lexical access. Cognition, 52, 163-187.**

**Utman, J.A. and Blumstein, S.E. 1994. The influence of language on the acoustic properties of phonetic features: A study of the feature [strident] in Ewe and English. Phonetica, 51, 221-238.**

## **OTHER RESEARCH FACULTY**

### **Eugene Charniak**

Research: Statistical natural language processing.  
Graduate programs: Computer Science; Cognitive & Linguistic Sciences

### **Katherine Demuth**

Research: Normal and impaired language learning/development  
Graduate program: Cognitive & Linguistic Sciences

### **Mark Johnson**

Research: Structured stochastic models of human language comprehension and production.  
Graduate program: Cognitive & Linguistic Sciences

### **Phil Lieberman**

Research: Language and thought in an evolutionary context.  
Graduate program: Cognitive & Linguistic Sciences

### **James Morgan**

Research: Infant speech perception, language acquisition, psycholinguistics, learnability.  
Graduate program: Cognitive & Linguistic Sciences

### **Julie Sedivy**

Research: Human language comprehension, psycholinguistics, semantic and pragmatic theory.  
Graduate program: Cognitive & Linguistic Sciences

### **Harvey Silverman**

Research: Speech recognition and microphone arrays.  
Graduate program: Engineering

## **CENTER FOR COGNITIVE BRAIN IMAGING**

CARNEGIE MELLON UNIVERSITY  
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[http://www.ccbi.cmu.edu/ccbi\\_cmu.htm](http://www.ccbi.cmu.edu/ccbi_cmu.htm)

The CCBI is located at Carnegie Mellon, but its work is collaborative between Carnegie Mellon and the University of Pittsburgh.

The Center's research focuses on fMRI studies to investigate high-level cognition, using state-of-the-art scanners and techniques. The investigations also include several other approaches used in conjunction with fMRI studies, most notably, behavioral studies, computational modeling, eye fixation studies, and therapy studies of people with brain damage. The main types of thinking that the Center investigates are high-level cognitive processes which include spatial thinking, language comprehension, problem-solving, and executive processes. The general research goal is to develop a unified theory of cognition that is grounded in and accounts for the neural level of brain activity, at the level of large scale neural networks.

The **Psychology Department At Carnegie Mellon** comprises approximately 25 faculty in four areas: Cognitive Psychology; Cognitive Neuroscience; also: Developmental Psychology & Social Psychology

FROM: <http://www.psy.cmu.edu/psy/depinf.html>

The Psychology Department at Carnegie Mellon has long been considered a pioneer in such areas as cognitive psychology, cognitive science, and artificial intelligence. Today its programs feature not only those fields but social psychology, developmental psychology, cognitive neuroscience, and health psychology. Ranked as one of the best in the nation, the Psychology Department of the College of Humanities and Social Sciences consistently places among the top 10 in research and education polls prepared by U.S. News & World Report Magazine. The Institute for Scientific Information (ISI) reports that the Psychology Department dominates its field in terms of citations per academic paper -- indicating that Psychology Department faculty research is among the most frequently used as the basis for further research and is described in a variety of academic articles and reports.

Research groups frequently interact with groups in other departments with related interests, including researchers in computer science and robotics at CMU, and in the neurosciences at the University of Pittsburgh. The graduate program in cognitive psychology encourages the analysis

### **FACULTY OF THE CCBI**

Patricia Carpenter  
Marcel Just  
William F. Eddy  
Chris Genovese  
Nicole Lazar  
F. Javier Lerch

Beatriz Luna  
Malcolm R. McNeil  
Nancy J Minshew  
John Sweeney  
Keith Thulborn

## **SELECTED CURRENT PROJECTS**

**FROM:** [http://www.ccbi.cmu.edu/projects\\_set.html](http://www.ccbi.cmu.edu/projects_set.html)

### **Aphasia Therapy: Brain Plasticity and Rehabilitation**

Investigators: Just, Carpenter, McNeil, & Haarmann

This research develops a cognitive therapy for aphasic comprehension that links recent findings in neuroscience to a computational theory of comprehension, and incorporates an analysis of two complementary therapeutic methods that have been demonstrated to improve aphasics' comprehension of sentences. The treatment's efficacy is being assessed with several behavioral outcome measures and with functional Magnetic Resonance Imaging (fMRI), before and after training. The premise underlying the therapy is that the patients have a reduced capacity for language processes, and the therapy is intended to increase the capacity and to encourage compensatory strategies. The article that very recently appeared in *Brain and Language* describes the background theory, and the *Science* paper describes the fMRI approach.

We are interested in recruiting aphasic patients to participate in our study. They would receive behavioral therapy that might improve language comprehension. The eligibility requirements are:

Medical diagnosis of a single episode, left hemisphere, focal, thromboembolic or hemorrhagic lesion  
No audiologically or medically documented hearing impairment. Diagnosis of a mild to moderate aphasia by a Speech-Language Pathologist using standardized tests of aphasia (e.g. above 40th percentile on Porch Index of Communicative Ability, Porch, 1982). Good oral comprehension of single words, as judged by performance on the Boston Diagnostic Aphasia Exam (BDAE) or similar standard test  
No severe apraxia of speech (mild apraxia of speech may be present)

### **The Neural Basis of Language Comprehension**

Investigators: Just & Carpenter

Brain imaging researchers don't tend to think of language comprehension as a model cognitive system to study. "Too complex a function, imagable activity too uncertain," researchers say. But it is noteworthy that among the first localizations of cognitive function were Broca's and Wernicke's. And among the first sources of evidence of cerebral dominance was the lateralization of language. So although language function may be complex, it has been extraordinarily informative about cortical organization. Our Center has re-lived this lesson in microcosm in the course of performing several fMRI studies over the past few years. It has turned out that the localization of brain activation associated with language comprehension is more robust over subjects and over task conditions than many other tasks that seem simpler. Furthermore, this robustness refers to the more complex comprehension of entire propositions, not just perceiving and understanding isolated words. Perhaps it is because language comprehension is in part biologically determined and a universal aspect of human culture that it has become fairly uniformly organized in the brain. This is not to deny the brain's great plasticity, which can accommodate brain insults, or the learning of a second language, or even a new medium of expression such as sign-language. But there is something very stable about the brain organization of language that we believe presents a special opportunity for cutting-edge neuroimaging studies of complex cognitive function. substantial surprise about how the classic language areas function. This research project will determine how the classic language areas contribute to comprehension, using a variety of experimental paradigms and brain imaging

techniques.

We expect to learn from fMRI research how a set of brain areas works together to produce comprehension. We expect to determine the interactive network-like properties of the language subsystem by studying its activity under different types of comprehension demand that selectively focus on the functions of particular network components. We are also studying how language processing is coordinated with other types of cognitive activities, such as the coordinated comprehension of text and diagrams (see the 1992 Hegarty and Just JML paper). This issue is also being addressed by some ongoing fMRI studies.

## **SELECTED RESEARCHERS**

### **Patricia Carpenter, Ph.D**

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CCBI Center Co-Director  
Lee and Marge Gregg Professor of Psychology  
Center for Cognitive Brain Imaging  
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Ph.D. Stanford

Carpenter holds an NIMH Senior Scientist Award. Her research interests include visuo-spatial processing, such as visualization and object recognition, language comprehension and executive processes in complex problem solving. Her interests span individual differences, the neural organization of the cognitive systems, neuropsychology, and the practical and educational implications of human processing characteristics.

FROM: <http://www.psy.cmu.edu/psy/faculty/pcarpenter.html>

### **INVESTIGATOR STATEMENT**

*Why is it that some people are good at solving spatial problems but are unable to express themselves in words, whereas others may write with fluency and ease, but have difficulty navigating with a road map? My research is on the functional characteristics and neural processes that underlie complex cognitive skills, such as mental imagery, problem solving, and language, using a variety of methodologies including behavioral studies, brain imaging, computer simulation, and neuropsychological studies of certain patients.*

*The behavioral studies use a variety of techniques to allow us to trace the process as it occurs. One such technique is the eye-fixation methodology, the analysis of where and how long a person looks for information while they are performing a task, such as reading or mental rotation. Such process-tracing techniques can be used in conjunction with the study of individuals who differ in training or other characteristics to investigate the underlying processes and sources of variation. These process descriptions, in turn, can be explored using computer simulation techniques.*

*In addition to behavioral and computational studies, we have been using functional Magnetic Resonance Imaging at the University of Pittsburgh Medical Center to examine the neural basis of*

*these cognitive skills. We are developing new paradigms to investigate the neural substrates activated in young adults while they understand language or solve visually-based problems. In addition, we are combining imaging with neuropsychological approaches to investigate the neural functioning of patients with specific deficits.*

## **SELECTED PUBLICATIONS**

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**Carpenter, P. A., Miyake, A., & Just, M. A. (1995). Language comprehension: Sentence and discourse processing. *Annual Review of Psychology*, 46, 91-120.**

**Shah, P., & Carpenter, P. A. (1995). Conceptual limitations in comprehending line graphs. *Journal of Experimental Psychology: General*, 124, 43-61.**

**Miyake, A., Carpenter, P. A., & Just, M. A. (1995). Reduced resources and specific impairments in normal and aphasic sentence comprehension. *Cognitive Neuropsychology*, 12, 651-679.**

**Carpenter, P. A., Miyake, A., & Just, M. A. (1994). Working memory constraints in comprehension: Evidence from individual differences, aphasia, and aging. In M. Gernsbacher (Ed.), *Handbook of Psycholinguistics* (pp. 1075-1122). San Diego, CA: Academic Press.**

## **Marcel A. Just, Ph.D**

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Just holds an NIMH Senior Scientist Award. He was at one time the co-Editor of the Journal of Memory and Language, and gave the journal its current name. His interests are in using advanced experimental methods to provide critical information for developing a comprehensive theory of cognition.

FROM: <http://www.psy.cmu.edu/psy/faculty/mjust.html>

## **INVESTIGATOR STATEMENT**

*Our research examines a variety of "understanding" processes involving visual thinking, language comprehension and problem-solving processes. To find out what goes on in a person's mind during such thinking, our lab uses several methodologies, such as functional brain imaging, reaction time studies, verbal protocol analysis, and eye movement monitoring during comprehension and visual thinking. The experiments determine the nature of the on-line psychological processes that occur during understanding and thinking. The research examines the thinking of both normal subjects as well as patients with brain damage, to determine the organization of the underlying cognitive mechanisms. The various performance measures are used to construct theoretical models, often expressed in computational terms, that perform the same task and exhibit similar performance characteristics as human subjects.*

*The specific topics that our research addresses include sentence and text comprehension, coordinated comprehension of text and diagrams, and the role of working memory in comprehension and problem-solving, mental kinematics and mental models of dynamic events. In addition to studying various kinds of understanding, we also examine why individuals differ in the strategies and cognitive resources that they bring to bear on a task, attempting to explain why some people are better thinkers than others.*

*Since early 1995, we have been using functional magnetic resonance imaging (fMRI) to study sentence comprehension and spatial thinking. The early part of this work has not only found the network of brain areas that become active during various language and visual tasks, but has also begun to relate the amount of brain activity to the amount of cognitive processing. fMRI research has become another tool for addressing the nature of understanding (linguistic and visual), directly assessing brain function during task performance.*

## **SELECTED PUBLICATIONS**

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**Carpenter, P. A., Just, M. A., Keller, T. A., Eddy, W. F., & Thulborn, K. R. (1999). Time course of fMRI-activation in language and spatial networks during sentence comprehension. NeuroImage.**

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**Just, M. A., & Carpenter, P. A. (1992). A capacity theory of comprehension: Individual differences in working memory. Psychological Review, 99, 122-149.**

## **Malcolm R. "Mick" McNeil, Ph.D**

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FROM: <http://www.ccbi.cmu.edu/faculty2.html>

McNeil is a research aphasiologist who has been working on a resource deficit approach to aphasia for the past two decades. One of his specialties is the design and evaluation of aphasia treatments demonstrated through single subject's experimental designs. He is a collaborator on the project that is evaluating the effects of a processing resource-oriented treatment for comprehensive deficits of aphasic individuals and the relationship of these cognitive/linguistic changes on brain function, demonstrated through fMRI.

Dr. McNeil teaches courses in neurogenic speech and language disorders and directs student research in these areas. His primary research interests are in the cognitive mechanisms and treatment of aphasia and in the nature and treatment of motor speech disorders. Current research efforts are focused on the development of the Story Retell Procedure and the development of the Resource Allocation Paradigms of Pittsburgh (RAPP), a computer program for the assessment of resource allocation in persons with aphasia and in their communicative partners. He is a co-founder and co-director of the Pittsburgh Aphasia Treatment, Research and Education Center.

### **SELECTED PUBLICATIONS**

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**McNeil, M.R., Hashi, M. and Tseng, C-H. "Effects of concurrent finger tapping on bilabial kinematics in conduction aphasia." Paper presented to the Academy of Aphasia, Rome, Italy, October, 1991.**

**McNeil, M.R., Odell, K.H. and Miller, S.B. "Successive Speech Repetitions Among Neurogenic Groups: Stropes and Gruggles". Paper presented to the Annual Convention of the American Speech-Language-Hearing Association, Atlanta, (Abstract) ASHA, 33:(10), 1991.**

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### **Keith Thulborn, M.D.,Ph.D.**

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Thulborn has made seminal contributions in the biophysics and biochemistry of MR physics and neuroscience. In addition, he has an M.D. with neuroradiology specialization, and was Director of the NMR Metabolic Imaging Laboratory for 4 years at Massachusetts General Hospital, the birthplace of fMRI, before coming to UPMC. His research focuses on the development of fMRI methodology, metabolic MR imaging, and applications of advanced neuroimaging methods.

## **INVESTIGATOR STATEMENT**

*As a biochemist interested in the metabolism and physiology that underlies human brain function and dysfunction, I have spent the last 17 years developing high resolution neuroimaging for non-invasive biochemical studies. This goal has focused on a full description of the bioenergetics of neuronal activity that is, in principle, available from the NMR signals of biological tissue.*

*I have developed a high field 3.0 Tesla functional MRI scanner with a SNR improvement of two-fold over the typical 1.5 Tesla clinical MRI scanner. This scanner has ultra-fast, very high-resolution, echo-planar capabilities for functional studies of the human brain which I, with collaborators from neuroscience, cognitive science, psychology and statistics, have used to probe cognitive functions of visual processing, eye movement control, visuospatial processing and language comprehension. I am pursuing not only the continued improvement in spatial and temporal resolution of mapping of the human cognitive function using blood oxygenation level dependent (BOLD) contrast but also the development of non-water proton, phosphorus and sodium imaging. My work integrates multiple aspects of the imaging chain from electrical engineering and imaging physics through physiology, metabolism and neuroscience. My work is enhanced through collaborative interactions with multiple investigators.*

From GE MR Master Series brochure, "Dr. Thulborn is an acknowledged world leader in fMRI."

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## **HAROLD GOODGLASS APHASIA RESEARCH CENTER**

Harold Goodglass Aphasia Research Center  
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Boston, MA 02130

<http://www.bu.edu/aphasia/index.html>

The Center in Boston, located within the VA Boston Healthcare System, has attracted a cadre of talented behavioral neurologists, neuropsychologists, neurolinguists, and speech/language pathologists, and in the mid-1960s was established as the Aphasia Research Center (ARC) of Boston University at the VA Boston Medical Center.

The Aphasia Research Center has the longest running center grant in the country with funding from the National Institutes Health running for more than 30 years. Founded by Drs. Norman Geschwind and Harold Goodglass, and currently under the direction of Dr. Martin Albert, researchers join to answer interesting neurological questions in aphasia, neuropsychology, aging, dementia, and other areas of behavioral neurology. The Aphasia Research Center has influenced the way in which stroke and aphasic patients are evaluated and treated worldwide.

The principal objective of the Aphasia Research Center is to advance the theoretical understanding, clinical evaluation, and management of language disorders produced by injury or dysfunction of the brain in adults. We focus primarily on individuals who become aphasic as a result of stroke or other neurologic impairment. Our overriding research goal is to develop a coherent view of how brain damage leads to the symptomatology of aphasia and related cognitive disorders, and to use that knowledge to enhance our understanding of mechanisms of normal language and their neural bases.

After the Second World War the federal government established three National Veterans Centers for the Study of Aphasia. Increasingly successful in its research activity and increasingly well-known nationally and internationally, the ARC has been continuously supported by the National Institutes of Health since 1965. To honor Harold Goodglass, who was Director of the ARC from 1969 to 1996, the Center has been re-named the *Harold Goodglass Aphasia Research Center*.

Until the 1950s observations on aphasia were primarily case by case, almost invariably carried out by neurologists who, although fairly sophisticated in the psychological and linguistic thinking of their time, were strangers to the idea of controlled studies. It was here at the Boston VA Hospital Aphasia Unit that the first controlled psycholinguistic studies of aphasic language, focusing on the production and comprehension of syntax and morphology, were carried out by Goodglass and co-workers in the mid-1950s. Concurrently, Drs. Howes and Geschwind at this hospital were engaged in a large scale analysis of the statistical characteristics of aphasic speech.

### **RESEARCHERS AT ARC**

Dr. Martin Albert  
Dr. Harold Goodglass  
Dr. Marjorie Nicholas  
Dr. Michael Alexander  
Dr. Yosef Grodzinsky  
Dr. Carole Palumbo  
Dr. Errol Baker  
Dr. Nancy Helm-Estabrooks

Dr. Penny Prather  
Dr. Barbara Barresi  
Dr. Audrey Holland  
Dr. Avron Spiro III  
Dr. Sheila E. Blumstein  
Dr. Ray Jackendoff  
Dr. Roberta White  
Dr. Hiram Brownell

Dr. Kimberly C. Lindfield  
Dr. Arthur Wingfield  
Dr. Lisa Tabor Connor  
Dr. William Milberg  
Dr. Deborah Yurgelun-Todd

Dr. Barbara Dworetzky  
Dr. Lena Moskovich  
Dr. Edgar Zurif  
Dr. Patricia Fitzpatrick  
Dr. Margaret Naeser

## **SELECTED CURRENT RESEARCH PROJECTS**

### **Real-Time Information Access in Aphasia**

Investigators: Sheila Blumstein & William Milberg, Co-PI's

This project is directed toward analysis of early processing stages in aphasia in which lexical entries are activated and their meanings and structural properties are made available for further processing at the syntactic and semantic levels. Studies of lexical activation focus on the role of summation within lexical networks.

### **Attention Training versus Linguistic Stimulation for Treating Auditory Comprehension Deficits**

Investigators: Nancy Helm-Estabrooks, Lisa Tabor Connor, & Martin Albert, Co-PI's

This project provides a neurocognitive delineation of attentional deficits in aphasic persons and will test the efficacy of a non-linguistic attention training program on the comprehension of performance of aphasic patients relative to a traditional linguistic stimulation treatment program.

## **Major Research Contributions, 1990-2000**

FROM: <http://www.bu.edu/aphasia/contrib.html>

### **1990-1995**

Highlights of research publications during this 5-year cycle demonstrate both an enduring interest in fundamental questions of brain-language relations and an openness to new ideas, new questions, and new methods. Blumstein, Milberg, Dworetzky and others explored syntactic priming effects in aphasia. Baker continued his studies of the effectiveness of C-VIC. Marjorie Nicholas, working with Baker and Helm-Estabrooks, began her studies of severe aphasia and of computerized augmentative communication aids for patients with severe aphasia. This research led to the development of C-Speak Aphasia, and laid the groundwork for her subproject in the current proposal.

Wingfield introduced into the study of aphasia techniques which he had used successfully in the study of speech comprehension in normal aging. **Albert continued his research into the neurobiological (especially neurochemical) and cognitive factors underlying treatment and recovery from aphasia. Helm-Estabrooks continued to develop new therapies for aphasia and, with Albert, published a manual for aphasia therapy.** Grodzinsky deepened and enriched his neurolinguistic theory of language. Zurif and colleagues provided an on-line analysis of syntactic processing in Broca's and Wernicke's aphasia and with Prather demonstrated the relevance of slowed lexical access in non-fluent aphasia. Goodglass continued to examine agrammatism and category specificity in naming in aphasia. Naeser defined the anatomical basis of poor vs. no recovery of speech in severe aphasia. Alexander, Naeser, and their colleagues provided a comprehensive clinico-anatomical correlation of subcortical aphasia. Brownell

extended his understanding of the communication deficits following right hemisphere damage into study of Theory of Mind.

**1995-2000**

**SELECTED RESEARCH**

**Aphasia Therapy and Predictors of Outcome**

The Aphasia Research Center has always recognized as one of its mandates to translate basic research into practical benefits for persons with aphasia: new approaches to therapy, assessment tools, predictors of outcome. In the present funding cycle this translational research was conducted by several investigators.

**Albert continued his studies of the potential benefit accruing to persons with aphasia by means of pharmacological intervention. These studies are directly dependent on earlier ARC research which he, Helm-Estabrooks and their colleagues carried-out on the role of perseveration in aphasia and the potential for treating aphasia by treating perseveration. The combination of these neurobiological and cognitive approaches to treatment of aphasia underlies their subproject with Connor in the renewal proposal.**

Naeser and Palumbo published several papers demonstrating that extent of lesion in specific subcortical regions is highly predictive of recovery of speech and auditory comprehension. Naeser and Palumbo reported on the finding that although there are visible changes in lesion borders on CT scan after 5 years post-stroke making the lesion appear larger, the patients showed continued recovery of some language functions. They also examined the relationship between lesion patterns and outcome following treatment with Baker's C-ViC program. The study reported that presence of lesion in specific areas, the supplementary motor area and Wernicke's area, resulted in poor outcome for the treatment program. Baker examined cognitive factors that predict communicative success in a computerized alternative communication system, and found that short-term visual recognition memory is intact in globally aphasic individuals, but that subtle disruptions of the semantic network may underlie difficulty that some patients had with learning the C-ViC treatment program.

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**Zurif, E.B.** Syntactic and semantic composition. *Brain and Language Third Millennium Special Issue*.

**Zurif, E.B. & Piñango, M.** Semantic composition: Processing parameters and neuroanatomical considerations. In R. Bastiaanse & Y. Grodzinsky (Eds.), *Grammatical disorders in aphasia*. London: Whurr.

**Zurif, E.B. & Piñango, M.** Combinatorial operations in sentence comprehension. In L.T. Connor & L.K. Obler (Eds.), *Neurobehavior of language and cognition: Studies of normal aging and brain damage*. Boston: Kluwer Academic Publishers.

**Zurif, E.B. & Piñango, M.** The existence of comprehension patterns in Broca's aphasia. *Brain and Language*.

## **SELECTED RESEARCHERS**

### **Martin L. Albert, MD, PhD**

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Professor of Neurology at Boston University School of Medicine

M.D. Tufts Medical School  
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Martin L. Albert, M.D., Ph.D., is the Director of the Harold Goodglass Aphasia Research Center and Professor of Neurology at Boston University School of Medicine. He received his M.D. degree from Tufts Medical School, his training in neurology and behavioral neurology at Boston University Medical School, and a Doctorate in Neuropsychology and Neurolinguistics from the University of Paris. He counts as his mentors Norman Geschwind and Henry Hecaen in neurology and behavioral neurology, and Harold Goodglass and Edith Kaplan in neuropsychology. He began working with Norman Geschwind and Harold Goodglass in 1962 when he was still a medical student, and has been affiliated with the Aphasia Research Center since its founding in 1965.

He has been Director of Behavioral Neuroscience in the Neurology Department of Boston University Medical School and Chief of the Clinical Neurology Section of the Boston Veterans Affairs Medical Center. For three years, in the mid-1990s, he was national Director of the Medical Research Service for the Department of Veterans Affairs in Washington, DC, and a Senior Science Consultant to the President of the United States in the President's Office of Science and Technology Policy. In that role he helped create the U.S. strategic research investment policy entitled "A Research Agenda for America's Health, Safety, and Food." He has served as a Consultant in Neurology and Behavioral Neuroscience to the World Health Organization and the Governments of France and Israel. He has published 7 books and more than 165 scientific articles, and is listed in Best Doctors in America. His areas of expertise are in the fields of dementia, aphasia, and the aging brain.

Within the field of aphasia he has been especially interested in neurorehabilitation, and, in close collaboration with his colleague Nancy Helm-Estabrooks, has developed successful programs for treatment of aphasia, including Melodic Intonation Therapy and Therapy for Aphasic Perseveration. His current research investigations include the neurochemistry of anomia, and the degree to which disorders of attention may influence auditory comprehension deficits in aphasia.

Dr. Albert is also a vice president of the National Aphasia Association.

#### **SELECTED PUBLICATIONS**

**Nicholas, M., Connor, L., Obler, L.K., Albert, M.L.: Aging, language and language disorders. In, Sarno, M.T., ed., Acquired Aphasia, Third Edition, San Diego: Academic Press, 1998.**

**Naeser, M., Palumbo, C., Prete, M., Fitzpatrick, P., Mimura, M., Samaraweera, R., Albert, M.L.: Visible changes in lesion borders on CT scan after five years post-stroke, and long-term recovery in aphasia. Brain and Language, 62:1-28, 1998.**

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**Albert, M.L., Connor, L.T., & Obler, L.K. Brain, language and environment. Brain and Language Third Millennium Special Issue.**

## **Harold Goodglass, Ph.D.**

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Professor of Neurology (Neuropsychology), Boston University School of Medicine

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Dr. Goodglass was born in New York City August 18, 1920, graduated from Townsend Harris High School in 1935, and received a BA from City College of New York in 1939. He served in the Army Air Force from 1942 to 1946, and was discharged as a Captain. He then attended New York University, receiving an MA in Psychology in 1948 and received a PhD in Clinical Psychology from the University of Cincinnati in 1951. He is married to Dr. Helen S. Denison.

Dr. Goodglass developed a special interest in aphasia early in his career and with the research support of the Veterans Administration and the National Institutes of Health he published research articles on disorders of naming in aphasia, on category specific disorders of lexical comprehension and production, on the comprehension of syntax and on the syndrome of agrammatism. He also carried out a program of studies on cerebral dominance. Among his collaborators were Fred Quadfasel, Jean Berko Gleason, Edith Kaplan, Sheila Blumstein, Nelson Butters, Norman Geschwind, Joan Borod, Arthur Wingfield, and Kim Lindfield.

Dr. Goodglass became director of the Boston University Aphasia Research Center in 1969, and remained in that post until 1996. He is Professor of Neurology (Neuropsychology) at Boston University School of Medicine. He is the author of over 130 research articles, and of the books Psycholinguistics and Aphasia (with Sheila Blumstein The assessment of Aphasia and Related Disorders and the Boston Diagnostic Aphasia Examination (with Edith Kaplan), Understanding Aphasia, and Anomia (with Arthur Wingfield). He received the 1997 Gold Medal Award for Contributions to the Application of Psychology from the American Psychological Foundation.

### **SELECTED PUBLICATIONS**

**Albert, M. L., & Goodglass, H. (1997). Evolving concepts of anomia: Geschwind's role. In S. Schacter & D. Devinsky, (Eds.), Behavioral neurology and the legacy of Norman Geschwind. New York: Raven Press.**

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**Disorders and the Boston Diagnostic Aphasia Examination (with Edith Kaplan), Understanding Aphasia, and Anomia (with Arthur Wingfield). He received the 1997 Gold Medal Award for Contributions to the Application of Psychology from the American Psychological Foundation.**

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**Goodglass, H. Aphasiology in the United States. *International Journal of Neurosciences*, 1985, 25, 307-311.**

## **Nancy Helm-Estabrooks, Sc.D**

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Nancy Helm-Estabrooks, Sc.D. is a professor of Neurology (Speech Pathology) at Boston University School of Medicine and an Investigator at the Harold Goodglass Aphasia Research Center. She has developed a variety of treatment methods, many of which are described in her *Manual of Aphasia Therapy*. Her standardized tests include the Aphasia Diagnostic Profiles, the Boston Assessment of Severe Aphasia, the Test of Oral and Limb Apraxia and the Brief Test of Head Injury. Dr. Helm-Estabrooks has authored and co-authored numerous books, chapters, and journal articles. Most recently, she co-edited the book, *Approaches to Treatment of Aphasia*, with Dr. Audrey Holland. Dr. Helm-Estabrooks holds Board Certification in Adult Neurologic Communication Disorders from the Academy of Neurologic Communication Disorders and Sciences. She is a member of the World Federation of Neurology study section on Aphasia and Cognitive Disorders.

Also: Research Professor at the National Center for Neurogenic Communication Disorders at the University of Arizona; member of the American Speech-Language-Hearing Association; the International Neuropsychology Society, the World Federation of Neurology (Aphasia and Cognitive Disorders) and the Academy of Aphasia.

### **SELECTED PUBLICATIONS**

**Helm-Estabrooks, N. (1998). A "cognitive approach" to treatment of an aphasic patient. In: N. Helm-Estabrooks and A.L.Holland (Eds). *Approaches to the Treatment of Aphasia*. San Diego, CA: Singular Publishing Group.**

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**Helm-Estabrooks, N. (1995). Cognitive Linguistic Task Book. Sandwich, MA: Publishing Division, Cape Cod Institute for Communication Disorders.**

**Helm-Estabrooks, N., Bayles, K., Ramage, A., and Bryant, S. (1995). Relationship between cognitive performance and aphasia severity, age and education: Females versus Males. Brain and Language, 51, (1)139-141.**

## **William P. Milberg, Ph.D.**

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Associate Director for Research of the Brockton/West Roxbury GRECC

Ph.D. Wayne State University

William Milberg received his Ph.D in Clinical Psychology with a specialty in Neuropsychology from Wayne State University in 1978. He completed an internship in Neuropsychology under the supervision of Edith Kaplan at the Boston VAMC, and a post-doctoral fellowship at Harvard Medical School with Brendan Maher. He holds the Diplomate in Clinical Neuropsychology from ABEPP and he is currently an Associate Professor of Psychology in the Department of Psychiatry at Harvard Medical School, and the Associate Director for Research of the Brockton/West Roxbury GRECC. Dr. Milberg has been an active member of the Aphasia Research Center since 1979. His research has focussed on the measurement of the dynamic changes of activation of semantic information in patients with aphasia and other neurological disorders. In collaboration with Sheila Blumstein and others he has pioneered the use of priming techniques to study the brief information processing events that contribute to disorders of cognition and language (Milberg and Blumstein. 1981).

One of his most recent publications (Milberg et al (1999) describes the development of a formal theoretical approach to understanding the semantic memory disorder of patients with Alzheimer's Disease. This paper describes what is called the GAIN/DECAY Hypothesis, a model directly derived from his work on the dynamics of activation of semantic information in aphasia. He and Dr. Blumstein are currently working on the problem of how summation of activation may impact semantic and syntactic processing.

## **SELECTED PUBLICATIONS**

**Milberg, WP, McGlinchey-Berroth, R, , Duncan, KM, Higgins, J. Alterations in the dynamics of semantic activation in alzheimer's disease: Evidence for the Gain/Decay Hypothesis of a Disorder of Semantic Memory J. Inter. Neuropsych. Soc. 1999Vol 5 (7), 641-658**

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## **Margaret Naeser, Ph.D.**

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Margaret Naeser is Research Professor of Neurology, Boston University School of Medicine. She conducts structural and functional neuroimaging research with stroke patients who have aphasia; emphasis is on studying recovery in aphasia. Her functional imaging research is primarily funded by the Medical Research Service, Department of Veterans Affairs, Washington, D.C. Her laboratory is located at the Boston Veterans Affairs Medical Center and the Harold Goodglass Boston University Aphasia Research Center.

She has published over 80 articles in the area of neuroimaging and aphasia.

She is also a Licensed Acupuncturist in Massachusetts, and board certified in Acupuncture by the National Certification Commission for Acupuncture and Oriental Medicine. ....While studying in Shanghai for almost 2 months, she learned how to perform painless, non-invasive laser acupuncture — i.e., low level laser stimulation of acupuncture points on the skin, instead of needle stimulation. From 1984-88, funded by the Robert Wood Johnson Foundation, she conducted research with acupuncture in the treatment of paralysis in stroke patients, and has published four papers on this topic.

She is currently conducting laser acupuncture research to treat carpal tunnel syndrome, at the Boston Veterans Affairs Medical Center. She has published two books on laser acupuncture, and on Chinese herbal medicines.

### **SELECTED PUBLICATIONS**

**Naeser MA: Neuroimaging and Recovery of Auditory Comprehension and Spontaneous Speech in Aphasia with Some Implications for Treatment in Severe Aphasia. Chapter in A Kertesz (Editor), Localization and Neuroimaging in Neuropsychology (Second Edition). Academic Press, Inc., Orlando, 245-295, 1994.**

**Naeser MA, Palumbo CL, Prete MN, Baker EH, Wingfield A, Goodglass H, Tow D, Moore S, Samaweera R, Syravanh C: Case Report: CT Scan Lesion Site and SPECT Scan rCBF in an Aphasia Patient with No Speech for 10 Years Poststroke. Brain and Language 47(3), 1994; 497-500.**

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**Naeser MA, Palumbo CL, Prete ML, Fitzpatrick PM, Mimura M, Samaraweera R, Albert ML: Visible Changes in Lesion Borders on CT Scan after Five Years Poststroke, and Long-Term Recovery in Aphasia. Brain and Language 62(1):1-28, 1998.**

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**Naeser MA, Baker EH, Nicholas M, Baird A, Hodge S, Samaraweera R, Palumbo C, Yurgelun-Todd D, Renshaw P, Harris G: fMRI Studies in Severe Aphasia Patients with No Speech, Pre- and Post- Treatment with a Nonverbal, Picture/Icon-based, Computer-Assisted Treatment Program (manuscript submitted).**

## **NATIONAL CENTER FOR NEUROGENIC COMMUNICATION DISORDERS (NCNCD)**

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The National Center for Neurogenic Communication Disorders (NCNCD) is staffed by scientists, educators, students and supporting personnel who are concerned with speech and language disorders caused by diseases of the nervous system. The Center has been made possible by a grant from the National Institute on Deafness and Other Communication Disorders, a division of the National Institutes of Health.

Center personnel conduct research and provide opportunities for research training in areas that include muscular control of speech and voice production, auditory and visual perception of speech, cognition, and the impairment of language function after stroke or as a result of nervous system disease.

An important mission of the Center is to educate the general public about the cause, prevention, and treatment of neurogenic communication disorders. Information is disseminated through a variety of media, including PhotoNovel (FotoNovela for the Hispanic community), video training programs, radio, and billboard advertisements, and PhotoMural.

### **TRAINING**

The National Center for Neurogenic Communication Disorders offers three education and training programs for persons who: wish to obtain a Ph.D. degree; have a Ph.D., M.D., or equivalent degree and are embarking on their research careers; or are established investigators and wish to work and study at the Center for periods of one to six months.

The predoctoral program typically involves a commitment of four years of study after completion of a master's degree. The beginning postdoctoral program is designed to provide trainees the opportunity to develop into independent investigators over a two or three year period. Senior postdoctoral fellows are encouraged to follow new research directions and are called upon to enrich the experiences of all of the Center personnel and trainees.

### **FACULTY OF THE NCNCD**

Kathryn A. Bayles, Ph.D.  
Pelagie Beeson, Ph.D.  
Carol Boliek, Ph.D.  
Kenneth I. Forster, Ph.D.  
Merrill F. Garrett, Ph.D.  
Theodore J. Glattke, Ph.D.  
Thomas J. Hixon, Ph.D.

Jeannette D. Hoit, Ph.D.  
Audrey L. Holland, Ph.D.  
Janet C. Nicol, Ph.D.  
Elena Plante, Ph.D.  
Cyma Van Petten, Ph.D.  
Gary Weismer, Ph.D.

## **SELECTED CURRENT PROJECTS**

The research component of the Center is an integrated and focused multidisciplinary effort. It involves both basic and clinical studies that are relevant to the understanding, evaluation, and management of speech and language disorders caused by diseases of the nervous system. This research includes both normal and abnormal function, with elements in speech production and perception, language production and processing, and cognition.

### **Aspects of Articulatory Function: Motor Speech Disorders**

Researchers: Gary Weismer, Ph.D., Joseph Perkell, Ph.D., Lorraine Ramig, Ph.D.

The two broad objectives of the current proposal are (a) to understand the potential relationship between speech breathing and articulation in persons with motor speech disorders, and (b) to develop a statistical model of articulatory variability in persons with motor speech disorders, and to use this model to explain the basis of speech motor control deficits in this population. More specifically, the aims of the proposed studies are (a) to understand how modifications in the starting lung volume for speech affect acoustical and perceptual measures of articulatory behavior, (b) to determine if persons with motor speech disorders are able to learn consistent modification of their starting lung volumes for speech, and (c) to study the statistical relationships between spectral and temporal properties of formant transitions produced by persons with motor speech disorders. The experimental plan to address these aims includes natural observation of the covariation between lung volume variables and the acoustical/perceptual measures mentioned above, single-case design methods to evaluate patients' ability to learn the lung volume modifications, and a paradigm in which speaking rate is intentionally varied for the purpose of inducing variability in articulatory processes. When the specific aims identified above are met, there should be a much better understanding of the factors contributing to communication deficits in persons with neurological disease, and hence a better notion of how best to treat the deficit.

### **Stimulating Cognitive Processes to Remediate Aphasia**

Researchers: Audrey L. Holland, Ph.D., Pelagie Beeson, Ph.D., Nancy Helm-Estabrooks, Ph.D., Joel Greenhouse, Ph.D., Cynthia Thompson, Ph.D.

The research proposed here is a series of clinical studies of therapy for individuals with aphasia, directed at the interface between cognitive and linguistic processing. The objective of this research is to provide tested alternatives to traditional aphasia therapy that attempt to modify language performance by direct work on patient deficits. The research has two phases. In Phase I, two groups of studies will use single-case research methods to develop and test a series of innovative cognitively based interventions. One set of these interventions will focus on patients whose aphasia is accompanied by nonverbal cognitive disorders and is directed to remediation for them. The second set of studies in Phase I, will focus on a different set of individuals with aphasia, those who demonstrate good cognitive skills. These studies are aimed at enlisting these good cognitive skills to aid in the development of compensatory support for poor language performance. In Phase II, a group study is proposed. Individuals with aphasia whose cognitive skills are similar to those studied in Phase I, will be tested with the treatments validated in Phase I and their performance will be compared with a matched group of patients treated with direct intervention for their language disorders. In both phases of this project, external criteria! tests of cognition, language, and functional language skills will be used to measure comparative effectiveness of the training protocols. All treatment in this study will be provided at an intensity that approximates that of current reimbursed clinical practice, so its usefulness for ongoing clinical environments can be

evaluated.

## **CONTINUING EDUCATION**

The National Center for Neurogenic Communication Disorders has a dynamic multifaceted continuing education program. It includes live television productions, videotaped instructional materials, innovative computer conferencing, audio teleconferencing and colloquia. TELEROUNDS is one of two of the Center's most successful continuing education efforts.

### **TELEROUNDS**

<http://cnet.shs.arizona.edu/telerounds/>

TELEROUNDS is an exciting videoconference series produced by the The National Center for Neurogenic Communication Disorders at the University of Arizona. The TELEROUNDS series is designed to meet the continuing education needs of speech-language pathologists and allied health care professionals who provide services to individuals with neurogenic communication disorders.

How TELEROUNDS works: Typically, in each program, a clinical scientist presents a client (or clients) with a neurogenic communication disorder in a video "grand rounds" session. During the hour-long program, viewers have the opportunity to call in questions about the case(s) or the topic being discussed. TELEROUNDS is broadcast live via satellite to sites across North America, thus it is a real-time forum for professionals. Those who view the live programs are eligible to earn CEU credit from the American Speech-Language-Hearing Association.

You will be able to continue discussions on recent TELEROUNDS programs, review abstracts of past TELEROUNDS, order VHS videotapes of TELEROUNDS, receive information on future TELEROUNDS, and post suggestions for topics for future programs on the listserv.

## **SELECTED RESEARCHERS**

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Professor of Speech and Hearing Sciences at the University of Arizona

Associate Vice President for Research and Graduate Studies at the University of Arizona

Thomas J. Hixon, Ph.D., is Associate Vice President for Research and Graduate Studies, Research Integrity Officer, Director of the National Center for Neurogenic Communication Disorders, and Professor of Speech and Hearing Sciences. He is also Principal Investigator on the National Center's Research Project on Normal and Abnormal Speech Production. In 1965 he received his Ph.D. from the University of Iowa, and from 1968-70 was a Postdoctoral Fellow at Harvard University. Dr. Hixon is a member of the American Speech-Language-Hearing Association.

## **Kathryn A. Bayles Ph.D.**

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Department Head and Professor of Speech And Hearing Sciences at the University of Arizona

Associate Director of the National Center for Neurogenic Communication Disorders.

For almost two decades Bayles has conducted investigations of the effects of dementia-producing diseases on linguistic communication and has authored two books on the subject of dementia and communicative function as well as two standardized tests. Understanding cultural diversity has been a strong interest of Dr. Bayles, having lived and worked on American Indian reservations in the southwest, and she has expertise in intercultural communication training.

## **Audrey L. Holland, Ph.D**

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Regents' Professor of Speech And Hearing Sciences at the University of Arizona  
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Ph.D, University of Pittsburgh

Audrey L. Holland received her BS degree in Psychology, and her Master's and Doctorate from the University of Pittsburgh. Before joining the faculty at Arizona in 1991, she was a Professor of Otolaryngology and Associate Professor of Psychiatry at the University of Pittsburgh School of Medicine. She has also previously taught at Emerson College, Boston. Her major research interests have been in neurogenic communication disorders, with special emphasis on aphasia and management of aphasia. She maintains an active clinical role in rehabilitation of aphasic adults. She has published over 125 research articles, textbooks and clinical tools. She holds the Certificate of Clinical Competence in Speech Pathology, and was the 1990 recipient of the Honors of the American Speech Language Hearing Association.

## **Pelagie Beeson, Ph.D.**

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Assistant Research Scientist at the National Center for Neurogenic Communication Disorders at the University of Arizona

A speech-language pathologist, Board Certified in Neurologic Communication Disorders in Adults, Pagie is active in research and clinical activity. Her primary interests include (a) brain behavior relations in the areas of language and memory, (b) treatment of aphasia, apraxia, acquired alexia and dysgraphia, and (c) issues relative to long-term rehabilitation following stroke-induced aphasia.

Pagie oversees the University of Arizona Aphasia Clinic which provides individual therapy as well as numerous weekly aphasia groups. Pagie is a member of the Steering Committee for ASHA Special Interest Division # 2: Neurophysiology and Neurogenic Speech and Language Disorders, and she is also active in the International Neuropsychological Society.

**Gary Weismer, Ph.D.**

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Professor and Chair of the Department of Communicative Disorders at the University of Wisconsin - Madison

Dr. Weismer is Professor and Chair of the Department of Communicative Disorders at the University of Wisconsin - Madison. He received doctorate from the University of Wisconsin - Madison (1975). Dr. Weismer teaches courses in the areas of speech acoustics and perception, neural bases of speech, hearing, language, and voice, and craniofacial disorders. His research interests are in the areas of motor speech disorders, normal speech production, and acoustic analysis of disordered speech.

**Elena Plante, Ph.D.**

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Associate Professor of Speech and Hearing Sciences at the University of Arizona

Elena Plante, Ph.D. is an Associate Professor with joint appointments in the Department of Speech and Hearing Sciences and the National Center for Neurogenic Communication Disorders. She has been conducting neuroimaging research for over 10 years. Her work is currently funded by grants from the National Institute on Deafness and Other Communication Disorders and the National Institute on Aging. Ongoing research involves morphometric analysis of structural MRI scans, fMRI studies of language in normal and impaired subjects, and electrophysiologic correlates of processing in normal and language/learning disabled subjects. Dr. Plante's lab supports structural and functional MRI studies that examine issues related to normal language processing or brain correlates of language disorders. Electrophysiologic studies are conducted in collaboration with the Van Petten ERP lab (Cyma Van Petten, Ph.D., principal investigator).

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Cyma Van Petten, Ph.D. is a Associate Professor with joint appointments in the Department of Psychology, and the Committee on Neuroscience and the National Center for Neurogenic Communication Disorders. Cyma Van Petten received her Ph.D. at the University of California in 1989. Her research interests include language comprehension, developmental language disorders, memory, and aging.

**NATIONAL INSTITUTE OF NEUROLOGICAL DISORDERS AND  
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The nation's leading supporter of biomedical research on disorders of the brain and nervous system. The mission of NINDS is to reduce the burden of neurological disease -- a burden borne by every age group, by every segment of society, by people all over the world.

To support this mission, NINDS:

- Conducts, fosters, coordinates, and guides research on the causes, prevention, diagnosis, and treatment of neurological disorders and stroke, and supports basic research in related scientific areas.
- Provides grants-in-aid to public and private institutions and individuals in fields related to its areas of interest, including research project, program project, and research center grants.
- Operates a program of contracts for the funding of research and research support efforts in selected areas of institute need.
- Provides individual and institutional fellowships to increase scientific expertise in neurological fields.
- Conducts a diversified program of intramural and collaborative research in its own laboratories, branches, and clinics.
- Collects and disseminates research information related to neurological disorders.

## **NATIONAL INSTITUTE ON DEAFNESS AND OTHER COMMUNICATION DISORDERS (NATIONAL INSTITUTES OF HEALTH)**

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The National Institute on Deafness and Other Communication Disorders (NIDCD) is one of the Institutes that comprise the National Institutes of Health (NIH). NIH is the Federal government's focal point for the support of biomedical research.

Established in 1988, NIDCD is mandated to conduct and support biomedical and behavioral research and research training in the normal and disordered processes of hearing, balance, smell, taste, voice, speech, and language. The Institute also conducts and supports research and research training related to disease prevention and health promotion; addresses special biomedical and behavioral problems associated with people who have communication impairments or disorders; and supports efforts to create devices which substitute for lost and impaired sensory and communication function.

It is estimated that more than 46 million people in the United States suffer some form of disordered communication. NIDCD has focused national attention on disorders of human communication and has contributed to advances in biomedical and behavioral research that will improve the lives of millions of individuals with communication disorders. NIDCD has made important contributions to the body of knowledge needed to help those who experience communication disorders and to advance research in all aspects of human communication.

Current research projects address the following: genetics of communication disorders in humans and murine models; elucidation of the sensory transduction mechanisms of hearing, balance, smell, and taste; structural, physiological, and developmental properties of the inner ear; neuroimaging of brain function in physiologic and pathophysiologic states; characterization of basic properties of neurotransmission and signal transduction; development of vaccines against otitis media; and epidemiologic studies of human communication processes.

Online Publication: *Aphasia* - [http://www.nidcd.nih.gov/health/pubs\\_vsl/aphasia.htm](http://www.nidcd.nih.gov/health/pubs_vsl/aphasia.htm)

## TREATMENT PROGRAMS & OTHER RESEARCH CENTERS

**This is not a comprehensive list of clinics and related research programs, but represents a selection of facilities and programs other than the major ones detailed in the MAJOR APHASIA RESEARCH CENTERS section.**

<http://www.aphasiahope.org/index.html> and other websites

**University of Michigan Communicative Disorder Clinic and Residential Aphasia Program** - <http://www.umich.edu/~comdis/welcome.html> a six week intensive speech-language therapy program.

The University of Michigan Communicative Disorders Clinic, founded nearly 60 years ago, is one of the original programs in communication disorders in the United States.

The mission of the Communicative Disorders Clinic at the University of Michigan is to provide excellent and intensive speech and language intervention to individuals with communication disorders; to promote awareness and understanding of communication and disorders of communication to the families of those we serve and the public at large; and to provide leadership in expanding the scientific knowledge base of language and language disorders.

**Aphasia Center of California** - <http://www.employees.org/~accadmin/> is a nonprofit community center providing speech-language treatment, caregiver groups, and recreational classes for individuals with communication impairment due to stroke.

The mission of the Aphasia Center of California is to enhance communication skills and maximize psychosocial well-being for all those affected by aphasia following stroke.

The Aphasia Center of California opened its doors as a 501(c)(3) nonprofit, charitable organization in 1996. We are dedicated to helping stroke survivors, family members, and co-workers understand how aphasia affects their daily lives. We are committed to giving participants an active "voice" through their participation in program planning and by membership on the Aphasia Center of California's governing Board of Directors.

Our therapy programs are based on clinical research studies which demonstrate treatment efficacy and effectiveness. Our research findings appear in peer-reviewed professional journals and have been presented at numerous scientific meetings.

**Pat Arato Aphasia Centre** <http://www.aphasia.on.ca/index.shtml> is dedicated to training volunteers and partners of aphasic individuals to communicate with them. The aphasia centre located in north Toronto is a community-based agency which provides long-term support and education for adults with aphasia, their families, professional and the community. Contact: The Aphasia Institute, 53 The Links Road, Toronto, ON M2P 1T7 Canada.

We, at the Pat Arato Aphasia Centre would like to take this opportunity to announce our new name, the "Aphasia Institute". The Institute will continue to operate its current programs and services at the Pat Arato Aphasia Centre, the service delivery

component of the Institute. The decision to change our name was taken after a thorough community planning process that identified the need to reflect more accurately the functions contained within our organization. The Aphasia Institute houses three major components:

- Programs and Services, housed in the Pat Arato Aphasia Centre
- Education, Training and Research Programs
- Access and Outreach Programs (including advocacy and awareness)

**Department of Communicative Sciences and Disorders** - University of California State, Hayward - <http://www.isis.csu Hayward.edu/alss/csd/aphaprogram.htm>

The Department of Communicative Sciences and Disorders at California State University, Hayward has developed an innovative and cost-efficient approach to the treatment of aphasia. Its purpose is to provide a variety of treatments for aphasia in an intensive rehabilitation program.

The Aphasia Treatment Program is offered on Mondays and Wednesdays from 10:30 to 4:00. Each day begins with an hour and a half of Cooperative Group Treatment, which provides opportunities to learn self-cueing strategies. Following this, there will be a break for lunch. After lunch, participants will be divided into small groups to practice conversations skills in Discourse Treatment from 1:00 to 2:00. On Mondays, from 2:30 to 4:00, all participants will meet in Community-Theme treatment, where we will explore recreational and social activities to expand communication opportunities. On Wednesdays, beginning at 2:00, participants will meet in our well established Aphasia Group that has been meeting for approximately ten years.

This group provides a social environment for interactions with many different aphasic individuals and their families and friends. Thus, each participant will receive eight hours of treatment per week at a cost of \$350 per quarter. A sliding fee scale is available. The Wednesday Aphasia Group from 2:00 to 4:00 will be available to anyone interested in participating. New clients are eligible for individual treatment for one hour sessions twice weekly and may prefer to apply for individual treatment through our regular outpatient clinic program instead of the Aphasia Treatment Program.

Due to the intensive nature of treatment offered through the Aphasia Treatment Program, participants should be ambulatory -- able to move independently with the aid of a wheelchair or cane.

**Intensive Residential Aphasia Communication Therapy Program (InteRACT) The School of Human Communication Disorders, Dalhousie University** - <http://www.dal.ca/~interact/>

Since 1987, weekly outpatient aphasia group sessions have been held at the Dalhousie School of Human Communication Disorders in Halifax, Nova Scotia. In response to a need for additional services for aphasia, a new intensive residential speech and language program is now offered through the school. This service, which is unique in Canada, is based on two main principles:

- Research in aphasia has indicated that improved communication skills can be best facilitated through intensive treatment
- Communication does not occur in isolation, therefore partners must be actively involved in any communication intervention program.

**MossRehab Aphasia Center**, Philadelphia, PA - <http://www.einstein.edu/mossrehab/>  
MossRehab is nationally recognized for its comprehensive medical rehabilitation programs. In addition, the National Institute on Disability and Rehabilitation Research has designated MossRehab as a Model System of Care for traumatic brain injury.

To address the unmet needs of people with aphasia and their families, MossRehab in Philadelphia, PA has developed a comprehensive aphasia center. It is a place where people can find information and peer support, as well as participate in on-going research and treatment. MossRehab Aphasia Center is a joint effort between MossRehab and Moss Rehabilitation Research Institute, one of the nation's leading aphasia research centers.

Survivors of stroke and traumatic brain injury often live with significant disability. One of the most devastating, long-term disabilities is aphasia. The communications disorder affects a person's ability to speak, read, write and understand language. More than one million Americans live with aphasia—more than with Parkinson's disease multiple sclerosis or muscular dystrophy.

Recovery from aphasia involves a life-long process of re-education, adaptation and support. Under the right conditions, people with aphasia can continue to recover even years after onset of aphasia. Participating in social, recreational and educational activities helps people with aphasia and their families make psychosocial adjustments. Patients and their families can play an important role in increasing public awareness of aphasia.

**Vanderbilt Bill Wilkerson Center** - <http://www.vanderbilt.edu/BillWilkersonCenter/> The Bill Wilkerson Center, located in Nashville, is a regional center for the diagnosis and treatment of hearing, language, speech and cognitive disorders.

The 43 year old Center averages over 40,000 client visits annually and serves individuals of all ages living in Tennessee as well as in surrounding states. The Bill Wilkerson Center operates an audiology clinic for assessment and treatment of hearing problems, a speech and language department for assessment and treatment of speech, language and related disorders, and the Pi Beta Phi Rehabilitation Institute, a comprehensive rehabilitation facility for individuals suffering the effects of head injury or stroke. In 1997, the Center became an organizational component of Vanderbilt University. Contact: 114 19th Avenue South, Nashville, TN 37212; 615.936.5000

The Vanderbilt Bill Wilkerson Center has a strong research program, with faculty members who are nationally and internationally recognized experts in their respective fields of study.

**Wendell Johnson Speech and Hearing Clinic** - University of Iowa - <http://www.shc.uiowa.edu/wjshc/mainclinsrvs.html> - The Wendell Johnson Speech and Hearing Clinic has a history of excellence in the quality of clinical services provided to individuals with communication disorders and in the quality of clinical education offered to graduate students in speech pathology and audiology. Today the goal at Wendell Johnson Speech and Hearing Center is to build a future worthy of the past.

**Memphis Speech & Hearing Center** - <http://www.ausp.memphis.edu/program/mshc.htm>

The Memphis Speech and Hearing Center, located in the heart of the Memphis medical district, was established in 1947 by the Board of Directors of The Memphis Speech and Hearing Center, Inc. to provide a full range of clinical services to individuals with communication disorders.

Since 1967, the Center has been affiliated with The University of Memphis, and is the site of The U of M's School of Audiology and Speech-Language Pathology. State-of-the-art research laboratories and a graduate education program, combined with the Center's well-respected clinical program, make it one of the premiere speech and hearing facilities in the Mid-South.

Clinical service programs at the Memphis Speech and Hearing Center are fully accredited in both audiology and speech-language pathology by the Professional Services Board of the American Speech-Language-Hearing Association (ASHA). The academic program, a vital resource at the Center, is accredited by ASHA's Educational Standards Board.

Adult Neurogenic Communication Disorders Program: This program provides speech and language services to individuals with aphasia, motor speech disorders, or other speech and language problems caused by stroke, brain surgery, or neuromuscular diseases. Individual and group therapy is designed to help clients become more functional communicators in the supportive therapy environment and in their daily activities.

**University of Texas-Dallas/ Callier Center for Communication Disorders** -

<http://www.callier.utdallas.edu/> The mission of the Callier Center for Communication Disorders is to advance knowledge and services in communication disorders. The Center accomplishes its mission through integrated programs that prepare future clinicians and researchers, offer to the community state-of-the-art clinical and educational services, and support research contributing directly or indirectly to the identification, treatment and prevention of communication disorders.

**University of Maryland - Department of Neurology**

<http://www.umm.edu/neuro-stroke/> At the University of Maryland Stroke Center, an integrated approach provides comprehensive evaluation and management for patients who have suffered strokes. State-of-the-art resources and innovative research combine to ensure that all patients receive the most advanced treatment through the Center's new Brain Attack program. The continuum to rehabilitation care optimizes patients' recovery.

**Kernan Hospital**

Kernan has been owned by the University of Maryland Medical System since 1985. This allows Kernan patients to access the continuity of care and extensive resources that characterize a university teaching hospital. In 1989, the state of Maryland selected Kernan to be one of five centers throughout Maryland with licensed rehabilitation beds, and in 1996 Montebello Rehabilitation Hospital merged with Kernan. Kernan Hospital is JCAHO and CARF accredited with speciality accreditation in Brain Injury (BI), Spinal Cord Injury (SCI), and Comprehensive Integrated Inpatient Rehabilitation Program (CIIRP).

University Post-Acute Care Services has created a system of brain injury rehabilitation with services at Kernan Hospital and Deaton Specialty Hospital. This inpatient/outpatient system allows University Post-Acute

Care Services to provide appropriate services for individuals with a range of medical and physical problems, from the comatose and ventilator-dependent to the physically independent but cognitively impaired.

**The University of Florida Speech and Hearing Clinic** has been in operation for over 40 years in historic Dauer Hall on the campus of the University of Florida. The Clinic serves as a teaching clinic for students pursuing Masters and Doctoral degrees in Speech-Language Pathology or Audiology. All patient services are provided by students under the guidance and supervision of faculty members and doctoral students. The supervisors are nationally recognized for their academic, research, and clinical expertise with a variety of communication disorders and hold national certification from the American Speech-Language-Hearing Association and licensure from the State of Florida.

University of Florida's **McKnight Brain Institute** - <http://www.ufbi.ufl.edu/> was. In early 1992, the University of Florida (UF), through its Health Science Center, College of Medicine and its teaching hospital, Shands at UF, made a strategic decision to create a unique campus-wide program to harness and enhance the multidisciplinary research, clinical care and educational skills of the entire university and thus maximize our ability to confront the awesome challenges brought on by nervous system disorders. This program was named the University of Florida Brain Institute (UFBI).

With the advent of the new millennium, the UFBI was renamed the Evelyn F. & William L. McKnight Brain Institute of the University of Florida (MBI-UF) to celebrate and commemorate a \$15,000,000 gift from the McKnight Brain Research Foundation. This award was the largest cash gift in UF history and it was matched by the State of Florida to create a \$30,000,000 permanent endowment devoted to fundamental research on the mechanisms underlying the formation, storage and retrieval of memories, the impairments in these processes associated with aging, and the development of therapeutic strategies for the prevention and/or alleviation of these impairments in humans.

Another "hot" area in aphasia therapy research has been in the field of cognitive rehabilitation. Research experts who have published in this field recently include Leslie Gonzalez-Rothi at the University of Florida in Gainesville, also the director at the at the Gainesville VA Medical Center.

**VA Medical Center -Brain Rehabilitation Center** - Gainesville, Florida  
<http://www.va.gov/resdev/rehab.htm#centers>

Investigators at this new Center will develop research programs focused on the development of effective/efficient post acute rehabilitation for veterans with cognitive and motor impairments due to traumatic brain injury, cerebral vascular disease, and degenerative diseases. These programs incorporate epidemiological approaches to develop comprehensive data sets on which to base health policy planning, neuro-physiological studies to enhance understanding of mechanisms of neural plasticity, new treatments for the rehabilitation setting, and telehealth methodology to extend care provided in rehabilitation settings to the home environment. The new Center will capitalize on available resources at the North Florida/South Georgia Veterans Health System, as well as the University of Florida McKnight Brain Institute.

## **Prompt Institute**

<http://www.promptinstitute.com/index2.html>

PROMPT Institute  
27 Pan de Vida  
Santa Fe New Mexico

Telephone: 505.466.7710  
Fax: 505.466.7714

Deborah Hayden, M.A., CCC-SLP, SL-P(C) the creator of PROMPT©, began developing the technique of PROMPT© over 25 years ago. Her experiences have included work with infants, toddlers, children, adolescent's, adults and geriatrics. As her experience and understanding of the development and breakdown of human systems (sensory, perception, cognition, ideation, planning and action) evolved so has PROMPT©. What is unique about PROMPT© is that it is a human philosophy that looks to create unique programs for each person based on the combination of many factors to support speech production change.

PROMPT© (a dynamic, holistic, tactile-kinesthetic system) is probably best known as a technique used in restructuring the speech production output of children and adults with variety of speech disorders e.g. phonological, dysarthria, dyspraxia, hearing impaired. However, it would be most accurate to describe PROMPT© as a philosophy of treatment that strives to (re)connect and integrate the motor, cognitive-linguistic and social-emotional aspects of communication.

For this reason, learning and using PROMPT© is a process. It is not a cook-book, does not employ oral-motor exercises, speech drill, or traditional developmental speech hierarchies ....but instead looks at each individual to determine how to develop the most normalized and flexible motor control, cognitive skills and social interactions in the quickest way with the most functional results.

The PROMPT© clinician gives input to all areas by using touch, pressure, specific placements, creating auditory and visual awareness and by being sensitive to timing. All information is used first to provide support for developing or disordered speech control mechanisms or structures (tone, trunk, head-neck control and stabilization). Second, as control is developed or regained, refining movement of the speech sub-structures (phonation, jaw, labial-facial, tongue) that lead to independent, flexible, finely controlled and interactive movement between structures.

One of the PROMPT instructors:

### **Roberta Chapey, Ph.D, CCC-SLP**

[RChapey@aol.com](mailto:RChapey@aol.com)

Department of Speech, Brooklyn College, CUNY  
Telephone: 718.951.5225

During the last 30 years, Chapey, is a professor in the Speech Communication Arts & Sciences at Brooklyn University. has been involved in clinical and research work in the area of adult aphasia. Most notably, this includes her work as author/editor of Language Intervention Strategies in Adult Aphasia, published by Lippincott, Williams and Williams.

## THE TOP U.S. SPEECH/LANGUAGE PATHOLOGY GRADUATE PROGRAMS (2001)

### **RANKED BY US NEWS & WORLD REPORT MAGAZINE**

<http://www.usnews.com/usnews/edu/beyond/bchome.htm>

Universities with graduate speech and language pathology graduate programs have clinics **associated with them. In some cases, proximity to a medical school or other institutional entity may result in an active clinic that develops a national or international reputation.**

**Details on selected treatment programs/clinics are listed in *Treatment Programs and Other Research Centers*.**

Rankings in the health professions are based on the results of surveys sent to deans, faculty, and administrators of accredited graduate programs. Respondents were asked to rate the academic quality of programs as distinguished (5 points); strong (4); good (3); adequate (2); or marginal (1), based on their own assessment of the quality of curriculum, faculty, and graduates. Individuals who were unfamiliar with particular programs were instructed to select "don't know." Scores for each school were averaged across all respondents who rated that school. (University of Iowa - 4.7 to Arizona State - 3.7 = range of the top 15 schools.)

School addresses and contact information from The Council of Academic Programs in Communication Sciences and Disorders -

[http://www.capcsd.org/cgi-win/cgplist32.exe/Programs By State](http://www.capcsd.org/cgi-win/cgplist32.exe/Programs%20By%20State)

(1) UNIVERSITY OF IOWA  
Dept. of Speech Pathology & Audiology  
Iowa City, IA 52242

Representative: Richard Hurtig, Ph.D.  
PH: 319/335-8730 FX: 319/335-8851  
E-mail: [richard-hurtig@uiowa.edu](mailto:richard-hurtig@uiowa.edu)  
<http://www.shc.uiowa.edu/>

(2) UNIVERSITY OF WASHINGTON  
Dept. of Speech & Hearing Sciences  
1417 NE 42<sup>nd</sup> St.  
Seattle, WA 98105-6246

Representative: Carol Stoel-Gammon, Ph.D.  
PH: 206/543-7974 FX: 206/543-1093  
E-mail: [csg@u.washington.edu](mailto:csg@u.washington.edu)  
<http://depts.washington.edu/sphsc>

(3) U OF WISCONSIN-MADISON  
Dept. of Communicative Disorders  
1975 Willow Dr.  
Madison, WI 57306

Representative: Gary Weismer, Ph.D.  
PH: 608/262-3951 FX: 608/262-6466  
E-mail: [weismer@waisman.wisc.edu](mailto:weismer@waisman.wisc.edu)  
<http://www.comdis.wisc.edu/>

(4) NORTHWESTERN UNIVERSITY  
Dept. of Communication Sciences and Disorders  
2299 N. Campus Drive  
Evanston, IL 60208

Representative: Dean C. Garstecki, Ph.D.  
PH: 847/491-3066 FX: 847/491-4975  
E-mail: [d-garstecki@nwu.edu](mailto:d-garstecki@nwu.edu)  
<http://nuinfo.nwu.edu/csd>

(5) PURDUE UNIVERSITY  
Dept. of Audiology & Speech Sciences  
West Lafayette, IN 47907-1353

Representative: Robert Novak, Ph.D.  
PH: 765/494-1534 FX: 765/494-0771  
E-mail: [novakr@purdue.edu](mailto:novakr@purdue.edu)  
<http://www.sla.purdue.edu/academic/aus>

(6) UNIVERSITY OF ARIZONA  
Dept. of Speech & Hearing Sciences  
PO Box 210071  
Tucson, AZ 85721-0071

Representative: Kathryn Bayles, Ph.D.  
PH: 520/621-1644 FX: 520/621-9901  
E-mail: [Bayles@u.arizona.edu](mailto:Bayles@u.arizona.edu)  
<http://w3.arizona.edu/~sphweb/>

(7) UNIVERSITY OF KANSAS  
Life Span Institute  
Intercampus Program in Communication Disorders  
39<sup>th</sup> & Rainbow  
Kansas City, KS 66160-7605

Representative: John A. Ferraro, Ph.D.  
PH: 913/588-5937 FX: 913/588-5923  
E-mail: [jferraro@kumc.edu](mailto:jferraro@kumc.edu)  
<http://www.lsi.ukans.edu>

(8) INDIANA UNIVERSITY  
Dept. of Speech & Hearing Sciences  
Bloomington, IN 47405

Representative: Larry E. Humes, Ph.D.  
PH: 812/855-4156 FX: 812/855-5531  
E-mail: [humes@indiana.edu](mailto:humes@indiana.edu)  
<http://www.indiana.edu/~sphsdept/home.html>

(9) VANDERBILT UNIV. SCHOOL OF MEDICINE  
Department of Hearing & Speech Sciences  
St. 17, Box 8700  
Nashville, TN 37232-8700

Representative: Edward G. Conture, Ph.D.  
PH: 615/936-5100 FX: 615/936-5013  
E-mail: [edward.g.conture@vanderbilt.edu](mailto:edward.g.conture@vanderbilt.edu)  
<http://www.vanderbilt.edu/BillWilkersonCenter>

(10) U. OF ILLINOIS AT URBANA-CHAMPAIGN  
Dept. of Speech & Hearing Science  
901 South Sixth Street  
Champaign, IL 61820

Representative: Ron D. Chambers, Ph.D.  
PH: 217/333-2230 FX: 217/244-2235  
E-mail: [rdc@uiuc.edu](mailto:rdc@uiuc.edu)  
<http://www.shs.uiuc.edu/>

(11) UNIVERSITY OF MEMPHIS  
Audiology & Speech-Language Pathology  
807 Jefferson Avenue  
Memphis, TN 38105

Representative: Maurice I. Mendel, Ph.D.  
PH: 901/678-5800 FX: 901/525-1282  
E-mail: [MMENDEL@CC.MEMPHIS.EDU](mailto:MMENDEL@CC.MEMPHIS.EDU)  
<http://www.ausp.memphis.edu>

(12) U OF NORTH CAROLINA-CHAPEL HILL  
Div. of Speech & Hearing Sciences  
Campus Box 7190-Wing D, Med. Sch.  
Chapel Hill, NC 27599-7190

Representative: Jackson Roush, Ph.D.  
PH: 919/966-1006 FX: 919/966-0100  
E-mail: [jroush@css.unc.edu](mailto:jroush@css.unc.edu)  
<http://www.alliedhealth.unc.edu/sphs/index.htm>

(13) UNIVERSITY OF TEXAS AT AUSTIN  
Communication Sciences and Disorders  
Austin, TX 78712-1089

Representative: Thomas P. Marquardt, Ph.D.  
PH: 512/471-4119 FX: 512/471-2957  
E-mail: [tmarq@mail.utexas.edu](mailto:tmarq@mail.utexas.edu)  
<http://www.utexas.edu/coc/csd/graduate/>

(14) UNIVERSITY OF MINNESOTA  
Dept. of Communication Disorders  
164 Pillsbury Dr. SE  
Minneapolis, MN 55455

Representative: Arlene E. Carney, Ph.D.  
PH: 612/624-3322 FX: 612/624-7586  
E-mail: [carne005@tc.umn.edu](mailto:carne005@tc.umn.edu)  
<http://www.cdis.umn.edu>

(15) ARIZONA STATE UNIVERSITY  
Dept. of Speech & Hearing Science  
PO Box 870102  
Tempe, AZ 85287-0102

Representative: David Ingram, Ph.D.  
PH: 480/965-2905 FX: 480-965-8516  
E-mail: [David.Ingram@asu.edu](mailto:David.Ingram@asu.edu)  
<http://www.asu.edu/clas/shs>

**Rankings of other universities with graduate speech pathology programs  
that also have affiliated major aphasia research efforts:**

(18) UNIVERSITY OF PITTSBURGH  
Communication Science & Disorders  
4036 Forbes Tower  
Pittsburgh, PA 15260

Representative: Malcolm R. McNeil, Ph.D.  
PH: 412/647-1346 FX: 412/647-1370  
E-mail: [mcneil@shrs.pitt.edu](mailto:mcneil@shrs.pitt.edu)  
<http://www.Pitt.edu/~commsci>

(21) BOSTON UNIVERSITY  
Dept. of Communication Disorders  
635 Commonwealth Ave.  
Boston, MA 02215

Representative: Gerald Kidd, Jr., Ph.D.  
PH: 617/353-3252 FX: 617/353-5074  
E-mail: [gKidd@ACS.BU.EDU](mailto:gKidd@ACS.BU.EDU)  
<http://www.bu.edu/sargent/CD/>

(26) UNIVERSITY OF TEXAS AT DALLAS  
Program in Communication Disorders  
1966 Inwood Rd.  
Dallas, TX 75235

Representative: Robert Stillman, Ph.D.  
PH: 214/905-3060 FX: 214/905-3006  
E-mail: [stillman@utdallas.edu](mailto:stillman@utdallas.edu)  
<http://www.utdallas.edu/dept/hd>

## ASSOCIATIONS

**These are the major groups involved in advocacy, supporting research, or consumer education for speech and language problems.**

### **ACADEMY OF APHASIA**

Administrative Assistant for the Academy of Aphasia  
East Bay Institute for Research and Education  
150 Muir Road (126-s)  
Martinez, CA 94553

Telephone: 925.372.2670      Fax: 925.372.2553

Email: [contact@academyofaphasia.org](mailto:contact@academyofaphasia.org)

<http://www.academyofaphasia.org/>

The Academy of Aphasia is an international organization whose members are researchers who study the language problems of people who have neurological diseases. Some of these researchers also provide clinical services to help people improve their language skills following strokes or other illnesses.

Membership shall be open to persons who are actively interested in language and language disorders resulting from brain disease. Applicants for membership shall show evidence of appropriate education and training and shall be involved in teaching, research, or clinical practice. Qualifications shall ordinarily include an academic degree at the doctoral level and at least three significant publications contributing to the understanding of aphasia.

Application for membership must be sponsored by two members of the Academy....The Governing Board shall elect by majority vote those individuals it considers eligible for membership and shall report their names at the Annual Business Meeting for ratification by majority of the membership present.

### **SELECTED LIST OF TALKS AND POSTER SESSIONS AT THE ACADEMY'S 2000 ANNUAL MEETING:**

*The architecture of speech production processes*

*Speech and prosodic errors*

*The characteristics of speech errors in persons with fluent aphasia*

*The influence of phonological context on aphasic sound errors: A case study.*

*Hemispheric specialization in processing prosodic structures: Re-visited.*

*Functional neuroimaging of sentence comprehension in frontotemporal dementia.*

*Visual processing and oral reading impairment in Alzheimer's disease.*

*PET activation during picture naming in Alzheimer's disease.*

*Real-time sentence processing in Parkinson's disease.*

*Dopaminergic modulation of semantic activation: Evidence from Parkinson's disease.*

*Effects of intralaminar thalamic stimulation on linguistic processing.*

*Semantic processing of nonwords by a deep dyslexic.*

*A Functional MRI Study of Language Therapy in a Conduction Aphasic Patient.*

*Long-term recovery of naming and word-finding in narrative discourse in aphasia.*

*Clinical significance of recovery in aphasia: Social validation of improvement in a selected aspect*

*of communication change.*  
*Functional imaging studies of language in patients with dominant-hemisphere brain lesions.*  
*Repeated sampling of word-retrieval in aphasia: Stability of errors.*  
*Naming objects and actions: A case study.*  
*Facilitation of word retrieval in aphasia revisited.*  
*Training a self-initiated written word strategy in aphasia and apraxia of speech.*  
*Treating attention to improve auditory comprehension in aphasia.*  
*Effectiveness of intensive training in a case of progressive non-fluent aphasia: Evidence of preserved brain plasticity.*  
*Changes in word list recall by subjects with right hemisphere stroke.*  
*The organization of agreement affixes in the mental lexicon: Evidence from German Broca's aphasia.*  
*Processing of noun-adjective and adjective-noun compounds in Italian agrammatic patients.*  
*Processing of grammatical gender in Russian-speaking aphasics.*  
*Grammaticality judgments by agrammatic aphasics: Data from Brazilian-Portuguese.*  
*The end of dichotomies: Dissociating different types of mental computations during the processing of past tense in Greek language-impaired patients.*  
*Non-semantic pathways of reading and writing Chinese: Data from a Cantonese speaking brain-damaged patient.*

## **APHASIA HOPE FOUNDATION**

Aphasia Hope Foundation  
2436 West 137th St.  
Leawood, KS 66224

Telephone: 913.402.8306  
Fax: 913.402.8315

Toll Free: 866.449.5804

<http://www.aphasiahope.org/index.html>

Aphasia Hope Foundation (AHF) is a nonprofit foundation that aims to compile and foster scientific research along with the practical knowledge gained from the actual experiences of survivors, their families and their service provider.

### **PROJECTS**

- Publication of a curriculum for speech therapists working with fluent and non fluent aphasics
- Development of a web page for children suffering from aphasia
- Promotion of educational videos viewable via the internet
- Content geared specifically for aphasia survivors, family members, and speech professionals.

Establishment of a scholarship program for children in speech school and adults needing speech therapy

## **NATIONAL APHASIA ASSOCIATION**

National Aphasia Association  
156 Fifth Avenue, Suite 707  
New York, NY 10010

Telephone: 800-922-4622

Email: [naa@aphasia.org](mailto:naa@aphasia.org)

<http://www.aphasia.org>

NAA is an organization dedicated to promoting the care, welfare, and rehabilitation of those with aphasia through public education and support of research. The NAA is not, however, a support group, research organization or referral agency. The NAA does not endorse particular therapeutic techniques or approaches, nor does it fund research studies. It also does not, at this time, address the needs of those with developmental (childhood) aphasia.

The MISSION of the National Aphasia Association is to stimulate the development and utilization of resources to help meet the needs of people with aphasia and their families.

Our GOALS are to:

- Stimulate increased access to and availability of information and resources for people with aphasia and their families
- Encourage public education to generate better awareness, understanding, attitudes toward, and appreciation of people with aphasia and their families
- Advocate for public policy changes necessary to meet the needs of people with aphasia and promote their reintegration into society
- Promote professional education and clinical research which addresses the rehabilitation of communicative function and the quality of life for those with aphasia
- Identify and bring attention to ethical issues related to aphasia.

The National Aphasia Association was founded in 1987 and is the first national association in the United States to focus on the person with aphasia and his or her family. Aphasia support groups are now found in almost state in the US. The NAA lists the groups on its website and points out: that the list “represents a wide variety of group types and structures. Some consist only of persons with aphasia and their significant others and some are more inclusive. Some are free and some are not.”

## **AMERICAN SPEECH-HEARING-LANGUAGE ASSOCIATION**

American Speech-Language-Hearing Association  
10801 Rockville Pike  
Rockville, Maryland 20852

Telephone: 888-321-ASHA; 24 hours a day 7 days a week automated information available

ASHA Action Center: 800-498-2071, available 8:30-5:00 ET

<http://professional.asha.org/>

**ASHA is the professional, scientific, and credentialing association for more than 99,000 speech-language pathologists, audiologists, and speech, language, and hearing scientists in the United States and internationally.**

The mission of the American Speech-Language-Hearing Association is to promote the interests of and provide the highest quality services for professionals in audiology, speech-language pathology, and speech and hearing science, and to advocate for people with communication disabilities.

ASHA serves a clearinghouse for information on legislation, certification, consumer information, state and federal regulations, careers, the business of speech pathology, ethics, educational programs, equipment and product, trends in insurance, and research.

ASHA also has an affiliated charitable foundation whose mission is to advance knowledge about the causes and treatment of hearing, speech, and language problems:

## **AMERICAN SPEECH-LANGUAGE-HEARING FOUNDATION**

American Speech-Language-Hearing Foundation  
10801 Rockville Pike  
Rockville, MD 20852

Telephone: 301.897.7341

<http://www.ashfoundation.org/>

The American Speech-Language-Hearing Foundation, created in 1946 by Wendell Johnson, is a charitable organization working to promote a better quality of life for children and adults with communication disorders. Its mission is to advance knowledge about the causes and treatment of hearing, speech, and language problems.

To achieve these goals, the Foundation raises funds from individuals, corporations, and organizations. Proceeds from fund-raising activities support research, graduate education, and special projects that foster discovery and innovation. The Foundation's legacy as a catalyst for new directions ensures a bright future for individuals who might otherwise face barriers to achieving their personal visions and full potential.

### **Foundation Individual Donors**

Thousands of individual donors have contributed over the past 50 years-- and not just audiologists, speech- language pathologists, and other professions linked to communication disorders, but also individuals who have been touched by friends, relatives, and neighbors with communication disabilities.

As an individual contributor, you will gain peer recognition in the Foundation's Annual Report, The ASHA Leader (circulation over 100,000), special program brochures, and ASHA Convention materials. In addition, you will receive invitations to the Founders Breakfast and special networking events at ASHA's annual Convention. You will receive

advance notice of grants, scholarships, and other Foundation-funded programs. And you will learn of the results of funded work through Foundation publications.

Benefactor \$25,000; Leadership Circle \$10,000; Pacesetter \$5,000; President's Circle \$1,000; Gold Founder \$500; Silver Founder \$250; Bronze Founder \$150; Founder \$100; Associate \$50; Contributor \$25

**You may designate your gift to support annual programs in research, scholarship, and special projects.**

You may also contribute to one of the Foundation's endowment funds. Honor and memorial cards are available should you wish to make a gift in someone's name. Contributions are tax-deductible as permitted by law.

**OTHER ASSOCIATIONS THAT MAY HAVE AN INTEREST IN APHASIA TREATMENT AND RESEARCH:**

FROM: [http://www.nidcd.nih.gov/health/pubs\\_vsl/aphasia.htm#info](http://www.nidcd.nih.gov/health/pubs_vsl/aphasia.htm#info)

American Academy of Neurology  
1080 Montreal Avenue  
St. Paul, MN 55116  
Telephone: 651.695.1940  
<http://www.aan.com>

American Heart Association  
7272 Greenville Avenue  
Dallas, TX 75231  
Telephone: 800.242.8721  
<http://www.americanheart.org>

Brain Injury Association, Inc.  
105 North Alfred Street  
Alexandria, VA 22314  
Telephone: 800.444.6443  
<http://www.biausa.org>

National Stroke Association  
9707 East Easter Lane  
Englewood, CO 80112-3747  
Telephone: 800.787.6537  
<http://www.stroke.org>

## **INTERNET- BASED INTERACTIVE EFFORTS**

### **THE NETWORK IN MULTICULTURAL COMMUNICATION SCIENCES AND DISORDERS**

<http://www.utexas.edu/coc/csd/multicultural/network/home.htm>

The Network in Multicultural Communication Sciences and Disorders is a web site maintained by the Multicultural Leadership Program in Communication Sciences and Disorders at The University of Texas at Austin. The primary purpose of the web site is to provide a vehicle for individuals, groups, and organizations who are actively interested in multicultural issues as related to communication sciences and disorders to connect with one another and find resources to facilitate our understanding of multicultural issues as related to communicative differences and disorders. To achieve this purpose the web site strives to organize relevant information, facilitate communication, and foster collaboration between and among participants. It is hoped that the web site will serve as a catalyst for interpersonal networking among professionals in the fields of communication sciences and disorders and related disciplines. As this interpersonal network develops, the Network web site will reflect the issues and expertise of its participants by providing opportunities for active involvement in the development and maintenance of the site. Participants are highly encouraged to sponsor portions of the Network in this manner. The Network is a only a vehicle for information exchange and collaboration and does not assume responsibility for the evaluation or endorsement of programs, organizations, or products that may be included within the site.

### **NATIONAL CENTER FOR NEUROGENIC COMMUNICATION DISORDERS**

#### **CENTERNET**

<http://cnet.shs.arizona.edu/cnet/>

CENTERNET is continuously a operating computer network on which high-interest conferences are offered to Internet users throughout the world.

[c-net\\_adultneuro@listserv.arizona.edu](mailto:c-net_adultneuro@listserv.arizona.edu)

This list focuses on professional concerns, cultural and reimbursement issues, as well as assessment and management problems, interesting cases, and research needs as they relate to neurogenic communication disorders in adults.

[c-net\\_telerounds@listserv.arizona.edu](mailto:c-net_telerounds@listserv.arizona.edu)

This list offers subscribers information on the video teleconference series, TELEROUNDS, and provides a forum for discussion of these programs.

Plus, a listserv focusing on issues relating to children, similar to the listserv for adults.

#### **ELSNET**

<http://www.elsnet.org/>

ELSNET is the European Network of Excellence in Human Language Technologies, funded by the European Communities' HLT Programme. ELSNET's objective is to bring together the key players in language and speech technology, both in industry and in academia. To encourage

interdisciplinary co-operation ELSNET organises a variety of events and services to the language and speech community.

## **Speech Guru**

<http://www.speechguru.org/>

This is a not-for profit website designed and organized so as to provide "information for all". This website deals with the various aspects of speech, language, hearing, communication, and swallowing disorders for all ages. This website promotes team work and facilitates transfer of message amongst the professionals and community by using Chat Groups. The mission of this website is to bring the best in each one of us to serve the mankind to alleviate, reduce, and eliminate all types of deviances, impairments, disabilities, and handicap. This website hereby promotes "Healthy Communication for All" both nationally and internationally.

## **SLP START PAGE - INTERNET SEARCHERS AND RESOURCES**

[http://members.tripod.com/Caroline\\_Bowen/slp-eureka.htm](http://members.tripod.com/Caroline_Bowen/slp-eureka.htm)

This site comprises some **160 web pages** for families, Speech-Language Pathologists, professionals in related disciplines, and students of human communication disorders and sciences. The articles and links here reflect my clinical and research interests, and also the important part that families can play in the assessment and management of communication impairments.

## **speechweb**

<http://www.speedline.ca/johnv/home.html>

This site was created with the hope of providing easy access to information on speech, language and speech-language pathology. In addition, it was also our hope to provide a meeting place for professionals and those who have been affected by communication disorders.

## **COMMUNICATION DISORDERS AND SCIENCES**

<http://www.mankato.msus.edu/dept/comdis/kuster2/discussion/discussion1.html#comdisgen>

ASHA has an interactive web-based discussion forum open to ASHA and NSSLHA members-only for discussion in seven areas: General Issues in Audiology, General Issues in Speech-Language Pathology, Issues Unique to Professionals in School Settings, Practice Issues for Audiologists, Practice Issues for Speech-Language Pathologists, Science and Research Forum, and Linking Research to Practice. The site is accessed by typing your last name and eight digit ASHA membership number [ASHA-RESEARCH-DIGEST@POSTMAN.COM](mailto:ASHA-RESEARCH-DIGEST@POSTMAN.COM) is a non-interactive, e-mail service disseminating information about conferences, workshops, funding sources, news briefs, post-doctoral fellowships, etc. to ASHA members. To subscribe, address message to [asha-research-digest-request@postman.com](mailto:asha-research-digest-request@postman.com). Type subscribe in the subject line and add the following message: your name and email address.

[CDMAJOR@LISTSERV.KENT.EDU](mailto:CDMAJOR@LISTSERV.KENT.EDU) is a forum for students and faculty in speech-language pathology, audiology, speech science, or hearing science programs. To subscribe, send the following message to [listserv@listserv.kent.edu](mailto:listserv@listserv.kent.edu) subscribe CDMajor firstname lastnameThe list owner is Antony Caruso ([acaruso@kentvm.kent.edu](mailto:acaruso@kentvm.kent.edu))

COMMDIS@CIOS.LLC.RPI.EDU is part of Comserve, a service of the Communication Institute for Online Scholarship (CIOS), established for students and professionals interested in the study of human communication. It provides a variety of services, including e-conferences, an E-Journal of Communication, a resource library, etc. Comserve is available at no charge to the general public for certain services. There are several affiliated institutions and associate membership is also available for a fee. Commdis is the hotline service set up to facilitate communication on the topic of communication disorders. It is designed in a digestformat. To subscribe, send the following message to comserve@cios.llc.rpi.edu join commdis firstname lastname The list moderator is C. Richard Dean (hssdean@ouaccvmb.cats.ohiou.edu)

GRNDRNDS@WVNM.WVNET.EDU is a forum that discusses all aspects of the clinical process with respect to the evaluation and treatment of communication disorders. To subscribe, send the following message to listserv@wvnm.wvnet.edu subscribe grndrnds firstname lastname The list owner is Karen McComas (mccomas@marshall.edu)

LOGOPEDIA@LISTSERV.REDIRIS.ES is a mailing list in the SPANISH language that deals with language, speech and voice handicaps. It is devoted to information exchange among speech therapists, psychologist, pedagogues, doctors or any professional that participates in rehabilitation of people who can have any disorder in language, speech or voice. To subscribe, send the following message to listserv@listserv.rediris.essub logopedia yourfirstname yourlastname

NEWSGROUPde.sci.medizin.logpaedie-a German newsgroup on communication disorders (not available through many US servers).

ORTHOPHONIE is a French language discussion list about logopedia and orthophonie. To learn more about the list check [http://www.multimania.com/rolfan/ac\\_liste.html](http://www.multimania.com/rolfan/ac_liste.html). The list owner is Aurelie Guittard (lilie@wanadoo.fr).

SLP@QED.QLD.GOV.AU is a discussion list for Speech Language Pathologists (and other therapists) working in the education setting. It was developed for SLPs working with Education Queensland (in Australia) but would be suitable for all interested therapists. To subscribe send the following message to LISTSERV@QED.QLD.GOV.AU, subscribe SLP emailaddress fullname. List Owners Marie-Therese Worthington, Tina Janes,Sue Ennis, slpbundy@bundwestss.qld.edu.au

## EXAMPLES OF ASSISTIVE TECHNOLOGIES

<http://www.aphasia.org/NAAweblinks.html>

### **Aphasia Therapy Products, Inc.**

<http://www.aphasia-therapy.com/>

The CHAT (Computerized Home Aphasia Therapy) program was developed over a number of years in the homes of stroke survivors and represents a collection of therapeutic strategies acquired over thirty years of helping people with aphasia. It has proven to be a viable option for language retrieval therapy following dismissal from a formal therapy program. The CHAT program was designed for the client with aphasia who has been terminated from a formal therapy program or is going to be finalizing his/her formal therapy soon.

For these people who want to continue with therapy, introducing the CHAT program before formal discharge allows both the client and the Speech-Language Pathologist in charge of the program, to make an intelligent decision as to the efficacy of continuing with the CHAT program at home.

Termination of therapy is usually difficult for all concerned: the client, the family, and the speech pathologist. It is difficult to predict whether or not clients will continue to progress with more therapy. The sad reality of the situation is that third-party insurers will not continue therapy payments if reports indicate that the client is not making progress. However, if the client wants to have more therapy, what is s/he to do?

The solution to this dilemma for many clients is the Computerized Home Aphasia Therapy program (CHAT), which allows clients to work independently of others, including speech pathologists and family members. They may intervene briefly from time to time to offer encouragement, but therapy is now under the clients' control. This may well be the first time that the client has felt in control of anything since his or her stroke.

For a relatively small one time cost, a client can use the CHAT program indefinitely on his or her computer. Thus, therapy is available 24 hours a day, and there is no need to go to some special location and at a scheduled time to get it.

### **Avaaz Innovations, Inc.**

CANADA

Telephone: 519.472.7944

Fax: 519. 472.7814

<http://www.avaaz.com/>

AVAAZ Innovations develops and markets software products for clinical, research, and industrial applications involving speech and spoken language. We are a university spinoff company, headquartered in one of North America's leading speech & hearing centers. Our customers include researchers, engineers and clinicians in more than 60 countries. We offer leading-edge products for both R&D and clinical needs to let you analyze, measure and process speech and

other acoustic signals; for advanced voice assessment; to treat childhood articulation and phonological disorders; and to assess and treat aphasia and adult language disorders.

Speech, Language and Hearing Research Centers:

Cambridge University (UK), CUNY Graduate School, Dongeui University (Korea), Kiel University, MRC Institute of Hearing Research (UK), University of Alberta, Universitat Beilefeld (Germany), University of California, University of Texas, University of Tokyo, University of Wisconsin (US), Vanderbilt University (US)

## **Bungalow Software**

Bungalow Software  
5390 NE Stanchion Ct.  
Hillsboro, OR 97124

Telephone: 503.648.0518

<http://www.bungalowsoftware.com/>

Terri Nichols was frustrated. A speech-pathologist providing therapy to stroke survivors, Terri's therapy time was limited. And stroke recovery takes a lot of therapy. Most of her patients could not afford all the therapy they wanted and needed. Her patients needed an economical way to get a lot of speech therapy practice at home. So she turned to her husband, a computer programmer...Terri explained in detail the methods she used for providing practice therapy. She also showed him worksheets she created as "homework" for her patients. Clay, in turn, developed the AphasiaTutor computer (software) program. What started as a 2 week project turned into a year long process of tweaking and refining the programs. Bungalow Software was born. That was 1994. It seems like last millennium.

Therapy practice isn't simply about "testing" or "correcting" the patient. It's about providing appropriate (and minimal) cues and hints. It's also about being patient for hours at a time. That alone is a challenge for anyone. So, where does this leave the patient ? ...Waiting for therapy. And waiting... and waiting...

Most people cannot afford to pay out-of-pocket for the tremendous amount of speech therapy needed. So, no insurance coverage usually means no therapy. It's not because speech therapists are expensive. Far from it. They need nearly as much schooling as a lawyer and charge less. But it takes a lot of therapy to recover from a stroke or brain injury. That can get expensive.

Sound familiar? We hear this same story from many of our customers. Hopefully, it hasn't happened to you, but it likely will eventually.

Bungalow Software provides the intensive speech therapy practice necessary to get through the plateau before insurance coverage ends. Using Bungalow's therapy software while getting insurance covered therapy cannot only help speed recovery, but also help to extend insurance coverage as well.

## **Interactive Therapeutics, Inc.**

P.O. Box 1805  
Stow, Ohio 44224-0805

Telephone 800.253.5111

<http://www.interactivetherapy.com/index.htm>

The primary focus of Interactive Therapeutics, Inc. is to provide functional, quality products at affordable prices to medical and educational professionals, clients and families.

Interactive Therapeutics, Inc. was founded in 1985 by two practicing speech-language pathologists having over 45 years of combined experience in the fields of speech-language pathology and audiology. Their goal was to provide clients, families and clinicians with functional and affordable materials that would assist in the rehabilitation process as well as help in day to day interactions. As a result, "Communicating in the Real World" has become the hallmark of Interactive Therapeutics, Inc. and its expanding line of products.

Beginning in 1985 with a simple word communication notebook, "The Daily Communicator®", the line of products has grown to over 40 items and continues to expand. With their depth of experience the founders not only create their own materials but also distribute the work of many leaders in the field. The reputation of Interactive Therapeutics, Inc. now attracts the work of outstanding authors and specialists from throughout the U.S. as well as internationally.

The majority of the products have been developed for use with adults and older children. They include a series of communication aids in both English and Spanish, counseling books for the patient and family, and several oral exercise products. Dysphagia management includes a variety of swallowing status charts as well as a patented mirrored exercise sheet. Several cognitive products in the form of daily planners, calendars, and workbooks are available.

The products available from Interactive Therapeutics, Inc. have been widely accepted by leading hospitals, rehabilitation centers, universities, extended care facilities and private practice therapists. These materials are sold extensively throughout the U.S. and Canada as well as on a limited basis internationally.

## **Learning Fundamentals**

1130 Grove Street  
San Luis Obispo, CA 93401  
800.777.3166 or 805.544.0775

<http://www.learningfundamentals.com/i>

LocuTour products are marketed through Learning Fundamentals.

Marna Scarry-Larkin, MA, CCC/SLP is a speech pathologist with 18 years of experience in private practice. For the past seven years, she was awarded the contract to provide language and cognitive rehabilitation services for the Atascadero State Hospital. She lectures around the country on topics of Executive Functions, Communication Disorders and Literacy.

LocuTour Multimedia was started by Marna Scarry-Larkin, MA, CCC/SLP who was frustrated by the limitations of DOS-based programs. She wanted software that had real voices, photo-quality pictures, and the flexibility to adjust to the needs of different Students. By 1994 she had filled up three drawers of a filing cabinet with ideas for software for cognitive rehabilitation and speech therapy.

LocuTour CDs are designed to meet the needs of speech pathologists, teachers, and parents. They can be used by children and adults with various skill levels. Most exercises have a beginning, intermediate, and advanced level. Options are available to change the games to suit the way the therapist wants to do therapy. Because speech sounds are so important, the voices on the CDs are recorded at 16 bits, the same as music CDs. The photos are clear, colorful, and captivating. The screens are simple and uncluttered to help Students with attention problems focus on the activity, but the games are engaging enough that both children and adults look forward to using them for therapy.

Because the CDs are so easy to use, Students can use them on their own, at home, to get more therapy time. Even severely impaired Students can get more therapy with the help of relatives and others who are not trained in rehab therapy. The CDs provide clear, consistent speech for the client to imitate. Speech aides can be trained to work with Students, easing the load on overworked speech pathologists.