

## **Technology and the ISN: cyberNephrology and the Informatics Commission**

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*"Technology is the continuation of evolution by other means....  
It is in the nature of exponential growth that events develop extremely slowly for extremely long periods of time, but as one glides through the knee of the curve, events erupt at an increasingly furious pace. And that is what we will experience as we enter the twenty-first century."*

*--Ray Kurzweil - The Age of Spiritual Machines, When Computers Exceed Human Intelligence*

<http://www.penguinputnam.com/kurzweil/excerpts/chap1/ch1botframe.htm>

*"When a scientist states that something is possible, he is almost certainly right.*

*When he states that something is impossible, he is very probably wrong.  
The only way of discovering the limits of the possible is to venture a little way past them into the impossible.*

*Any sufficiently advanced technology is indistinguishable from magic."  
-- Arthur C. Clarke's three laws of technology"*

Nephrology had its origins in the work of conceptual thinkers - Tigerstedt and Bergman, Volhard and Fahr, John Peters, Robert Pitts, Homer Smith etc..- but it was technology that allowed it to flower and attain an identity. At the beginning in the 1950's and 1960's, when subspecialties were defined by their procedures, it was dialysis, transplantation, and the renal biopsy which distinguished the clinical discipline, micropuncture and electron microscopy which defined nephrology science. At the first International Congress of Nephrology in Evian in 1960 nautical technology was also involved, with a ship becoming the symbol of the International Society of Nephrology.

Despite the enormous explosion of technology in general, in the clinical discipline, and in the research laboratory, it was not until the late 1980's that advances in communication technology affected the ISN.

When the ISN Commission on Acute Renal Failure was established in 1989, it made use of an extensive worldwide fax network. At the same time, the word processor and personal computer were superseding the typewriter. These revolutions in communications technology did not represent simple replacement of one instrument by another, but rather in a whole new way of working, and so it continued.

In 1991 the First Banff Conference on Allograft Pathology was held as an activity of the ISN ARF Commission. The conference was directed by Kim Solez and Lorraine Racusen, with practical organization provided by Michele Hales. This highly successful consensus building conference, which continues every two years under the same organizational structure, led to the Banff Classification, the worldwide standard for renal transplant biopsy interpretation. Initially, fax was the primary mode employed not only in the Banff classification communications, but also in another important activity of the ARF Commission, the Disaster Relief Task Force (discussed in the previous newsletter). Beginning in 1994, Email and the Internet came to the communicative forefront. In the fall of that year, Michele Hales and I established the ISN site on the World Wide Web and the NEPHROL Email discussion group. The first renal biopsy images were sent over the Internet in early 1995. Also in 1995, the Banff meeting became the first international medical meeting which one could "virtually" attend via CD-ROM and the WWW. The first nephrology conference conducted by Internet videoconferencing occurred between Edmonton and Milan in December 1996.

Tremendous growth and diversification followed these initial beginnings. By 1997 there was justification for formation of a separate Informatics Commission, coincident with creation of NKF cyberNephrology by the National Kidney Foundation. Over the next three years there was increasing employment of Internet videoconferencing. A health education quality site without precedent was created when the five volume Schrier Atlas of Diseases of the Kidney was placed on line in searchable form with PowerPoint presentations from each of the 66 chapters <http://www.kidneyatlas.org> with the help of former Churchill Livingstone CEO William F. Marovitz. The number of Email discussion groups grew to over 70 counting those run from Edmonton and those run from New York by Gary Green, Director of the NKF's New Technologies Division. Recently cyberNephrology has been making increasing use of wireless connectivity using radio waves rather than

wires to connect to the Internet greatly enhancing our capabilities at meeting venues and in humanitarian projects with Renal-Tech and COMGAN.



NKF cyberNephrology Assistant Director Michele Hales using wireless connectivity employing radio waves via an AirPort base station on a different floor of the building.

Through the Renal-Tech computer donation and Internet assistance program <http://www.renal-tech.org> and in cooperation with COMGAN substantial informatics help has been provided to Nepal, Cuba, and other developing countries, see:

<http://cnsrver0.nkf.med.ualberta.ca/cn/Sisters/>  
<http://cnsrver0.nkf.med.ualberta.ca/cn/Nepal/>

Our latest ventures have been in Kosovo. see:

<http://cnsrver0.nkf.med.ualberta.ca/cn/Kosovo/Title.htm>  
<http://cnsrver0.nkf.med.ualberta.ca/cn/KosovoII/>



Rebuilding Kosovo - The author has never seen an area with more active construction going on! (Picture by Dr. Wendy Brown.)





Renal-Tech Director Zina Munoz establishing computer facilities and Internet connections for nephrology at Pristina Clinical Centre



Dr. Szilard (Chief IOM Medical Officer for Kosovo) and Zina Munoz working together at IOM Medical Headquarters, drafting a plan for continued informatics assistance to the Central Pristina Medical Center and the 5 regional medical centers which serve renal patients throughout the country.

In addition to those mentioned above, over a hundred WWW sites for humanitarian ventures and virtual attendance at nephrology meetings have been created with thousands of images. For meeting examples see:

<http://cnservers0.nkf.med.ualberta.ca/cn/AST/> and  
<http://cnservers0.nkf.med.ualberta.ca/cn/Banff>

Many of the sites we have created include 360-degree panoramas produced by the "software-stitching" of overlapping individual pictures. In the course of a few years, the time required for this highly RAM-dependent process has been reduced from hours to minutes, creating panoramas like those seen in these recently created examples:

<http://cnservers0.nkf.med.ualberta.ca/cn/PSN/Panorama/>  
<http://cnservers0.nkf.med.ualberta.ca/cn/Kosovo/PristinaSunrise.ivr>



NKF cyberNephrology Secretary/Assistant Janice McDonald handles many of the daily tasks relating to the cyberNephrology Email discussion groups and WWW sites. She is seen here using wireless connectivity at the reception desk of the NKF cyberNephrology/ISN complex at College Plaza in Edmonton.

Up until this year, most of our image intensive WWW sites involved people and their presentation slides. When pathology images were presented, they were scanned from transparencies - there was always a step that involved film.

Now the excitement in 2000 is that film is no longer necessary; images obtained directly from a digital still camera mounted on a microscope are equal or superior to those obtained through film. Similar advances have occurred in other areas of medical imaging.

Digital microscopic panoramas can be used to create a "virtual microscope" with a very familiar feel, but in many ways much more convenient than a real microscope. Panoramas are not limited to still images and two

dimensions, they can be equally well applied to video and three dimensional images:

<http://www.cnn.com/2000/TECH/computing/06/22/360.video.idg/index.html>

True virtual reality nephrology in all its aspects is now technically feasible, it is just a matter of making it happen!

Using these emerging technologies, the Informatics Commission and NKF cyberNephrology is shifting their WWW site emphasis to nephrology medical and scientific images and away from people images. This change not only ensures that images from past meetings will remain ageless, but leads us to our future goal to make the nephrology community aware of the true potential of modern technology. Beginning with the fact that you may never again have to use film for any purpose!

More surprises. One expects the unexpected in an article about technology. Part of the surprise is not just the "what", but also the "when". The reader may be thinking "will I see this in my lifetime?" but consider this:

Everything I am describing in this article, above and below, already exists today at least in its rudiments, it is just a matter of applying it to nephrology and creating specialized products to bring it into our world!

I have taken this approach of considering what already exists today because the alternative, talking about developments purely in the future raises the question of "what will nephrology be then?". So if Ray Kurzweil (quoted at top) is correct that machine intelligence will fully equal human intelligence in 2020, and that humans and machines will be indistinguishable from each other in 2099, what will be the relevance of nephrology then, since machines and computers lack kidneys?

So I will concentrate on what exists at least in prototype now.

New developments with the potential to revolutionize nephrology include:

1) Circuits that combine digital and analog signaling just as the human brain does:

<http://www.cnn.com/2000/TECH/computing/06/23/brain.circuit.ap/index.html>

2) Human-centered rather than machine-centered computing, near perfect voice recognition:

<http://www.cnn.com/2000/TECH/computing/06/23/mit.oxygen.idg/index.html>

3) Gene chip DNA Microarrays for instant genetic diagnosis:



<http://www.gene-chips.com/>

4) The wearable computer, digital clothing

<http://iswc.gatech.edu/>

5) The bioartificial kidney

[http://www.nature.com/nbt/press\\_release/nbt0599.html](http://www.nature.com/nbt/press_release/nbt0599.html)

6) The wireless Internet

<http://www.web-wo-wires.com/> <http://www.apple.com/airport/>

7) Evolution of new ethical standards for e-health

<http://www.ihc.net/ethics/code0524.pdf>

8) Quantum computing

<http://squint.stanford.edu/> <http://www.qubit.org/>

9) Optical switching/Optical Internet

<http://www.nortelnetworks.com/corporate/pressroom/pressconferences/061900/index.html>

10) Nanomachines/near molecular level organ repair in disease

<http://live.altavista.com/scripts/editorial.dll?ei=1949105&ern=y>

If this is what exists today, imagine what technology will be there tomorrow!  
Before long in a sense all nephrology will be cyberNephrology!

You can watch our embrace of these new technologies evolve at:

<http://www.cybernephrology.org> and

[http://cserver0.nkf.med.ualberta.ca/misc/NKF\\_ISN/Informatics.htm](http://cserver0.nkf.med.ualberta.ca/misc/NKF_ISN/Informatics.htm)

Enjoy!

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